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The purpose of this article is first to elaborate on the premise that technology is merely the metaphor for more significant changes that we are undergoing; second, to suggest ways to involve faculty as learners in the process of understanding those changes; and, third, to explore how they might capitalize on the information age technology in order to transform learning and thus the role of the faculty itself in the process. There is no more important role for the university in the information age.

Information Age Challenge for Metropolitan Universities

A participant at a recent conference in Washington, D.C. cut to the quick in laying out the information age challenge for the current generation of academics who comprise the faculty culture of the metropolitan universities. She addressed the issue of dramatic changes in the way we teach and learn as affected by the computer-based information age. The issue for her is the pressing need for change from a print-based culture to an electronic one, that it is the need for faculty to avoid becoming the medieval monks of the current generation by contributing to a new education theory and practice rather than clinging to the way we were taught and what we learned. In her analysis the monks became paralysed in the face of the new medium of their era — the printing press — and, being unable to respond creatively, were passed by in the education of the next generation. John Strange has for several years used a similar metaphor in his presentations and writings, including his contribution in this journal.

I think this metaphor is an appropriate one for many aspects of the rather dramatic changes we face in higher education today. Although many may argue that there are more pressing issues than technology infusion, I would counter that this is the key to the future of our metropolitan universities in particular. First, technology infusion, like the introduction of the printing press, is not about technology per se, it is about creativity, information creation and manipulation, turning information into knowledge to solve problems, and perhaps above all, control of the process of education. Second, it is about the major resource we have

in higher education — the faculty — and how they will be able to attract students and interrelate with them in the teaching/learning process. Third, the most important living laboratory for confronting the challenge is likely to be the campuses of the metropolitan universities. Because they attract the most mobile, most diverse, and increasingly greatest numbers of those students who seek skills, knowledge, and yes, empowerment, through higher education, metropolitan universities have the greatest opportunity to respond to the challenge. They are most actively engaged in the process of self-definition and have still the greatest flexibility to encourage a more fundamental and critical examination of the impact of information-age technology on the teaching/learning process.

More than five years ago, when I was serving as an administrator on a brand new branch campus of a major urban research university, we had the opportunity to decide on what technology we needed to provide an innovative interdisciplinary curriculum for upper-division and graduate level students. In order to explore the broader horizon beyond the walls of the University in developing the new curriculum. I started a project to bring futurists and visionaries to campus to engage the faculty and the campus community in a dialogue about the nature of the future needs of our students as a basis for further examination of the curricular needs and technology needs to support the curriculum. The project came to be known as the 21st Century Project. It continued for an academic year with the examination of the implications of distance learning technology, the changing student body with its diversity of age, ethnicity, goals and technological sophistication, as well as the rapidly changing educational needs of the business and industry of our global economy. At the end of that year, I accepted an offer to go to the University of South Alabama (USA) as Senior Vice President for Academic Affairs, largely because I saw it as a possible opportunity to implement some of the lessons learned in this project.

The 21st Century Project had been a great stimulus. It raised fundamental questions about the dynamic tension within the university regarding the value of the new technology There were many faculty who were skeptical that there was anything of value in it, and who were fearful about the cost implications upon their traditional program supports. Even those who were enthusiasts about the potential, often were unable to see the creative potential and became fearful of trivializing their subject content. Many were fearful of the technology itself and did not want to appear hopelessly naive in the presence of other faculty or the students especially. By now this is not an unfamiliar scenario in higher education across the country.

Thus, when I came to South Alabama, I thought it might be useful to take another approach to continue the exploration of what had been learned elsewhere and to see how faculty on this different type of campus might respond to the challenge. Accordingly, a Task Force of faculty and staff was appointed with a fairly open charge to explore the aspects of technological innovation as they might affect creativity and innovation on this campus.

The University Task Force on Technology, Creativity, and Innovation took its charge seriously and began to explore aspects of the Information Age with great energy. Its members explored such questions as, "If by the year 2000, all information will be in all places at all times, what will be the role and function of universities?" They read and discussed ideas drawn from *Gutenberg Two*, *Mindstorms*, and *Information Anxiety*. Each of these books is identified and described in John Strange's second article in this issue of *Metropolitan Universities*. In the process of discussion, the participants came to agree upon several generalizations about the nature of the change they were experiencing. These included the perception that there are

widespread demands upon the educational establishment to provide the latest technologies in order to increase the personal productivity of faculty, students, and staff, but that there is less agreement about the nature of the technologies needed or the goals of that productivity. Also, there was a consensus about the pressure being placed to make instruction more efficient and to expand the places and times in which instruction is offered; to address in the curriculum the social, economic, political, and cultural changes being brought about by recent developments in technology; and, to innovate — in teaching, in the curriculum, and in working with industry and the community to develop graduates of our educational institutions who can use the technology to transform information into useful knowledge that will facilitate problem solving. This was a significant leap, but the group did not stop there.

