Acadia Advantage – Computerizing a Campus

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Abstract: In 1996, Acadia University joined a small number of North American universities who embarked on a transition to a fully computerized campus. The adopted strategy was to equip each student and faculty member with a personal laptop computer, take advantage of computer technology in most courses, and provide ubiquitous access to the computer network everywhere on the campus.

In this presentation, we will describe the experience of campus computerization, talk about the logistic problems, impact on faculty and students, successes and disappointments, present video tapes showing the use of computer technology in our classrooms, and introduce some of the technical and education-related research that was stimulated by the project.

Introduction

Acadia University located in Wolfville, Nova Scotia, is a small, predominantly undergraduate, teaching-oriented university in Eastern Canada. Its full-time enrolment is about 3,500 undergraduate and some 100 MSc students, for a faculty of about 230. Student-faculty ratios are relatively low, class sizes typically 20 to 30 students, with only a few around 100. The corresponding size of classrooms, labs, and other teaching facilities is generally quite small too. With its small size and focus on teaching, Acadia University has always placed emphasis on instructional style and technology.

In 1996, Acadia University began the Acadia Advantage program (AA for short), an academic initiative that integrates the use of notebook computers into the undergraduate curriculum. Phase I of the program saw 370 students and 45 faculty piloting the initiative. In September 1997, all first-year, full-time undergraduate students and approximately 125 faculty entered the program. By the year 2000, all full-time undergraduate students and all faculty will be involved.

History

The original impulse for the creation of AA can be traced back to difficulties associated with maintaining information resources. During the late '80's Acadia University faced the problem shared by many other North American universities: How to continue providing students and faculty with the information and knowledge resources required to maintain a dynamic academic environment under the conditions of decreasing public grants and increasing costs of purchase and storage of printed materials. At the same time, some faculty members felt that the traditional lecture format needed to be adopted to new technologies to prepare students better in critical areas of communication skills, problem solving, working in groups, entrepreneurial instincts and technological capabilities. In addition to these fundamental challenges, Acadia faced daunting costs in maintaining the traditional computing facilities that students and faculty had come to expect and to depend on.

In 1989, a report entitled The Global Library was prepared at Acadia University by the Director of the Computer Centre and the University Librarian. The document was approved by the Senate and the Board in 1991. Key among its more than 20 recommendations was the goal to provide access to the information highway at the user's preferred location on the campus. As Acadia moved to implement this strategy, it became increasingly clear that all of the objectives could be met through a single project. The first step in the project - identification of what was to become the Acadia Advantage Program - began in August 1995. Through the fall of 1995 and into early 1996, the initial concept was investigated, discussed, refined and developed. The final draft of the plan was presented to an open assembly and approved by the Senate and the Board of Governors in the spring of 1996.

Implementation

The key elements of the project included identification and study of similar projects in North America, identification of material and development needs, design and construction of new teaching facilities in support of the new technology, design of a program to support faculty development, and significant increase of the capacity of the existing campus wide intranet.

While the project was under development, various other universities started introducing "electronic" classrooms [Mühlhäuser 1996], [Shneiderman 1995] where each student has access to his or her computer, either a mobile notebook [Wake Forest, 1997] or a stationary computer (University of North Carolina). In these classrooms, computers are usually networked, allowing students to access Internet. At the same time, various organizations started developing integrated educational systems that provide numerous facilities including access to information about courses such as course descriptions, computerized course materials, discussion groups, chat rooms, on-line tests, etc.

During the summer of 1996, a new ATM backbone was installed beside the existing FDDI backbone. Fibre optic cable was extended to all buildings on campus, and copper wiring was provided to bring data to faculty offices and classrooms. Seven classrooms ranging in size from 30 to 100 were redesigned and provided with network connections to all seats. Each classroom was provided with full multimedia capabilities that are easily operated from an instructor console. Approximately 3000 sites on campus were wired including the library, public gathering areas, lounges, offices and other key locations. In the summer of 1997, 12 more classrooms and several laboratories were renovated, and by summer's end of 1998, 60% of all learning facilities will meet AA requirements.

At the time of this writing, each new AA student arriving at Acadia is provided with an IBM Thinkpad with 24 MB RAM, and 1.2 GB hard disk, a CD ROM drive, and software including Windows 95, Microsoft Office Suite. A host of discipline-specific programs is included individually to satisfy the needs of each department. Faculty and students make use of the computers in both synchronous and asynchronous ways, using them in a standalone or network connected fashion. The majority of courseware is either TCP/IP based or resides on individual laptops and students thus have 24-hour access to courseware material. The hardware/software configuration continuously evolves and selection of a new model with more RAM and disk space for the fall of 1998 is under way.

