ACADEMIC COMPUTING: WHERE SHOULD THE FOCUS BE?

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ABSTRACT

The potential of computing technology to enhance if not transform higher education is undisputed, but small colleges face seemingly impossible obstacles as they try to realize this potential. This paper surveys the role that the academic computing coordinator plays on a small college campus, reviewing the generic problems which all institutions face, but drawing a focus on the current major issues. The discussion covers hardware, software, innovation, and planning for future needs, in each case presenting strategies for responding to the issues. The paper reflects the author's experience in academic computing over the past two decades, but citations are made to papers and reports authored in small colleges as well as to developments reported in the general higher education press.

INTRODUCTION

There was a time, hardly more than a decade ago in most small colleges, when there were only a handful of computer-knowledgeable people on campus. Everyone else looked to these individuals to recommend campus computing policies, to help acquire software and hardware and train other faculty in its use, to run the computer labs, and
to act as the campus help desk. Back then it was popular to separate academic and administrative computing on distinct machines (two mini-computers or an administrative mini and academic pcs) and to worry about how to justify adequate financial support for academic users (because academic users always got short shrift on a shared machine). The proliferation of micro-computers solved the resource allocation problem and broadened the functional expertise of faculty and students, but it also broadened the jurisdiction of academic computing. Now faculty needs competed with laboratories for workstations (which are more useful than terminals had been), bootlegged software and viruses flourished, and standardization become an issue. More recently we have moved from viewing computers as tools for science and business to essential means of communication and information access for all disciplines, requiring that all students not only become "literate" about computer use, but personally competent to employ computers for word processing, data analysis, and information retrieval. As more and more colleges bundle personal computer purchases with tuition, personal computers become as integral to academic work as the textbook. This amazing growth of computing on campus has tended to make redundant the phrase "academic computing" because the first word encompasses the second (just as on campus we no longer refer to the "academic library").

But if computing is now integral to higher education, the problems which were shouldered and solved by the academic computing pioneers of a decade ago have not likewise disappeared into the academic mainstream. Technological ignorance, deprivation, and resistance abound on campus, but at more sophisticated levels. The problems have been dissected, and,
in the larger institutions, a spectrum of new specialists have arisen to address each facet. There are now hardware systems managers, PC technicians, communications managers, help desk managers, Internet specialists, training managers, instructional technologists, multimedia specialists, and on-line retrieval experts. The fact that small colleges cannot afford this plethora of experts means that the solution of technology problems in small colleges is lagging, and consequently, that the faculty and students of small colleges today are more backward than at better-staffed institutions. The difference is not readily apparent because expertise at large institutions is not evenly applied, resulting in both pockets of innovation and pockets of technological desolation in the same institution. However, the neglect is cumulative in the small college and self-correcting in the large institution.

The largest academic computing problem faced by small colleges is the cost of the technology. The small college has fewer sources for funding technology acquisition and must work harder to disseminate and maintain its technology because it cannot afford specialists. The only strategy open to the small college is to adopt proven technology, buy at the end of the technology cycle when new hardware is starting to replace the prevalent platforms and is therefore pushing down the price of the not-yet-obsolete technology, and encourage faculty and students to cooperatively provide user services. The author first held the title of part-time academic computing coordinator in 1974, and has played the role of technology planner, campus power user, and academic computing spokesman for 20 years while attending to the business of being a computer science faculty member. This paper describes the shifting
focus which the author and others who have played the same role in their institutions have witnessed in maturing academic computing. It summarizes today's problems and points to the practical solutions available to small colleges.

**Issues of Academic Computing in Small Colleges**

Academic Computing Coordinators are concerned with the four broad areas of campus hardware, academic software, facilitating innovation, and planning for the future. The following sections outline the issues of concern in each of these areas, summarizing their development patterns and concluding in each case with a description of the current problems. Since small colleges are in various stages of developing their academic computing resources, readers will quickly identify where in the cycle their institution lies, and may appreciate how to shorten their path to the stage of the technology leaders.

