Multimedia and Asynchronous Learning: Changing the Role of Academic Computing

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Abstract

The traditional paradigms for teaching and learning follow the Socratic model which is not only time and place dependent but predominantly uses linear teaching tools such as the lecture and textbook. The changing nature of the workforce and the increasing demand for higher education to reach students off campus requires us to look at new paradigms for teaching and learning. After decades of promises based on overhead projectors, classroom video, teaching machines, and other instructional technologies, the ability to improve instruction by integrating digital technologies across the curriculum has become a reality. By incorporating digital text, audio, graphics, animation, and full motion video into the lecture, laboratory, self-study, interpersonal and intergroup communication activities that are fundamental to teaching and learning, the quality of both increases. To effect these changes the nature of Academic Computing Units will need to transform itself if it is to support these emerging technologies and cultural changes.
Introduction

After decades of promises based on overhead projectors, classroom video, teaching machines, and other instructional technologies, the ability to improve instruction by integrating digital technologies across the curriculum has now become a reality. By incorporating digital text, audio, graphics, animation, and full motion video, into the lecture, laboratory, self-study, interpersonal, and intergroup communication activities that are fundamental to teaching and learning, the quality of both increases.

A paradigm shift is taking place in instruction, from a mode of faculty-student interaction taking place in specified locations (campus classrooms) at specified times (class schedules or office hours) to one in which students have access to most of the information content in a variety of forms at their convenience (when the choose, and where they choose from a variety of locations, including their living quarters). This shift is possible because several technologies have matured that provide the basis for major changes in the delivery of instruction. Education in the future must support both synchronous and asynchronous interaction between the learner and the sources of knowledge and information. Real-time, simultaneous two-way video presentations, multimedia presentations, and “education on demand” can be delivered to students on the campus, in their homes or their work places. Connectivity to the Internet and World Wide Web allows students and faculty to access educational resources anywhere in the world to supplement these aforementioned services.

Escalating costs, declining financial support, increasing demand, and diverse demographics have placed significant pressures on higher education to become more productive. Careful analysis shows that the productivity improvements required cannot be achieved by increasing the workload of the faculty; in fact, any significant movement in this direction will only decrease the quality of instruction. There is simply no room left in the workday of a faculty member to teach more students. Rather, the focus for productivity improvement must be on learning.

It is this realization that is leading to a paradigm shift where students gain access to information resources, faculty lectures and demonstrations, conferencing and tutorials over networks from digital information organized in servers by the faculty. The productivity gains occur in both retention, more efficient use of the student’s time, easy access to group studying over networks, better feedback to faculty, and organized self-assessment and self-pacing. Faculty and traditional classrooms are not replaced, but another dimension is added that greatly improves the efficiency of learning. As this new process of using technology to improve learning develops, more students will be able to take advantage of this type of instruction.

Virginia Commonwealth University (VCU) has been exploring several cost-effective teaching models and technology solutions which are designed to improve learning productivity, reduce labor intensity, provide new ways of delivering education and better services to students while improving the quality of instruction. If effective, these concepts could be integrated with and, expanded to, other programs and institutions.

Strategic Plans and Goals
Over the past two years VCU has embarked on a strategic planning effort to define the future role of information technology in support of the university’s academic and administrative programs. The VCU Strategic Plan states that technology will be used to deliver traditional education to the University, the community, the Commonwealth, the nation and to the world.

The visions that emerged recognize that technology can benefit learning when it:

- allows a student to take a more active role
- allows a teacher to express the content of a course in more than one format
- effects students by using techniques that reach various learning styles
- broadens the array of resources brought to a classroom and the student’s workstation
- increases the opportunities for interactions between teachers and students and among students
- increases the productivity of those who support the learning environment

Instructional computing in the next decade will be symbolized by communications between machines, office and office, classroom and library, teacher and student, the campus and the world (network connectivity) not by isolated desktop machines. The next revolution will be less about the technology of computation than about access to information and ways of sharing information. Consequently, this revolution will involve most members of the university communities not only those who have been traditional beneficiaries of technology.

In the new environment, every instructor or student working alone at their office desk or working with others in any campus classroom will access not only the powerful tools of the desktop computer, but also the networked applications and information resources of the University and the world beyond.

The plans envision high-bandwidth network connection to faculty offices and classrooms, network port distributed throughout the campus, high-bandwidth/telephone access from off-campus sites or residences, classrooms equipped with systems for displaying prepared lecture material and sharing information resources, on-line processing of grades and other student records, and desktop search and retrieval of a wide variety of library materials, including multimedia, international journals, databases, reference works, and scholarly discussion groups. Also they call for a new methodology for faculty to conduct and publish research, create and deliver lectures, and interact with students.