In its analysis of the issues, the Task Force realized not only the importance of the challenges faced, but the rapid pace of change which exacerbates the complexity of the problems confronting institutions that want to change. The explosion of information available, the accessibility of new forms of information in graphics, animation, pictures, and video that augment the words and numbers already stored in magazines and journals, and the storage capacities of the new technologies which provide access to those new forms presents those who wish to innovate with other significant problems. Not only is the pace rapid, but it brings obsolescence more rapidly, and it confounds all who confront the costs of keeping pace.

Technology Issues

The Task Force defined educational technology so as to include the many general purpose technologies recently developed and currently available to collect, store, access, manage, transmit, and otherwise use data that are words, numbers, sounds, still and motion picture graphics and still and motion pictures. Thus, laserdisc and CD technologies, video equipment, electronic musical instruments, and various data transmission devices were all included in their thinking, along with the computer.

In reaching its conclusion that technology is increasingly central to instruction, the Task Force argued that students have many fewer barriers to information access now, and that they learn more efficiently if they can see or hear events or data. Technology provides the potential to make learning more interactive, more pro-active, and more problem-based. It also overcomes the barriers of time and space which have forced students and faculty to come together at fixed times in fixed places for the most traditional forms of access to information. In brief, the new technologies provide a wonderful opportunity to extend the learning community, to reach new potential learners that we do not yet serve, or whom we serve inefficiently or ineffectively.

But how do faculty take advantage of the opportunity to extend the learning community through the use of new technologies? The Task Force agreed that improvements would not come without changing the campus approach to instruction in rather significant ways. Investment in technology must be accompanied by faculty development, according to the report of the Task Force, and, a change in technology would mean a change in faculty and in faculty/student interaction that would go beyond the simple use of the technologies themselves. Thus, technology was really a metaphor for the much broader change that is confronting us all.

Technology and Learning in the Change Process

Change is difficult. It does not come without pain of some sort, at least some pain over the loss of what had been in the past. For many faculty this is the most difficult aspect, and often at the core of the unspoken agenda, namely the fear that the new technology will replace them. However, in this initial stage at least, the Task Force confronted the issues squarely, and advocated a program of faculty development that would lead to a mastery of the technology required for new approaches to teaching and learning that would not replace them, but transform their roles.

In exploring how to proceed with this training, the Task Force looked at several models of faculty development, including teacher technologists, laissez-faire, and content/technology partnerships. Institutions following the first model either try to make all instructors into technology specialists, or they attempt to create a limited number of specialists in technology who connect technology to learning and teaching. This approach tends to have little impact upon most faculty.

The laissez-faire approach tends to encourage and reward only the greatest entrepreneurs among the faculty. Thus, it tends not to be curriculum focused, and often ignores the general education components where it might legitimately find its most reasonable home. Nor is this approach likely to stimulate any overall improvement in the quality of instruction. Again, most faculty are left out of the campus innovation.

The third model recognizes that few faculty will have the time or inclination to master the use of technologies for instructional purposes given the current incentives that drive much of higher education. However, the content/technology partnership model hypothesizes that many more faculty are interested in the improvement of instruction and are willing to consider the opportunities presented by the new technologies if they have both access to technology and access to technical expertise to facilitate their adoption of it. Thus, the Task Force came to recommend implementation of a means to bring these two elements together.

The proposal for faculty development attempts to maximize the resources available. Realizing that funds for hardware, software, technical expertise, upgrading of equipment, and faculty time would all be scarce, the faculty and staff recommended combining the resources of already existing faculty and staff from across the campus, with those of students who were enrolling in the graduate programs in Instructional Design. Buoyed by the success of some previous experimentation in this area and with the on-campus use of student assistants to create interactive Laserdiscs, the Task Force advocated strongly that the University support projects that would use the combined expertise of the content-expert faculty and the technically-expert student assistants to build toward new ways of thinking about teaching and learning. To accelerate the progress, it was further agreed that faculty with greater experience and success in this arena would be provided to assist the projects and to critique the results. They liked the fact that students and faculty alike would be working together as learning teams to solve the problems of how to use the new technology most effectively in the creation of a new learning model in many subject areas. Many of those experts were already on campus and were beginning to grow significantly through their interaction with members of the Task Force itself as they carried out their charge. Perhaps most importantly, although not fully realized at the time by members of the Task Force itself, there was developing a process of dialogue that cut across many traditional boundaries on campus. These included department, discipline, student-faculty, and teaching-learning lines that had been long accepted

as the way to educate in the university.