1. **Hardware Issues**

   As the institution's investment in both administrative and academic computing applications rises, the professional computing support staff on campus grows, and the first service that this staff renders to academic computing is to take over supporting the campus computing labs. Computing labs generally start as one or two machines used by the faculty and students of a particular program, and evolve rapidly to the status of campus utilities, economically providing access to all students. As utilities, they merit centralized oversight, but they are often nurtured by those departments who have the greatest dependence upon them. The era
of large "open" labs is waning as the cost of workstations decrease, and even small colleges are returning to program-specific labs through the natural mechanism of proliferating workstations where they are convenient to each program area (each academic building boasts a lab frequented by the students of the programs housed in that building). The program specific labs exhibit the preference of that group of faculty for a specific hardware platform (Mac, DOS, UNIX) and discipline-specific software. These labs are frequently reserved for classroom instruction and "closed" lab sessions. The faculty expect that the Computer Center will support the hardware in the lab, but programs tend to grow their own systems and software support for platforms which differ from the administrative system. The era of a "campus standard" platform is past (Brian Gallagher, who for two years chaired a study committee for LaGuardia Community College, advises "Adhere to a policy of 'Computer Pluralism,' i.e., the right of each department and area to decide, within rational limits and careful review, the kind of hardware and software environment it needs to function pedagogically and administratively" [#1]). The new era emphasize connectivity.

Because many small colleges initiated computing services on mini-computers, distributed access was via remote, hard-wired terminals. As micro-computers were acquired, a few would be outfitted to dial-up the mini-computer, but most were thought of as single-purpose devices. The cost of micro-computer work stations never competed with the cost of terminals, but the greater versatility and lower cost of the software which ran on the pcs induced both faculty and administrators to forego terminals for micro-computers. In most instances as faculty and
administrators moved from terminals they endured a period where they had both terminals and pcs in their offices. Inexpensive software also led faculty to migrate academic applications off terminals and into pc labs. This migration was driven by the need to teach the personal productivity software packages to students, the wide acceptance of Turbo-Pascal as the academic programming language, and the ready availability of pc-based statistical packages.

Often a local area network was started in a lab as a mechanism to distribute and control software, but sometimes it began in the building housing the power computer users so that they could use e-mail. These first campus LANs were department networks and they were given over to the computer center to maintain as rapidly as a campus network specialist could be acquired. Since administrative computing was often on its own machine and frequently isolated to one or two buildings, it was not uncommon for both academic and administrative networks to evolve independently and finally merge. The pressure to network the whole campus comes both from the need to distribute academic software access to labs, offices, and dorms, and to distribute campus information to faculty and administrators. Today the campus network is viewed as being primarily an institutional asset which serves all members of the campus, and even delivers admissions and alumni services to constituencies off campus.

The focus changed in the 1990s because of a communications revolution spawned by large research universities. Today the campus network is viewed as the way in which the campus community accesses the information of the world. Information sharing among researchers
provided the motivation for establishing the Internet, which took advantage of the local area networking technology which had made e-mail common on large campuses. Telephone access to campus computers was always feasible, but there was little reason for non-campus members to dial-in until the government began subsidizing communication channels between its research centers. By dialing into a local node on this communication network, a researcher could be routed on the network across the country and could leave messages for a colleague on a remote computer.

This idea was picked up by BITNET, which grew its own national network via agreements between universities to provide store and forward mail services to anyone who dialed a local node. A college paid the cost of a telephone connection to the nearest existing BITNET site and had the benefits of communicating with anyone on the network, and, through gateways, it could also communicate with nodes on the research network. Very rapidly through the 1980s the faculty in large universities became accustomed to networking with each other. Discussion groups were next to be setup, borrowing the bulletin-board technology which the computer "techies" and hobbyists had developed for recreation and information swapping. This was followed quickly by anonymous access to files so that the requestor did not have to mail a request and the disseminator did not have to respond.

The combination of inter-network packet routing schemes and the largess of individuals and institutions who maintain data banks and permit network access has created "cyberspace." The phenomena of cyberspace is so economically and culturally significant, world-wide, that
**TIME** magazine has recently devoted a special issue to it [#2]. Universities are now being augmented as the Internet hosts by hundreds of commercial access providers, and the national information infrastructure is a matter of political concern. Traditional textual information providers, publishers and libraries, have taken note, and the evolution of the Internet to multimedia capability is inexorable. It is obvious that the small college cannot pretend that the Internet does not exist, and that it is not encroaching upon all aspects of modern life. At a minimum this acknowledgement means that students must be provided with access and instruction in "surfing the net," just as they are taught to access local library resources, but more realistically it means that the way students are expected to acquire and evaluate information in various undergraduate courses will change [#3].

