Developing an Effective IT Integration and Support System

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Executive Summary

Faculty are feeling increasing pressure to use IT, but they commonly face numerous obstacles when attempting to use technological teaching techniques. Institutions of higher education must strategically develop IT integration plans that help overcome these obstacles, addressing the needs of diverse pedagogical agendas and multiple levels of comfort with technology. Barriers can make technology use frustrating for the technologically savvy, let alone the many teachers who may be somewhat technophobic. We sought to mediate the effect of these barriers by proactively designing a responsive process to guide the development of resources and the implementation of technological enhancements across our campus.

To get a baseline assessment of use of and desire for technology in our classrooms, a survey was conducted during a full-day workshop held to expose faculty to various enhancements that technology may offer for their teaching. The results of this survey indicated that while over 90% of the faculty used some type of technology in the classroom, the majority used video and various presentation technologies. We found our highest unmet needs were in enhancing the technology and training necessary for using Internet/Web functions and enhanced presentation tools.

To address these needs (and others as they emerged), we developed a model of interdisciplinary strategic development that made the use of information technology a more effective and accessible process for faculty at multiple levels of comfort and usage. A key element of the model is the institution's educational technology committee comprised of representatives from the campus's faculty, staff, and students. The committee is charged with supporting the adoption of information technology across the campus and investigating how IT may be used as a tool to serve the college's mission of fostering a student-centered, active community of life-long learners. Toward this end, we continually examine IT needs and provide seminars, workshops, and tutoring to meet these needs. Students and educators responses to the proffered IT are closely monitored.

Two years after the initial baseline assessment was conducted, another survey was administered to assess how usage of information technology had changed on our campus. At this time, all faculty indicated that they used some form of technology in the classroom. The proportion using e-mail and listserves to communicate with their students had increased from one half to over 90%. Those utilizing other computer functions (such as enhanced presentation tools like Power Point) had risen by 44%. Use of the Internet had increased from just over one third to 80%.

Clearly, we had achieved notable success in fostering an IT environment across our campus. Through a conscientious interdisciplinary approach that took into account the many issues that

confront diverse technology users, we managed to create a system that responded to the concerns of users across disciplines and levels of expertise. We hope that our success may serve as a model for others to effectively implement the use of information technology across their institutions.

Keywords: IT integration, technology training, educational technology support, assessment of technology use

Introduction

As faculty are feeling increasing pressure to utilize technological enhancements in their courses (Neal, 1998), they are often frustrated by the myriad challenges they encounter using these techniques. They may find that the technology doesn't do what they thought it would do, that they don't have the training to use the technology effectively, or that their students don't have the training to use the technology. In a recent survey of faculty members at 378 institutions, educators ranked the stress of keeping up with technology as higher than stress caused by research/publishing demands, teaching loads, or the review/promotion process. Nevertheless, most saw technology as educationally beneficial (Higher Education Research Institute, 1999). The challenge for higher education is to develop well-informed integration plans that enable faculty to effectively use the learning enhancements offered by informational technology (Bothun, 1999). This is a critical effort if we are to develop functional, educated individuals prepared for life in our ever-evolving knowledge society (Druker, 1993).

However, many faculty see their institution's technology policies as misguided or inadequate (Trinkle, 1999). We sought to avoid this situation by proactively designing a responsive process to guide the implementation of technological enhancements. Effective utilization of information technology requires extensive access to technological expertise and supportive infrastructure (Stuart, 1999). Over a two-year period, we undertook an intensive upgrade in our IT resource system to meet the diverse pedagogical needs across our institution. At the end of this time period, we measured significant increases in technology use throughout the campus, and a substantial percentage of our students reported that the technological enhancements had either made doing their classwork easier or helped them learn more. The following discussion will present the model of interdisciplinary strategic development that made the use of information technology a more effective and accessible process for faculty at multiple levels of comfort and usage and helped us overcome common challenges to IT integration efforts.