In terms of faculty development, Acadia faced a fundamental problem faced by all colleges and universities undertaking similar initiatives: What type of support will most successfully help faculty to prepare course material and master the new technical tools available to them for curricular innovation? Students involved in the program have high expectations about the use of the technology (they pay an extra amount in addition to already high tuition fees), and many faculty were rightly concerned with pedagogy and course content. Information on the effective use of computers in education is full of qualitative data, but little concrete information was available to help guide the process. It was clear that faculty should not be required to learn all there is to know about using personal computers, accessing the Web, developing courseware, adapting to new modes of scientific data acquisition, or constructing on-line tutorial or testing programs. What was needed was a place where faculty could go to discuss possibilities and find help in implementing technology-based enhancements to instruction.

To address this need, the university created a central location to support faculty development, the Acadia Institute for Teaching and Technology or AITT, now better known as the ‘Sandbox’. AITT is the primary on-campus site for technical support of computer-enhanced learning, research, development, and training. Quite naturally, AITT also came to play a crucial role in the selection and development of educational software. The first steps in the selection of appropriate software included evaluation of numerous commercial packages, as well as software developed at other institutions. Cost, installation, support, and maintenance issues were considered and in the end, a mixture of software with a shared core of applications augmented by discipline-specific applications adopted. Due to the perceived unsatisfactory quality or lack of match with course specific requirements, AITT undertook to develop a core application that would satisfy the shared needs of the faculty across all departments.

The largest Sandbox project in the area of software development to date has been the development of ACME - an Automated Courseware Management Environment [ACME]. ACME (Figure 1) is a Web-based course development package that has now been widely adopted by the faculty; at present, 150 faculty use it in over 450 courses and labs on-line. Its first version was developed over a short period of time, mainly by Acadia University Computer Science students under the leadership of the first author.

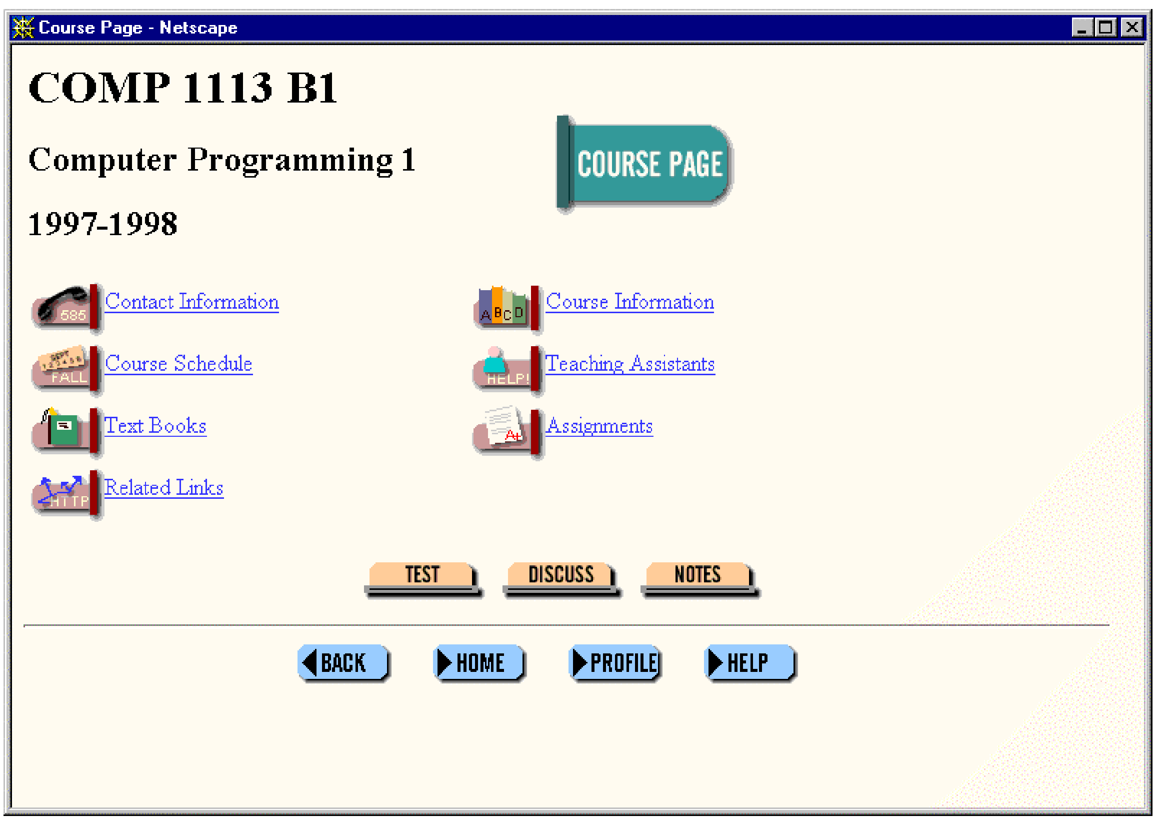

Figure 1. A typical ACME course page providing access to course materials and other facilities.