The most significant hardware infrastructure problem which faces the small college today is how to provide Internet access to the campus community. The network generally comes to the campus door by virtue of state and regional communication networks which provide flat-rate, 24-hour access, but the college must find the means to funnel its users to the network port. Those campuses with a well-developed campus LAN will witness a tremendous increase of LAN activity once the Internet connection is made. Computer centers will naturally be adverse encouraging this problem, which can be controlled only by limiting access or by expanding channel capacity appropriately. At a time when campus budgets are already squeezed, increased expenditures on technology will come at the sacrifice of something else: library periodical subscriptions, scientific lab equipment, faculty raises, higher tuition, etc. But, as a
recently released report indicates ("What Presidents Need to Know .... about the Payoff on the Information Technology Investment"), there is really no alternative.

The costs of not equipping our campuses to compete in a future where students can learn and communicate in a virtual classroom linked to international networks of digitized information will be substantial. Faculty and staff will lack the tools and expertise to develop new learning modalities and be unable to help students learn to select, synthesize, and give meaning to the vast array of informational choices which confront them. Many institutions will be lost in the growing competition from for-profit learning corporations which are already beginning to challenge higher education’s monopoly on the provision and credentials of learning. [#4]

Telephone technology may provide the most economical solution because higher and higher throughput is being achieved on twisted pair wiring. The cost of modems is falling more rapidly than that of networking cards, and, since the bulk of the campus communication traffic will be to the router and off to the Internet, communicating directly to the router via phone lines may offer the best solution. Most students now bring a computer to college and the rest can be helped to do so, so that the access problem can be solved by moving access from the lab to the dorm room and office. It is even feasible to negotiate a site license with a commercial Internet provider and pass that cost to the student along with the textbook cost. Internet access is today an institutional problem, not one which can be solved by the academic computing coordinator. The academic problem is to obtain that access as rapidly as possible by helping the administration find the necessary resources.
2. Software Issues

There was a time when the academic computing coordinator was virtually the only software resource for faculty and the only consultant to assist faculty members in the development of instructional applications. Authoring tools of high quality and great versatility are now available and multimedia technology is packaged so that the hobbyist can develop interfaces and construct presentations. The proliferation of academic software in every discipline makes it discouraging for faculty to bother trying to maintain their early efforts at text-based CAI. Textbooks come with digital supplements for both the teacher and the student. Higher expectations for graphical interfaces and the complexities of the Windows environment impede all but the most dedicated faculty member from instructional software development. It would seem that the problem now is selecting which package is worth the effort to learn and acquiring the license.
More rational licensing policies by major software publishers and the growth of shareware has eased the financial constraints on providing software in bulk, constraints which once encouraged the unauthorized use of software on campus. Ethical use of computers and respect for intellectual property is easier to convey when a site license permits the distribution of a standard software tool to all members of the class. However, the college is still required to provide reasonable security and procedures which discourage software piracy. These same procedures tend to mitigate against the spread of computer viruses.

While use of purchased tools predominates academic computing applications today in small colleges, it is the use of presentation software that is steadily impacting the traditional classroom lecture. As an intermediate step toward the computer classroom, computer-based projection technology permits the demonstration of concepts with greater flexibility than foils. The faculty member who lectures with presentation software can also publish the lecture to students and to other faculty in its electronic form. For a total of $4000, a projection panel, laptop computer, and overhead projector can be placed on a cart and rolled into any classroom to present the multimedia lecture that the faculty member designed at home and brought in on a floppy disk [#5]. (At Stanford University to goal is accommodate the faculty member's laptop, according to the study committee chair. "We would really like to move to a situation,", he says, "where a professor, without thinking about it in advance, can go to a set of classrooms and know, for instance, that there are going to be video-presentation facilities there--or that whatever model of laptop computer he or she has can be plugged into those
facilities to show computer-based stuff in class. [#6]).

The real problem surrounding the academic use of software is not its availability or affordability, but faculty resistance to changing their mode of instruction. There is always the problem that what is available does not exactly support the way you have always presented a concept. There is the argument that mastery of the details of operating the software constitutes too much overhead and is too distracting. There is the danger that the medium becomes the message. But even when a faculty member fights through these rationalizations, there is the bleak fact that teaching with technology depends upon the ready availability and reliability of the technology infrastructure. It is difficult to present a multimedia lecture if the device breaks, or to expect all students to have completed an exercise if it could be done only at a few workstations within a prescribed time period. These are difficult arguments for the academic computing coordinator to overcome.