The Integration Model

Initial Assessment

The first step in any major change effort is to frankly assess an institution's current state in comparison to the end goal and to try to identify where there may be pockets of both support and resistance to the proposed changes. When we evaluated our campus, we felt that two aspects in particular would be quite helpful in facilitating our IT integration process — institutional youth and student population. Established twelve years ago in response to community demands, the Lewiston-Auburn Campus is one of three campuses of the University of Southern Maine. Its relative youth means that the facilities are modern and that the organization as a whole is fairly flexible in nature. The faculty is comprised of 15 tenure-track, 15 regular part-time, and approximately 30 adjunct professors, all of whom are firmly committed to trying pedagogical techniques that may improve the quality of their teaching and students' learning. The campus enrolls 1600 non-residential students whose course load equates to approximately 800 full-time equivalents. Eighty percent of the students are women. With an average age of 31, many of our students work and have families. The non-traditional profile of the majority of our students meant that they would likely welcome the flexibility that technology could offer their educational experiences, yet they might be less comfortable with technology than more traditionally aged students. We knew that

we would have to carefully monitor reaction to our efforts across the campus in order to remain in touch with users' needs.

A key element of the monitoring process was to develop an educational technology advisory committee comprised of representatives from the campus's faculty, staff, and students. The committee is charged with supporting the adoption of information technology across the campus. To this end, the committee investigates how IT may be used as a tool to serve the campus's mission of fostering a student-centered, active community of life-long learners. In support of this goal, committee members examine IT needs and provide seminars, workshops, and tutoring to meet these needs.

Unfortunately, mounting demands on faculty time have made it difficult for many to devote the time necessary for creating new learning environments (Smith, 1997). Engaging in course enhancement via IT is particularly challenging due to the amount of preparation time that is often required for this effort. Although simple outline presentations may entail only one hour of preparation per hour of classroom instruction (once faculty are familiar with the technology), some report that technologically delivered education may take 100 hours of preparation per hour of instruction with an extreme of 400 hours of preparation per hour of instruction for extensive multimedia productions (Stuart, 1999).

With the time commitment involved in mind, we rejected issuing an IT mandate. Instead, we sought a more tempered approach that invited faculty to voluntarily explore how they may benefit from using IT in their educational efforts. To get a baseline assessment of use of and desire for technology in our classrooms, a survey was conducted during a full-day workshop held to expose faculty to various enhancements that technology may offer for their teaching. The results of this survey indicated that while over 90% of the faculty used some type of technology in the classroom, the majority used video and various presentation technologies. We found our highest unmet needs were in the technology and training necessary for using Internet/Web functions and enhanced presentation tools.

Targeted IT Training

On the whole, educators are not well prepared to use IT effectively (Wright & Marsh, 1999-2000). Proper training requires that faculty gain familiarity with a tool, observe someone experienced in its use implementing it successfully, use the tool themselves, and then gauge its potential to help them meet their pedagogical goals (Barrette, 1999-2000). The learning outcomes of technology use are the result of the activities in which it is used. Technology use in and of itself does not provide results (Ehrmann, 2000; Moore, 1997). Rather than having technology drive teaching practice, teaching goals should drive how technology is implemented (Frayer, 1999), and the training engaged in must be prioritized in support of educational content (Sanford, 2000).

Institutional training initiatives should be framed as an avenue to empower educators with a wider range of pedagogical options (Ehrmann, 2000). Most technological tools are multifunctional and can be used for a variety of learning objectives (Merisotis & Phipps, 1999). Initially, training must overcome perceptions that technology use involves less personalized contact with students than in traditionally structured classrooms. IT is not merely a handy storage space for text based materials, and its potential for collaborative and interactive learning should be emphasized (Ekhaml, 1999-2000). In technologically enhanced courses, faculty must be "content experts, learning process design experts, process implementation managers, motivators, mentors, and interpreters" (Merisotis & Phipps, 1999, p. 16). Thus framed, IT implementation is not perceived as replacing the time faculty spends interacting with students.

Having overcome fears of an environment of depersonalized information delivery, training should not minimize the fact that technological advances present faculty with a host of challenges or that higher education as a whole has a lot to learn about how technology can enhance student learning (Merisotis & Phipps, 1999). In fact, IT innovation may be occurring faster than our understanding of its use in practice (Merisotis & Phipps, 1999). To respond to the impact of this phenomenon, IT implementation must

be approached more as an on-going organizational learning process than as a technology acquisition process (Levinson, 2000). Effective IT use involves a continual process of: 1) identifying pedagogical goals, 2) determining what activities will serve this goal, and 3) selecting the appropriate IT tools to implement the activity (Ehrmann, 2000). The fundamental question driving IT adoption must ask what the best methods to teach our students are at any given point in time.

Clearly, IT training should not occur in a vacuum, but should be well grounded in educational mission. The creation of a thriving IT environment across our campus was the central theme running throughout the training efforts of the institution's educational technology committee. Our goal was to provide a situation in which faculty, staff, and students clearly perceived the benefits of their interaction with the technological tools available to them. In addition, we sought to create an environment that was not stagnant, but rather could be repeatedly modified by users to optimize teaching and learning. Thus, we aspired to add evolution to our IT development model.