At this stage in its development the Task Force on Technology, Creativity, and Innovation at the University of South Alabama presented its report to me with recommendations for the establishment of a center that would enable the process of faculty development to continue with momentum gained from the enthusiasm of the participants in the work of the task force. To fund the necessary costs, the group recommended that a fee be charged to students each quarter with the proceeds to fund hardware, software, staff time, technical support, maintenance, as well as data bases and project development. Students appeared willing at this point and the report was forwarded to the President with my enthusiastic recommendation for approval.

Lessons to be Learned from this Experience

The experience of the USA Task Force on Technology, Creativity, and Innovation is in several ways a microcosm of the change afoot in higher education across the country. The Information Age technology presents a significant challenge to the very heart of higher education. If information is instantly available at all places and at all times, what will be the role of the faculty and the facilities of the university of the 21st century?

Many of us believe that this is a wonderful opportunity. After all universities are supposed to focus on learning, on the use of information to create knowledge, and on problem solving. The rapid growth in the U.S. work force which is dedicated to information, knowledge, and education is one indicator of the rapidly growing need for experts in information. By 2000 it is estimated that two-thirds of the work force in this country will be employed in that area. Moreover, according to John McHale, information expands as it is used (*The Changing Information Environment*), and whole new industries are developing to exploit the changing nature of information. As Harlan Cleveland observed about a decade ago,

> The further a society moves toward making its living from the manipulation of information, the more its citizens will be caught up in a continual struggle to reduce the information overload on their desks and their lives in order to reduce the uncertainty about what to *do* (*The Knowledge Executive*, p. 30).

Although the prima facie opportunity for the universities is contained in these thoughts, the actual working out of implications for the way we teach and learn are not so clear. We have to think more about the limits to growth of knowledge and wisdom, that is the **time** available for people (especially people within universities who are already challenged to stimulate thinking in traditional ways) to reflect, analyze, and integrate new information. Moreover, we have to be concerned about the **capacity** of people to analyze and think integratively, whether individually or in groups (Cleveland, p. 30). There are limits in each case, but there is capacity to expand if people are given encouragement and opportunity.

The university has one of the best potential environments for such expansion, and the USA Task Force outcome suggests that faculty will respond positively. Many here said faculty and staff were not interested, would not take the task seriously, and would not even meet regularly on such a potentially divisive topic with its underlying turf issues. Yet, the group convened at least three times a month for several hours each time in groups, while individuals carried out their assigned tasks, and the report was ready for review within three months from the time of the ap-

pointment of the Task Force. In addition, there were encouraging immediate short-term outcomes that resulted from faculty from across the campus getting to know one another for the first time, including collaboration on the production of new interactive videos and the development of a new curriculum for a masters level degree in multimedia communications. Moreover, members of the Task Force appeared genuinely ready to continue the process to new levels of depth regarding questions of teaching and learning with the new technologies. There was strong faculty leadership in this instance, but I believe this would be true on other campuses across the country as well. In many ways the issues and problems are typical of higher education, especially in the metropolitan campuses where the dynamics of the urban culture present further constraints on the time and capacities of people to consider fundamental change.

Harlan Cleveland has a wonderful description of what is happening at the moment on many campuses as we struggle with the dynamics of the information explosion. He reminds us that when faculty become disturbed about new things, they often label them externalities, which, according to Cleveland, is an academic word for factors that don't fit into a traditional discipline or profession or analytical system, yet seem to be disturbingly relevant all the same — so you put them on the shelf to think about later (*Knowledge Executive*, p. 125). There is still a lot of whistling in the dark out there.

Yet, we know that the change in technology is part of a change in values that is upsetting the equilibrium. Many on college campuses are aware and are involved in experimentation to understand the implications for the mission of higher education. Organizations such as EDUCOM have been working for several years to develop a strategy to engage faculty in communication across the disciplines. States across the country have invested heavily in interactive communication networks to link college and university campuses with those of both public and secondary schools. The team of Clinton and Gore support the further development of the Information Highway.

However, there is no smooth cruising on this journey of technological progress. In fact, at this point the faculty skeptics still far outnumber the converts and early enthusiasts for the use of CD-Rom, interactive video, multimedia, or the use of hypertext to motivate and engage students. Where is the research evidence to support the notion that use of the technology will make teaching and learning more effective they ask. The unions now ask about the impact of the new technology on jobs, and what about intellectual property issues, health and safety, or support for ongoing training and development. And the broader public is even jumping in with a deepening cynicism about technological and scientific progress in general.

Much of the anxiety is driven by fundamental resource questions or issues of control and territory. As legitimate as the issues may be, we should not let the heat drive us from the kitchen. We still must address the fundamental metaphor of change that is embodied in the new technologies. We must bring faculty and students together to let them learn and experience the new potential together, or risk the appearance, and even the reality of obsolescence. We cannot cling to our chained manuscripts in the age of the new printing press. The world of our students as they enter our academic world has already been filled with the new technology, the rapid pace of technological change.