The academic computing coordinator's best efforts will likely be focused on those programs which have already managed to acquired the proper infrastructure resources and whose faculty and students have established a comfort level with the technology. Special effort must therefore be made to identify and assist inquisitive faculty members to incrementally get the resources need to join this club. Productive alliances can be established between the have and the have nots if the academic computing coordinator moderates the sharing of resources and prevents annoying encroachment. In this way a foreign language professor might be enabled to explore the utility of language software on computers in a science lab and to build the expertise needed to justify
additional computing resources for foreign languages.

3. Facilitating Innovation

The academic computing coordinator is the expert to whom faculty and students turn for information, advice, and often training. The wide variety of interests of faculty and students overwhelm the narrow technical training of computer center personnel, who are rightly focused on maintaining the proper functioning of the campus computing systems and supporting a short list of software packages which have been designated campus standards. Central staff might reasonably run a help desk, provide documentation on standard applications, or offer training in system usage that cuts across disciplinary boundaries, but discipline specific applications are the responsibility of the faculty.

The academic computing coordinator’s detailed knowledge of discipline specific applications is also limited, but the job requires broad interest in the spectrum of possible academic applications, and constant vigilance for opportunities to encourage faculty to experiment. Faculty will bring citations to applications recommended in their professional literature and ask if those programs can be imported. Faculty will struggle with a software package and come to ask why they can’t make it do what they feel it should be able to do. The coordinator, as a consequence of seeking broad exposure to academic applications, will run across sources which can be passed on to the appropriate faculty member (sometimes a monthly newsletter works well as a way to keep faculty apprised of innovation opportunities across the campus). The coordinator may ascertain that one department or division of the campus is lagging in
its exploitation of computing and the coordinator will become proactive in helping them catch up.

The reality is that the task of coordinating academic computing is as much a matter of inciting computing usage as it is working to satisfy the demands of those who are involved. The coordinator must find ways to make adopting the technology less threatening and less arduous for the many faculty who are on the sidelines, waiting until everything shakes out and utilizing the computer is no longer exasperating. These faculty have to be prodded to take small steps, and must be guided to select reasonable goals so as to ensure a successful experience.

(A discussion of the difference in attitudes between "early adopters" and mainstream faculty with respect to adoption of technology in teaching and learning can be found in a recent issue of Change magazine, which focuses entirely on the expectation and realities of computer technology in higher education [#7]).

Considerable effort must be devoted to arranging appropriate faculty training. While the computer lab is a helping place, it is not comfortable for some faculty to expose their ignorance and anxiety to students who have already been initiated to the computer's secrets. These faculty need the opportunity to make their mistakes in private, or with a tutor whose respect they can depend upon. Sometimes the best solution is to send faculty off campus to learn computing skills, possibly supporting them to attend a pre-conference workshop at a professional meeting. (LaGuardia Community College recommends, "Sponsor regular, full-fledged, ongoing practically oriented training for faculty and staff, training that stresses the possible (and varied) applications of software. Our experience at the
college has proven that long-term, broad-ranging and compensated training programs are the most effective way of getting faculty both excited about using computers and fully competent to integrate them into their course designs. [1] It is essential that all faculty have a realistic exposure to the potential of the technology, because, in the words of Stanford's technology study committee chairman: "People are either going to jump into this very fast-moving stream or they're going to somehow get left behind." [6]

The major problems to be overcome in facilitating innovation in computer use today, besides the capacity to support new usage when the idea matures, is the fact that change is hard and must therefore be strongly motivated. In large universities much of the progress in the applications of instructional technologies is made by specialists because the research emphasis does not recognize or reward time spent by ordinary faculty in devising and refining new instructional strategies. Once demonstrated, these innovations can be readily replicated, given the university's resources, the guidance of the resident expert, and the benefits derived from an economy of scale.