Obviously, the concept of continuous improvement is not a novel concept. Organizations are increasingly being seen as constantly learning and evolving entities. However, we consciously sought a way to maximize the learning process. As we examined this issue, we realized that we would have to regularly employ a wide variety of tools to communicate new IT opportunities effectively. As Bagshaw & Bagshaw (1999) state, the individuals who are of highest worth to our new information environments are not merely those with expert knowledge, but those who are willing to share their knowledge freely with others. To enhance the potential for this type of interchange, continuous open communication between the providers of IT and its users is required. Communication efforts of the educational technology committee includes five modes: IT resources orientation at the faculty pedagogy workshop held annually each summer; traditional mailings and use of the faculty list-serve to distribute IT information (announcements, bulletins, invitations, etc.); seminars on IT tools held through the year; short IT presentations and training sessions embedded in bi-monthly faculty meetings; and the identification of technology gurus adept at the implementation, evaluation, and demonstration of technology. Inherent to all of these activities was an ethos of volunteerism; no faculty member was required to utilize information technology. This approach allowed for enthusiastic faculty to occupy the forefront of IT adoption while others could use what Brown (2000) calls the *lurk and learn* method, propelled only by their own impetus.

Our regular summer faculty pedagogy workshops afford us an annual opportunity to present IT opportunities and updates to the faculty as a whole. Also at this time, new faculty are oriented to IT at the institution. Information on the hardware, software, and Web-based resources available across the campus is distributed, and technology support contacts are introduced. This initial orientation is especially important in enculturating faculty to an IT environment. From the start, faculty are aware that IT literacy is an essential element of the institution's educational mission.

Building upon the information provided each summer, members of the educational technology committee (and others who come across helpful information) regularly inform faculty of IT updates throughout the year using mailings and the faculty listserve. This activity is largely informational, yet has proved quite valuable in developing an on-going IT presence. Not only are these vehicles used to announce informational and training sessions, but they are deliberately used to ensure that faculty are consistently reminded of the IT tools they may use to enhance their pedagogy. For example, web sites of interest for various faculty's content areas are regularly posted, and any changes or new acquisitions in hardware are shared expediently. These venues can take on a simplistic instructional role as well. For example, difficulties encountered by current IT users can be troubleshot in advance for those who will be using the tools in the future. When a problem is uncovered that others might run across, an explanation of the difficulty and its solution are presented through these forums.

However, the bulk of the structured IT training on campus occurs in various types of instructional seminars. Interested individuals are presented with multiple opportunities to take part in seminars offered by technology support staff, other faculty on campus, and faculty and staff from the university's other two campuses. Seminars are strategically scheduled at the times and locations throughout the year that will maximize information dissemination. Before each term begins, orientation seminars are held to introduce new arrivals to the IT resources we have on our campus. At the beginning of each term, seminars focused on introducing IT offerings new to the campus are offered. Throughout each term, instructional seminars on applications of a variety of IT tools are available for faculty, staff, and students.

In the event that a more global delivery of information is warranted, a training session is held during regular faculty meetings to ensure as complete a faculty audience as possible. When the university system adopted Course Info state-wide, a 45 minute session delivered in this manner served to introduce this Web-based classroom presentation and communication package to the faculty as a whole. In this session, the software's features were demonstrated as well as the physical ability to utilize the package in a diversity of campus classrooms using mobile laptop computer/projector carts. The session not only included presentation of the package, but also showed how it was currently being utilized in a nursing course on campus.

To provide further instruction for individuals with specific IT needs, technology gurus are identified among the members of the campus community. Using the Course Info example again, when the faculty meeting session was held, an additional instructional avenue was highlighted. The session was presented by a member of the nursing faculty together with an individual who holds a joint appointment as both an adjunct faculty and a professional staff member in technology support services. The nursing professor modeled the capacity for a regular faculty member with a normal teaching load to master Course Info and to prepare lectures in a timely manner without an overly burdensome preparation to instruction ratio. The adjunct faculty/professional staff member became identified as the Course Info guru and has continued to be available to faculty who encounter problems with this IT tool. Thus, particular IT areas in which individuals have special skills are recognized as well as the fact that they are willing to share their knowledge with others.