The speed and scope of change in instructional methods promised by the new technology is unprecedented in educational history and will require unequivocal institutional support not only to create the infrastructure to make this possible but also to meet the need for faculty motivation and training.

This plan calls for institutional policies to encourage individual faculty to make the required investment of time and effort, provide incentives for faculty development such as release time or direct pay to conduct and/or attend training, consider professional development in this area for retention, promotion and tenure purposes, and support faculty with well-
defined projects for experimenting with new technologies and innovative ways of employing them in the teaching, learning, and research processes.

Achieving these goals will move these institutions toward becoming fully integrated “virtual universities” utilizing asynchronous learning networks in which students, faculty and staff are linked by electronic mail, two-way interactive video, on-line processing, electronic databases, library services, multimedia-on-demand, and other information technologies without regard to physical locations.

The potential benefits of moving in this direction include:

- enhanced quality of instruction
- access to information and library resources
- high levels of support services to existing students
- increased access to academic programs by non-traditional students
- improved effectiveness in uses of limited human, program and financial resources
- net revenue streams to offset infrastructure and operating costs
- incentives to faculty to develop new educational materials

**Applications envisioned**

This vision would support and enhance traditional instruction, non-traditional instruction and administrative processing. Typical applications could include:

**Delivery of education to students in classrooms at multiple sites in the continental United States and internationally, e.g.:**

- capturing unique faculty experts and special lecturers on video to augment lectures/courses
- downloading information from multiple sources into a multimedia presentation in the classroom
- teaching low enrollment courses at multiple campuses using two-way video and electronic teleconferencing and collaboration software
- evaluating student teachers remotely in the classroom and communicating via electronic mail
- teaching remediation courses at senior universities remotely from community colleges
- conducting library/text searches on-line world-wide
- requesting assistance via electronic mail with timely responses from faculty
- interaction between students or students and faculty utilizing bulletin board or conferencing software

**Delivery of education to non-traditional, off-campus students in their workplaces or homes, e.g.:**
• specialized training and retraining programs for industry
• professional licensing/certification courses
• adult education/enrichment programs
• continuing education or degree credit programs
• advanced placement courses to high school students

Implementation Plans

Electronic Campus and Digital Library
VCU is rapidly becoming an “electronic campus,” providing access to all major resources through a ubiquitous network. This fiberoptic network connects all buildings and residence halls on both the academic and medical campuses, and will link to a “Digital Library” to support the concept of a “virtual university” and asynchronous learning networks, as shown in Figure 1. The “Digital Library”, Figure 2, will provide faculty and

![Figure 1. The infrastructure for the “Virtual University”](image-url)
students with on-and off-campus access to a full range of information technology resources (voice, data, video) in an integrated, networked educational environment. It also will facilitate local and statewide access to full-text articles and publications, electronic library services, databases, multimedia presentations, a central repository of CD-ROM materials, interactive television, and a wide variety of other material including slides, graphics, and video. It will also serve as an important node in a client-server topology supporting campus-wide services and functions in a multi-level server architecture, Figure 3.

Figure 2. The Digital Library will provide students and faculty an integrated networked environment.
Authoring Workstation
VCU is equipped with both IBM and Apple authoring workstations and software tools, including image editors (PhotoShop), video editors (Premiere, D-Vision) and authoring packages (Persuasion, PowerPoint, ToolBook, Authorware, Hypercard, Action and Director). Other resources available to faculty include scanners and digitizing stations to convert source material from work process, VHS tape, laserdisc, CD-ROM, illustrations and artwork, full video production facilities including a video taping studio, hand-help video cameras for off-site work, digital, video and sound editing studios, and in-house support for creating VHS tapes and CD-ROMs.

Electronic Classrooms
VCU is committed to developing “electronic classrooms” equipped with high-resolution projectors, quality audio, microcomputers with high-speed network access, and presentation software. Faculty will be able to bring their own presentation control software to the classroom, connect to a local or remote server, and access a wide variety of digitized materials to enhance a classroom lecture under their individual control. This concept is illustrated in Figure 4. VCU now has several classrooms equipped with large-screen video projection systems, Macintosh and IBM-compatible computers or interfaces, and network connections. Although delivery of full-motion video is limited at present, several programs (e.g., the School of Pharmacy and the Department of Physics) are developing content which requires the delivery of full motion streamed video.
Virtual Classrooms

VCU is developing the capacity to “digitize” lectures which can be edited, indexed and stored along with course materials. Both the lectures and materials can be retrieved later to supplement existing classroom instruction, either as stand alone video, or more likely integrated with interactive multimedia presentations. A system for interactively is being developed to encourage conferencing and interaction between the faculty and students participating in this “Virtual University”. Initially, this will be accomplished through electronic mail, bulletin boards and newsgroups, or software such as Lotus Notes. Today with these tools students and faculty can communicate electronically whenever they like. Assignments can be given and received electronically. Faculty can hold “virtual” office hours, freeing them from rigid schedules, and enabling students to obtain information with little loss of time. Although the method for student/faculty interaction will change, these technologies should allow the quality of interaction be maintained, or, in the case of the large lecture, improved over current levels.