In smaller undergraduate institutions, novel and effective applications of the computer are welcomed, but the resources with which to experiment are scarce. Unfortunately, in small colleges there is no significant penalty for avoiding the use of computing even after its advantages have been demonstrated. Since sacrifices must be made in order to obtain the resources with which to experiment and innovate, it is easy to argue that these sacrifices are too great. The culture of the small college prizes student faculty interaction and relationships over
skill development or exposure to current knowledge. Computing technology can be utilized to strengthen such interactions, but to do so requires additional effort. Somehow, the college community must become convinced that this effort is rewarded both by high quality interaction and by the attainment of competencies which will contribute significantly to future success. It is the duty of the academic computing coordinator to argue that such an environment is feasible, to marshall examples and suggestions from leading institutions, and to influence the faculty and administration to commit to supporting change.

Once the campus is formally committed to expanding academic computing, priorities can be set for carrying through the implementations. One strategy might be to focus on a lagging program and allocate it institutional support and encouragement to make a flashy step forward. Another strategy would be to identify a universal competence and set a goal to bring the whole community to that level. The poorest strategy would be to choose the most computer proficient program and push them still farther to the forefront. While they might argue that they would merely be achieving parity with leading programs elsewhere, this strategy makes the effort to keep up seem ever more hopeless to the "computing challenged" programs on campus. Flagship applications are desirable, but the small college has less ability to tolerate disparities in resource allocation than does the large university.

4. Planning

Simply acquiring adequate resources to support the essential academic computing applications on a small college campus is difficult. Budgeting to maintain and replace this equipment is virtually impossible
(a 1994 survey determined that only one-fifth of the nation's colleges and universities have a capitalization amortization plan for their computer purchases [#8]). When a machine or system fails, emergency funds are utilized to repair or replace it, or else the faculty and students limp along without it. Equipment is expected to be used until it can no longer fulfill its role (software upgrades are the most common reason for the obsolescence of hardware), and then, when the academic program's computing support is at the point of collapse, a major allocation of funds is made to leapfrog one or two hardware generations. The new hardware decision is usually made by an ad hoc committee charged to make a quick prediction as to what will serve the college best for the next decade.

When computing was less integral to the life of the college this mode of non-planning was acceptable. Some external funds trickled into the institution from grants and donations and could be used to help those programs in the most desperate need of computing power survive until the next technology acquisition binge. It is obvious that with more dollars at stake and with technology evolving at an ever faster rate, more systematic planning must occur.

"What Presidents Need to Know .... about the Payoff on the Information Technology Investment," provides the following summary of where we are today [#4]:

In the past ten to fifteen years, the convergence of three technologies--high-speed, low-cost computing; high-capacity, low-cost mass storage; and high-capacity, low-cost telecommunications--has transformed information flow and personal communications throughout the world. Colleges and universities cannot refuse to invest in information
technologies; they can only set the pace of their investment. Perhaps the most important payoff from the investment in technology will be found, not on the balance sheet, but among more qualitative measures of an institution's health. How have technologies furthered the institutional mission? ... helped meet community needs for relevant courses and services? ... increased the ability to share resources? A purely economic approach will not support the risky but vital investment in an infrastructure that will permit a quantum leap to a currently undefinable future model of operation.

Academic applications of computing resources must be accorded significant priority in a campus's information technology plan, even though it is much more difficult to predict academic needs or quantify academic benefits than for administrative applications. The conventional wisdom holds that academic interests are safeguarded if a broadly representative committee of faculty are given primary input in the planning process. "The keys to success are in shared resources, compatible computing environments and a collegial relationship between faculty and academic computer services. The creation of a viable academic computer committee with the authority to outline priorities and recommend purchases is the single most important element in a successful computer program. [9]"

Unfortunately, describing an institutional vision and allocating funds are difficult tasks for the same committee. The responsibility for husbanding scarce funds tends to shorten one's vision of the goals which the institution should set. An academic computer committee should mediate the administration's concern that funds be spent most effectively. Such a committee should insure that, in the words of
LaGuardia Community Colleges's planning document, "sound, proven pedagogy dictate computer use in courses, rather than letting the computer reshape pedagogy via its technological processes and constraints. [#1]" The LaGuardia report warns against another common technology pitfall, suggesting that the academic computing committee should also insure that the college "not get caught up in the spiral of rapidly 'improving' technology: only upgrade and replace hardware and software when it appears that the new equipment or program will significantly improve learning or administrative functions. [#1]" In other words, a standing Academic Computing Committee can and should make decisions as to whether systems or software purchases conform to the campus plan. Such decisions should be in the nature of limited permissions for a program to seek its own resources to support a given capability or an annual review and prioritization of the institution's technology budget, rather than an item by item purchase authorization.