The Continuous Assessment & Improvement Process

To remain well-adapted to our rapidly changing world, an organization must embrace an ever evolving system that is flexible in how it will achieve the institution's core values (Bagshaw & Bagshaw, 1999). One year after we began our needs targeted IT training, we held a luncheon for the faculty to reexamine in detail the implications of using technologically enhanced instruction on our mission of providing student-centered, active learning. It is vital to ascertain whether technological implementations remain firmly grounded in the foundational goals of the institution (Everson, 1997). As we investigated how the majority of the faculty had been using technology, we found that most had been using the less complex tools located in the middle of the technology continuum: web enhanced courses, conference boards, list serves, etc. There was an interesting diversity presented of ways in which educational technology had been utilized ranging from using web assignments as an integral component of the classroom to simply using e-mail or list serves to facilitate course communication.

We then explored when these methods had enhanced our teaching and when they had not. Many of us had found that integrating technology had enhanced communication between students and professors and students with each other. This was not particularly surprising as technology use is shifting from something used to support an individual's efforts to something that supports relationships between individuals, allowing a fluid cross-pollination spanning traditional academic boundaries (Brown, 2000).

This point was elegantly demonstrated in an upper-level cell biology course that used Course Info. One function of this software package allows the designation of user groups whose members can communicate with one another via a conference board while excluding all non-member classmates. (The instructor retains universal access.) The cell biology groups were working on a group presentation that was to occur in lieu of a final exam. At the beginning of the semester, the instructor would monitor each group's electronic discussions and make comments and suggestions. These exchanges began the semester as typical one-way, instructor to student comments. By the mid-point of the semester, the communication converted to two-way, collaborative discussions that evolved to the point where the students felt no need for continued instructor input and cordially invited him to consider the group conference board off-limits! Gratifyingly, the group presentations were superb. The students had placed themselves at the center of the learning activity, matured their deliberations to the point of independence, and then produced an intellectually rigorous presentation. Clearly, IT had the capacity to serve a mission of student-centered, active learning.

Despite the success stories we were hearing, there remained concerns about widespread use of information technology across the campus. What would an IT environment do to our carefully nurtured learning communities? Would students have the same depth of learning in technologically enhanced classrooms? Would we be able to protect our low faculty to student ratio? Would administrators encourage and reward our IT efforts? Would we be able to maintain the support systems vital for this effort to succeed? These fears are certainly not unique to our campus. They are themes repeated throughout the educational technology literature. However, through conscientious use of our integration model we were able to address these concerns as our IT environment developed.

Common Challenges in IT Integration Efforts

Using IT to Build Learning Communities

Perhaps our faculty's greatest concern with widespread technology use was that we would diminish the close-knit learning communities we develop on our campus. Despite the fact that we are a commuter campus, and the vast majority of our students have jobs and families, our culture is such that students are expected to support and nurture the learning experiences of their classmates as well as their own. This sense of responsibility for one's own learning and the learning of others is extremely empowering and not something to be tempered with lightly. However, we discovered that fears that technology would dilute this ethos were largely groundless. In fact, it may be that IT's greatest contribution to education will be that students take more responsibility for their own learning experiences. Although the inhibiting effect of computer phobia/apprehension was an early concern in the classroom adoption of IT, these qualms have faded. The most important factor in reducing apprehension appears to be overall experience with technology (Scott & Rockwell, 1997). In addition, the socially and culturally neutral IT environment (Do & Lee, 1997) seems to mediate the effects of power dynamics present in oral communication and may further reduce apprehension in articulating ideas (Scott & Rockwell, 1997). As student exposure to technology has increased, IT is emerging as an excellent venue for all to share in the learning experience.

Unfortunately, some faculty find launching an online venue for knowledge sharing quite challenging (Wright & Marsh, 1999-2000). When faculty in our institution voiced this difficulty, we once again brought the resources of various technology gurus to bear. In successful implementations of this tool, the educator "links ideas across assignments, gives feedback, sets goals, provides instructions, offers advice, summarizes or weaves disparate comments, and refers to outside resources or experts in the field" (Bonk, 2000, p. 12). Those who had established track records in developing robust IT enhanced learning communities were asked to share specific methods they had used successfully in the past.