The main goal of ACME is to make courseware development and use as easy as possible for faculty and students with limited computer expertise. The package provides a directory of registered courses allowing authenticated users to access their personal combination of course materials. The tools provided include access to general course materials, access to the instructor and information relevant to the course provided by the instructor, a discussion group facility, and an on-line test tool.

The early experience with ACME has been positive as both the faculty and students enjoyed the opportunity to access a large amount of material within a fully integrated and easy to use system. Soon, however, users started presenting new demands, asking for additional features and for customization of existing features. This has been positive in correcting initial design shortcomings and helping to discover new possibilities, but it also created problems in that specific features are required only by small audiences and are not economically justifiable. Because of unsatisfied requirements and interest in exploring new directions, various faculty members started developing their own subsystems as their personal research projects. This initiative is currently supported in two ways – by a competitive university Teaching Innovation Fund which supports selected projects in the general area of innovative teaching endeavours (commonly AA-related), and through support provided by the Sandbox. Sandbox support for departmental AA-related activities has the form of allocating qualified students to individual departments for varying lengths of time during the summer, to help with the implementation of AA-based course materials.

Among the education technology-related research activities triggered by the AA initiative, the best known probably is the Digital Agora [Waters et al., 1998], a Web-based interdisciplinary project that aims at shifting the educational paradigm in social sciences from instructor-centered to student-centered (Figure 2). The project allows authorship of hypertext nodes and links (both shared and private), discussion groups, collaborative analysis, simulations such as economic forecasts and population growth, and graphical representations of complex issues using lateral maps built from a dictionary of shared annotated symbols. The project provides access to primary and secondary data, supports quizzes and evaluations, consensus negotiation, collaborative writing, online student newspaper, glossary, calendar, personal annotation, and additional features. The software has been initially used by Political Science students at Acadia University but its use has now grown beyond Acadia University and outside of university educational settings.

Figure 2. Digital Agora's home page.

Since learning is a collaborative process and since computer networks invite collaboration but don't provide sufficiently sophisticated tools to support it, faculty researched development of collaborative and interactive sharing of tools and collaborative virtual environments (CVEs). In particular, the second author of this paper is involved in research on the following implementation techniques: servlets instead of CGI, RMI or Corba rather than sockets, Java instead of ad-hoc user-defined specialized servers (such as relay servers), and JDBC for persistent data. The cost of this approach is in the need for highly skilled programmers, but the benefits greatly outweigh the cost: The resulting software will be efficient, maintainable, portable and modifiable. The following projects are currently under investigation: (1) Virtual collaborative working environments [Hussey, 1998]; (2) Comparison of RMI and Corba for development of persistent shared workspaces; (3) Comparison of two implementations of Corba: IONA Orbix and Microsoft Com; (4) Integrated Java desktops; (5) Specialized Java servers for workspaces with shared applications; (6) Complete Corba-based educational systems; (7) Balancing the load for client/server systems; and (8) Design patterns and frameworks for access controls for shared workspaces.

In another project, a prototype MOO-based CVE called Jersey [Tomek et al. 1998] has been extended and used to teach three software development courses in which participants did not have to, and occasionally could not, work in the same physical locations (Figure 3). Clusters of virtual rooms including personal offices, document rooms, and meeting rooms were created to support projects, and software agents were implemented to perform tasks such as notification of project events to users who registered interest in them, meeting support, delivery of a weekly newsletter to subscribers, and asynchronous query support. A new version of this environment for use in much larger courses is under development.