Another group, however, should maintain an evolving campus computing vision which describes the role which technology must play as part of the mission of the institution. This plan should set multi-year goals and provide a rationale for its priorities which will guide the academic computing committee. The planning group, perhaps called the Campus Information Infrastructure Committee, would involve the chief administrative officers of the college, the academic and administrative computing coordinators, the librarian, and appropriate faculty. This committee will then observe the following points expressed by just such a committee at Sinclair Community College [#10]:

1. Establish an IT vision that is aligned with and supports the institution's strategic vision. Work in collaboration with
faculty and administrators to establish a vision of a redesigned or re-engineered approach to teaching and learning utilizing IT.

2. Determine the optimum ways of moving the institution toward the IT vision and infuse technology into the fabric of the college. Establish how IT will be supported and how the college will react to global IT changes.

3. Beyond the vision, determine what the target is. Should the college be a leader or a follower in IT? Is the field changing so rapidly that you can't afford to be the leader...or, if you wait, do you lose strategic position? In either case, the full capabilities of technology should be tapped to access the global community.

4. IT investment sends a message about where the college is headed. [But] IT investment alone will not produce change. There must be a concomitant investment in people.

A similar committee has been functioning at Carnegie Mellon University, chaired by Stephen Director, Dean of Engineering, taking as its task the examination of goals and strategies which will keep that institution at the national forefront of academic computing. "What his committee is advocating for Carnegie Mellon, he says, is a sweeping approach that 'permeates every aspect of what we do.' [#11]" Stanford University's planning committee has been referenced previously.

Kenyon College is an example of what effective planning can accomplish (as described by Ron Griggs; Director of Networks, Systems, and Technical Services) [#12]:

The oldest private liberal arts college in Ohio, Kenyon College is isolated on a hill in rural, north central Ohio.
Traditionally, Kenyon has used that isolation as a focus to build a community of scholars. With approximately 1450 students all residing in College housing, 135 faculty members, and 300 members of the administrative and support staff, the college maintains an important sense of community unavailable at larger institutions. The development of the campus network at Kenyon served to reinforce and enrich this community concept.

Kenyon's information technology infrastructure development took its shape and direction from this larger ideal of a community of scholars. The Kenyon network stresses communication and inclusiveness for every member of the community, with as many resources as possible available to all.

All Kenyon faculty have microcomputers on their desks; all members of the administration have either microcomputers or terminals. Students enjoy access to computing at over 150 stations (microcomputers or terminals) situated across the campus, including 40 stations inside student residence halls. Additionally, students with microcomputers can subscribe to the Student Network Access Program (SNAP) for individual network connections in the residence room. All faculty and staff microcomputers are connected to the network, either through serial connections or direct 10BASET Ethernet connections. Over 300 students are SNAP subscribers. As a result, effectively 100% of the faculty and staff at Kenyon, and 99.5% of students use the network at least once per week.

The effect on Kenyon College of essentially 100% community participation on the network has been astounding. The various communication tools--electronic mail, of course, but also KCINFO (the Kenyon CWIS), VAX Notes conferences, Usenet News discussion groups, on-line newsletters, on-line polls, on-line student elections, etc.--have served to pull the community closer together and establish a powerful sense that
we are all accessible to each other, despite the sometimes
disparate schedules of student life, administrative office
hours, and academic research and teaching.

The network enables the Kenyon community to tap into the
vast resources of the outside world, as well. Over 80% of
Kenyon students regularly use Internet information tools, for
example, enriching their access to information and to
scholarly work beyond the traditional classroom material.
Through the network, Kenyon students are becoming global
citizens and scholars, at ease in a world with global resources
at their fingertips. The "splendid isolation" of Kenyon's
community on the hill remains, but it no longer limits.

This remarkable environment was not achieved by accident. Thomas
Moberg, Vice President of Information and Computer Services describes
the transition.[#12]

In 1986-87, the College had no coherent long-range plans
for computing or networking. A set of basic goals for
developing a campus network and substantially improving
access to computing resources for faculty, staff, and students
was defined in 1987-88. Those goals were basically completed
by 1991-92. The College recently developed an institutional
Strategic Plan which treats information as a strategic asset.
The Plan has goals and objectives related to information
access, management, and technology integrated throughout.