One key to stimulating the type of conversation desired is to frame the electronic discussion space as a vital part of the learning community in the very first class. From the beginning, students should be encouraged to post questions to the instructor and each other so that all may hear the inquiry and response, to share frustrations they may be feeling, and to communicate any findings they believe may benefit other students in the class. Thus, flexible access to professors, peers, and information is facilitated (Smith, 1997). This environment must then be closely monitored to ensure that it stays active throughout the course. There are many ways to do this, but the most effective seems to be continually framing the medium as a space to structure upcoming learning experiences and debrief experiences that have already occurred, while always promoting a safe environment in which to exchange information. Maintaining truly shared learning requires that students feel secure doing so. In a well-framed IT environment, many of the pressures of traditional classrooms (exacerbated by the physical presence of the educator as authority) are removed, and a warmer classroom environment develops (Fajou, 1995). When educators adopt an informal conversational style that clearly encourages everyone's involvement, students increase their intellectual explorations and knowledge sharing (Bonk, 2000).

Depth of Learning

A related concern faculty express about IT based education delivery is that the medium may lend itself to relatively shallow involvement with course material. Students have a tendency to surface-level process streamed information (Marton & Saljo, 1976a). However, the educational community has long known that the passive absorption of content material is not the most effective teaching method we have at our disposal. How do we avoid this tendency in IT based courses? The key is to make sure that the combination of pedagogical tools used in any given course does not lend itself to this type of learning situation.

We have largely surmounted this problem via one of our most deeply held pedagogical tenets, the vital importance of critical thinking and writing across the curriculum. This philosophy extends itself to a blanket rejection of a primary reliance on objective test assessment tools that promote rote memorization in favor of an essentially universal administration of assessment mechanisms that require a depth of understanding that is far more robust. Students modify their learning styles based on the type of exam they expect to be given, and essay and oral exam formats induce deeper processing of course content (Marton & Saljo, 1976b). Our commitment to critical thinking and writing across the curriculum serves a dual purpose, promoting the in-depth processing of course content while also facilitating more effective IT utilization. It is important to evaluate whether IT implementation interacts well with other institution-wide initiatives so that a complementary fit with educational mission and values and with each other can be achieved.

Course Enrollment

Although the educational possibilities for IT are becoming ever more apparent, many educators are concerned that technological potential will not be used to improve our current learning environments, but instead will be used as an excuse to enlarge class sizes (Trinkle, 1999). Once again, the solution to this concern is to ensure that an institution's IT development model is strategically founded upon pedagogical mission and values. We clearly embrace a pedagogical philosophy firmly grounded in active, student-centered learning, and this centering force continues to be embraced and defended by the institution as a whole.

The administration in consultation with the faculty sets course enrollment limits with the goal of maximizing student-professor interaction as much as possible. (The teacher-student ratio university-wide has hovered at 1:14 for the past decade.) Guided by this overarching pedagogical philosophy, campus faculty have repeatedly rejected the adoption of interactive television courses and only recently have

adopted a limited use of compressed video as a means to access graduate courses offered exclusively at other campuses. New IT opportunities must not be adopted simply because we have developed the technological capability; they must clearly further educational priorities.

Administrative Barriers

Linked to uncertainty about administrative motives for promoting IT is the necessity for administrative support of the pedagogical rationales for using educational technology tools. Administration must acknowledge and address institutional barriers to technology selection and implementation for IT to thrive in the classroom (Neal, 1998). At our institution, top administration provided the original impetus to create the educational technology committee and was responsible for charging the group with its mission. Throughout the evolution of our IT environment, administration has been kept appraised of the challenges encountered when continually attempting to upgrade IT resources and has been very receptive to faculty concerns. We continue to avoid administrative barriers by involving key administrators in IT deliberations as much as possible. Having all institutional constituents regularly involved in the process is vital to effective IT implementation.

Complementing administrator support, a structure of recognition and reward for innovative and improved pedagogy serves to sustain our IT efforts. The investment faculty must make to initiate and maintain an IT environment is clearly acknowledged. The faculty promotion and tenure guidelines explicitly recognize Boyer's (1990) four-part conceptualization of scholarship: discovery, integration, application, and teaching. Thus, the scholarship of teaching is specifically included in our evaluation criteria, and pioneering IT efforts are officially recognized.

IT Support Structure

Another institutional level area of faculty concern is the support available to them when technology tools fail. Similar to the experiences described by faculty at other institutions, those of us who had used various technologies in our classrooms found we had encountered related problems. Most commonly, problems developed when a new technique was being implemented without sufficient debugging or when software was upgraded without sufficient warning or documentation. To combat these types of situations, we now have a procedure in place to make sure that we have done sufficient preparation before a new devise is implemented in the classroom. Having faculty and technology staff in constant communication about practices that result in less than desirable experiences has greatly improved the likelihood of having adequate lead-time to effectively adapt to new technological tools.