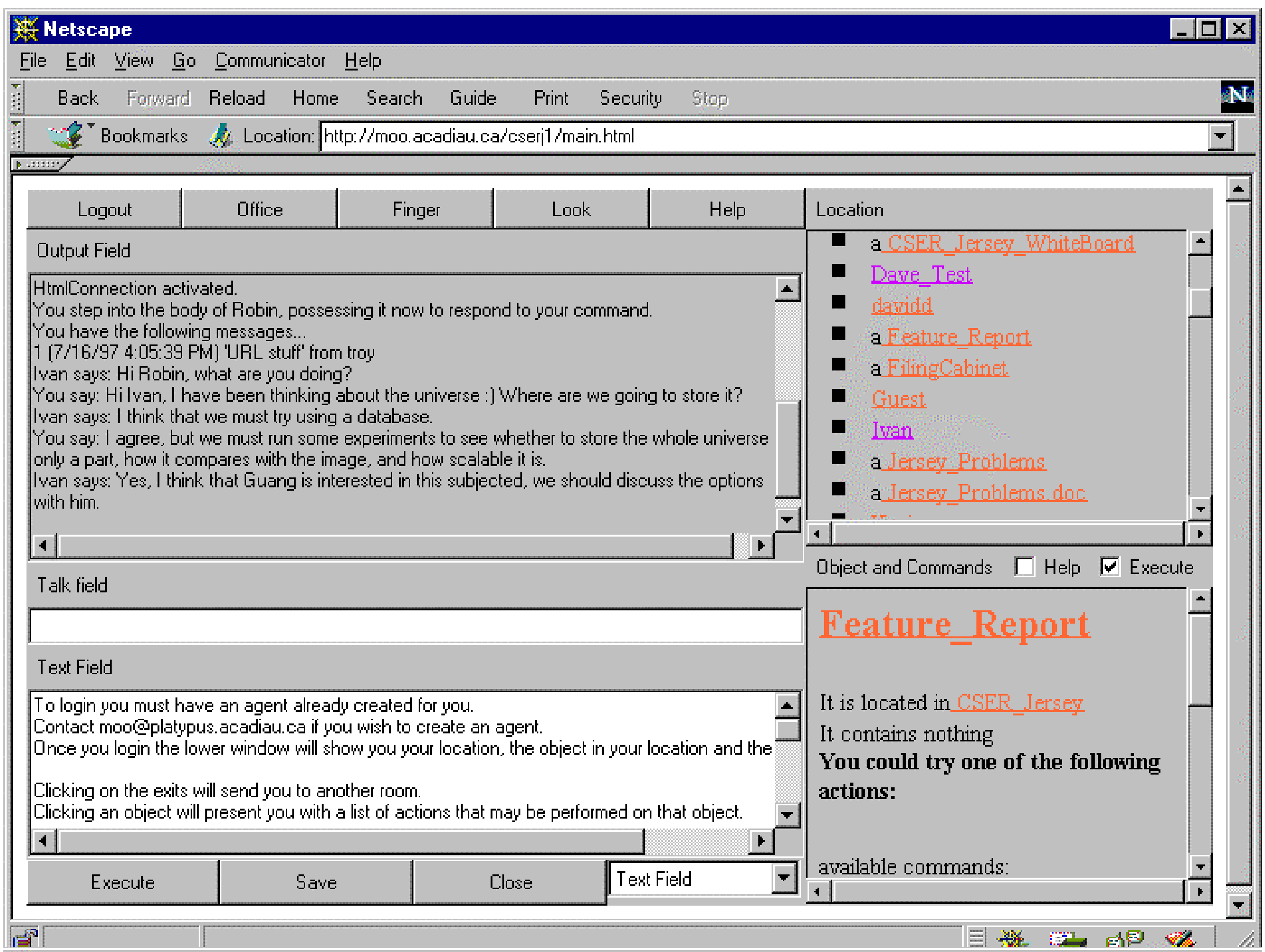

Figure 3. Jersey main window with an output area, talk input field, and workspace on the left, and current room and selected object information on the right.

Conclusion

The Acadia Advantage program, one of the first North American attempts to bring computers into the hands of all students on a university campus, is now nearing the end of the second year of its existence. From a beginning pilot implementation restricted to a few departments and courses, the program has now become universal and all incoming students at Acadia University now obtain a laptop computer with their registration. The initiative required large investments of money and personal time, created internal controversies, and went from apprehension to enthusiasm and critical reappraisal.

In spite of inevitable problems, a large majority of participants consider the program a success. After the initial focus on the use of laptops in the classroom, many instructors have now realized that computer technology does not yet provide the same interactivity as more traditional forms of presentation. In the classroom, the computer has thus become a supplement, an additional tool providing access to large amount of live information and interactivity, instead of being the center of the lecture. More and more instructors are finding that a greater benefit can be derived from the ubiquity of the computer and direct students to use it outside the classroom – as an information accessor, as an interactive tool, and a learning partner with limited intelligence but great power.

The active involvement in exploration of new teaching technologies opened new research avenues for all Acadia University faculty. With continuous hands-on access to computers and with a large student population enjoying the same access, Acadia faculty has started exploring ways in which computer technology can be exploited in university education at a scale that was impossible until now.

From a very pragmatic point of view, perhaps even more important than its presence in the teaching process is the computer's continuous availability. As computer literacy is increasingly a prerequisite to success, employers value extensive experience with information technology, AA students with their 24-hour access to computers can claim this background, and employers appreciate it.

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