In 1986-87, less than 10% of Kenyon's faculty, staff and
students made any regular use of College supplied computing
resources. Now, almost everyone on campus uses the central
systems every week and hundreds of people use
microcomputers. Faculty use of IT for instructional support is
accelerating. In the past six years, the Academic Computing
Awards Program has allocated about $130,000 to fund
curricular development projects using technology, with about
50% going to the Natural Sciences, 40% to the Fine Arts, and the rest to other areas. Virtually all faculty, students, and staff use electronic mail, word processing, and other on-line information resources. Internet use is growing rapidly. The basic library automation system has been completed, and new initiatives to provide access to information are continually underway.

Prior to 1988, the College had separate academic and administrative computing departments, reporting to different senior administrators. Cooperation between the two departments was minimal. Computing services and resources were very limited, with various campus constituencies completely ignored. Network development was primitive. Use of computing as an instructional and administrative resource was minimal. Discontent among faculty and staff was high. In November, 1988, the College created a new division, Information and Computing Services, to oversee information technologies on the campus. A Vice Presidential position, reporting to the President, was created. A new staff structure was created with three departments: Academic Computing; Administrative Computing; Networks, Systems, and Technical Services. These departments support all central computing, microcomputing, library automation, networking, campus information systems, media delivery systems, and equipment installation, maintenance and repair.

Funding for the major information technology developments has come primarily from off-budget sources: campaign gifts, reserves, operating budget surpluses. Between 1986-87 and 1991-92, Kenyon spent an average of about $600,000 per year on information technology development, including network construction, installation of access devices, VAX systems, library automation, and facilities. The ICS operating budget for 1993-94 is $1,265,000, about 4% of the College E&G budget.
The crux of the planning problem at small colleges is the lack of campus leadership and goal-setting. This cannot be solved by the academic computing coordinator, but in order to make real progress in academic computing there must be an acknowledged and supported campus information technology program. Successful colleges have put such programs in place using a strategic committee which examines the future inter-relationships of IT with the college mission and envisions the goals and strategies. A second committee of faculty work with campus administrators to monitor the allocation of resources to accomplish those goals. The need for comprehensive planning arises periodically in the form of a campus crisis in either academic or administrative computing, but the failure in leadership occurs when such crises are addressed piecemeal instead of comprehensively.

Summary

The issues of concern in academic computing, or campus computing for that matter, never really change, but different issues take the spotlight at different times. Over the past two decades the focus on hardware has moved from separate academic computers and establishing computer laboratories to networking the campus and today to accessing the Internet. In the meantime, each campus still struggles with how to maintain diverse computing platforms, how and when to upgrade hardware, and what to do with computers which no longer fulfill the function for which they were originally acquired.

The issues in academic software have moved from writing CAI and
controlling the propagation of illegal software, to selecting and using software tools. The issue today is that faculty have not thought deeply enough about how to teach with software and therefore are not in a position to make good selections from a myriad of options. All faculty should be looking at ways to incorporate multimedia in their instruction and planning to make the transition to the computer classroom and from there to the virtual classroom.

The significant issues pertaining to innovating on campus cluster around the lack of resources for experimentation and the lack of motivation for change. The academic computing coordinator must play the role of a change agent among fellow faculty, but hard financial times have given reluctant faculty still more excuse to stay with the status quo. Campus leaders must create the expectation and acceptance of change and manage the process of campus transformation so that no areas of the campus are left behind. Once begun, this process is continuous. "The development of a computer-literate campus [Dakota State Univ.] has required constant training and retraining in an effort to keep pace with ever-changing technology. [#13]"

Today planning for the growth of information technology on campus must be a top priority. This plan must be a community effort which has importance to every facet of the campus. In the past, technology planning was piecemeal or non-existent. The importance of information technology to all of education mandates a change of view. Small colleges may need to reorganize themselves in order to place proper priority on technology and implement plans which will insure their continuing credibility as institutions which prepare students for the future.
REFERENCES


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10. Background paper for HEIRAAlliance Executive Strategies Report #4, prepared by representatives of Sinclair Community College (see reference 4).


12. Background paper for HEIRAAlliance Executive Strategies Report #4, prepared by Dr. Thomas Moberg and other staff members of Kenyon College (see reference 4).