The Role of Academic Computing

Prior to 1980 the role of an academic computer unit was typically to operate a mainframe and provide software consulting support for the users of these large, timesharing machines. When the personal computer revolution began, academic computing centers invariably
took the lead in offering all levels of support: consulting, training, even repair. A decade later, personal computers became ubiquitous and support moved from a centralized model (where academic computing units supported the PCs), to a decentralized one (where departments now provide for basic PC support). The primary reason for this is that personal computers are no longer new and the knowledge to support them can be readily found.

The example of personal computing represents a fairly well-established process of migration of support. In other words, when the technology is no longer new or rare or exotic, the role of the academic computing center transitions to the support of emerging technologies (e.g., World Wide Web and client/server technologies) while the support structure for mainstream technologies (e.g., PC support) migrate to the academic and administrative units. For this reason academic computing units today have made a major commitment to supporting and disseminating information about networks, the Internet, the World Wide Web, and multimedia education.

At VCU the changing role of academic computing support has manifested itself in many ways:

**Multimedia Development**
A new faculty support unit has been created to provide the leadership for the creation of a student-centered and asynchronous learning environment at VCU. This new unit provides not only the consulting expertise to assist faculty in the development of their own skills, but has expertise in instructional design, applications development, network implementation, media digitization and editing, and systems programming to create a successful educational module. The role of this unit is to facilitate development of multimedia applications in the distance, distributed and asynchronous educational field. At VCU the Multimedia Development Center works to change the way that faculty look at the traditional teaching and learning paradigm; and to use asynchronous products to promote teaching and learning outside of the traditional classroom.

**Faculty Support**
The role that Academic Computing units play in faculty support must also change. In the past the training has been primarily given in brief training sessions of one to three hours, and has been a scatter-gun approach which has not reached the mainstream faculty. VCU is now developing a major effort to provide 40 hours of intense hands-on training for each faculty member in all the newest technologies of multimedia and asynchronous learning. During these workshops the faculty will begin to create content that can be accessed over the University’s data network, the Internet and World Wide Web. The faculty member will come away from this training ready to take an active role in planning and implementing changes in the way he/she teaches.

**The Cyber-Consultant**
The traditional role of consultants in Academic Computing units has been to provide one-on-one, face-to-face consulting. As the faculty home base moves away from the mortar and bricks of a campus, and as students become less willing to be campus and classroom bound, the consultant will need to learn how to provide consulting information without ever seeing the person face-to-face. In fact, the consultant will use the same tools that are being developed for teaching and learning at the “Virtual University”. They will need to
practice what they preach, and by using these tools become more accessible to faculty and student alike.

Access to the Ubiquitous Network
Providing full Internet access is a major support issue which has already emerged. VCU has decided to outsource this function to a private Internet provider. The infrastructure to create this function for 2,000 faculty, 5,000 staff and 20,000 students is prohibitively expensive in today’s changing market. In fact, it is likely that the entire infrastructure will need to be changed in two years. Today’s 28.8 kb modem over analog dial up may be today’s technology choice, but ISDN is likely to replace it in the next several years as the need for higher and higher bandwidth to the desktop are dictated by the emerging technologies of the World Wide Web and the Digital Library (e.g., full motion video and high resolution imaging).

The role of academic computing support has changed because the level of access to information has become so pervasive. In a brief twenty years, Academic Computing units have moved from supporting a few mainframe users with terminals on campus to supporting students and educators world wide who demand better service from their office, home, or residence hall, and even from foreign lands.

Conclusion

Technological advances to deliver education-on-demand are progressing rapidly. VCU plans to take this technology and apply it to education in order to overcome the economic, cultural, and physical barriers to learning facing the United States and the world. This includes continuous retraining of the workforce.

The current economic restructuring plans causing “downsizing” combined with unprecedented growth in demand for higher education will require universities to mirror business and industry by delivering “just-in-time” rather that “just-in-case” education, and to pursue cooperative efforts with the private sector to achieve this vision.

Virginia Commonwealth University will not achieve these goals all at once. We intend to proceed deliberately, with a careful eye on changes in technology that may change the goals, and on vicissitudes in the economy that enable them to implement the new pedagogical paradigm. Still, universities must begin proceeding now toward an asynchronous learning network environment and a new faculty support structure if they are to deliver the sort of education the students will need and demand as we move into the next century.