However, difficulties can sometimes develop for reasons outside of the institution's realm of control. A recent example of this type of challenge occurred when there was suddenly a large increase in the percentage of students who used Internet access providers other than the university to sign on to class list serves. In one instructor's courses alone, fully half of the students had trouble signing on to the lists. To help address this problem in the future, each student's problem was documented (e.g., sending a sign on message to the server without turning off an automatic signature, not making sure messages were set to plain text only, etc.). After all the student's problems were taking care of, a troubleshooting handout was designed that documented solutions to all the problems encountered and is now available to give to any students having difficulty in the future. In addition, all faculty were alerted of these problems and advised how they could avoid them. In this way, the institution acts as a cohesive learning collective, and missteps needn't be continually repeated by isolated individuals within the whole.

Over time, we have learned that the most effective applications of IT tools are those that encourage a more active student involvement in the learning experience, facilitate a greater depth of understanding of course content, and promote richer communication between faculty and students. In keeping with our foundational belief in the importance of continually evaluating the pedagogical impact of the methods

by which we structure our courses, we have placed an ever greater emphasis on technological tools and techniques that have proven to be both effective and adaptive to the variety of learning and teaching objectives across our campus.

Results

Two years after the initial baseline assessment was conducted, another survey was administered to faculty to assess how usage of information technology had changed on our campus. At this time, all faculty indicated that they used some form of technology in the classroom. Using the Mann-Whitney U test, we found significant positive differences ($p<.05$) in usage in all technology type categories. The proportion of faculty using e-mail and list serves to communicate with their students had increased from just under one half to over 90%. Use of the Internet had increased from one-third to 80%. Those utilizing other computer functions (such as enhanced presentation tools like Power Point) had risen by 46%. (See Table 1 below.)

Technology faculty had used in the classroom				
	1998 (n=15*)	**2000 (n=15*)**		
	Had Used	Had Used	Mann-Whitney U	Sig.
Video	9	14	75.00	.034
Overhead	9	15	67.50	.007
Computer	6	13	60.00	.009
Internet/Web	5	12	60.00	.011
E-mail or Listserve	7	14	60.00	.006

*This number represents the faculty who are full-time professors on our campus. Courses are also taught by adjunct faculty and faculty from the university's other two campuses. Regardless of type of position, all faculty are oriented to our IT resources when they teach on our campus and receive the same IT communications as full-time faculty.

Table 1: Technology faculty had used in the classroom

As a further assessment of the effectiveness of our efforts, a survey was conducted to gather students' perceptions of the learning benefits of IT course enhancements. Students were asked to indicate whether the various types of IT they had engaged in had either made doing their classwork easier or helped them learn more. Over 80% said that being able to access course information through the Internet, do library work on-line, and hand in assignments electronically facilitated their studies. Over 90% said that having e-mail access to their professors and other students and conducting Internet research was beneficial to their learning. These findings closely mirrored faculty impressions of the learning benefits gained through IT use.

Conclusions

Clearly we had achieved notable success in fostering an IT environment across our campus. When we began this effort in 1998, educators such as Wilmoth and Wybraniec (1998) were just beginning to anticipate the growing list of observers who would report the beneficial effects of IT on student performance. These benefits are perhaps best summarized by Brown and Duguid (2000) who state that IT

creates a longitudinal process that ignores traditional student/faculty boundaries and facilitates the practice of a discipline much like what is achieved with the apprentice system. To the extent that the learning community's members are dependent upon their modes of communication and dissemination of knowledge, a sustained environment is established that determines the tenor of interaction (Brown & Duguid, 2000). However, for this environment to be beneficial for all, a number of critical factors must be attended to: the varying technological opportunities and challenges of different disciplines; the faculty's concerns about the impact of technology on their students' learning, classroom environments, and the make-up of the institution; the training needs of users at a variety of levels of technological expertise; and the unique support demands of each technological tool being adopted.

Our faculty's overwhelming adoption of various information technologies affirms our belief that the judicial use of IT can contribute to the creation and maintenance of a dynamic learning environment. All of our full-time faculty now have a permanent electronic presence in the form of a web site, a course site, or both. Through a conscientious interdisciplinary and voluntary approach that takes into account the many issues that confront diverse technology users, we have managed to create a system that responds to the concerns of users across levels of expertise. The IT environment at the institution has evolved for the benefit of all users. We hope that our success may serve as a model for others to effectively implement the use of information technology throughout their institutions.

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