The challenge for the leadership in higher education, faculty and administrators alike, is to develop the commitment, the energy, and the resources required to stimulate innovation. The creativity potential among college and university faculty

is substantial, yet there is a lack of positive incentive for change that gets at the issues of effective instruction. Industry typically spends 3-5% of its annual budget for employee education and/or training. Few colleges and universities do, and when they do, nearly all of those resources are spent on individual projects, and not collective ones that advance the knowledge of how we learn or how the new technology affects teaching, learning, or creativity.

True dialogue, not merely discussion, is critical in confronting the impact of technology on the teaching- learning process. It is necessary to frame the questions to be explored, to overcome the notion that we must wait for the next generation of research to prove the value of technology, and to help participants understand the dynamics of technological change in general. In the case of information technology, for example, the basic information networks do not threaten learning, they provide a new structure to support and deliver it. They provide access to information, communications among learners, and the potential for the development of learning-centered instructional systems. If the dialogue focuses on learning, and the nature of the learners and the learning goals, and not control of learning, it promises to be much more fruitful and creative. Moreover, if it focuses last on the technology itself. It is even more likely to see the technology as an aid, a tool in the hands of the learner, and not as a replacement of the learner. Faculty roles can be enlarged, not diminished in the process of confronting the challenges of technology as opportunities to learn, to grow, and to expand the role of higher education in the information age.

The metropolitan institutions in this country have particular assets that give them an advantage in this process. First, they can have good access to business and industry for support and cross-fertilization of thinkers in the development of the ongoing dialogue that will be required for more effective education of future generations. They can profit from industry's experience in using various techniques for group think, for employee involvement in solutions, for Total Quality Management that involves group problem solving and less hierarchical decision-making. Business is struggling with how better to manage the ultimate intangible: knowledge (*Fortune*, October 3, 1994, 68ff). Colleges and universities have been struggling with that issue for a much longer time.

A second advantage for metropolitan universities is found in the greater diversity of their student population that can enrich the experience levels in terms of education, maturity, and culture required to insure more effective solutions to real problems. Many students come to our four-year institutions from the more applied and technically more sophisticated environment of industry or that of the two-year schools. They often bring experiences and skills that would make them an asset in problem-solving groups on our campuses, as do those from different cultural backgrounds, as they help us to understand where our communication with them breaks down in the teaching-learning process.

However, there are real barriers to dialogue that must be overcome. The experience of the USA Task Force is instructive in this regard. The charge given to this group of faculty and administrators was that they should think about technology as it affects learning and teaching on this particular campus. Moreover, they were asked to think about interdisciplinary cooperation and creativity and faculty work roles as they interact with the process of thinking about learning goals and methods for the future. The group was university-wide in its makeup and tried to avoid control by special interest groups. The concepts of innovation and creativity were included in the name and charge of the group so as to expand the concerns well beyond the mere acquisition of technology, and to encourage a student orientation

various key appointments were made as well. Yet, the progress of the group fell short of ongoing open-ended dialogue that might have taken us to new levels of thinking about the teaching-learning metaphor encapsuled in the technological issues themselves. It failed to reach those levels because it emphasized the process of decision-making in order to meet a deadline.

If colleges and universities are successful in reaching any internal shared vision about these issues in the future, it may well be because they are approaching the setting for dialogue described by Peter Senge in *The Fifth Discipline*. Dialogue, he reminds us, is not discussion. Whereas, discussion converges on different points of view that are defended in the process of making decisions, dialogue presents different points of view in order to discover new ideas and to explore complex issues. Although it can lead to a new course of action as a by-product, dialogue tends to diverge. Good dialogue is a special form of conversation about a subject which takes us in directions we could never have planned. Senge accepts the notion that thought is essentially collective (pp. 240-248).

Thus, the purpose of bringing groups together around the subject of technology is to encourage the collective thinking process of a good dialogue. The purpose of dialogue is to go beyond any one person's understanding, i.e. even to reveal the incoherence in our thought , to suspend our assumptions and to begin to see each other as colleagues, not contenders trying to get ahead by making a good impression (p. 241, 182). This kind of dialogue leads to genuine learning, wherein we recognize leaps of abstraction and articulate what we normally do not say to one another. It leads to a balance of inquiry and advocacy, and finally leads us to face up to the distinction between what we espouse and what we do. (p.186) It may also enable us to overcome the centrifugal forces in metropolitan institutions that keep us apart. What a wonderful opportunity for the faculty of the metropolitan universities to provide a new paradigm for their own development which is cooperative and learner focused. True, it does take a whole lot more effort to bring faculty together as learners, but the effort may well lead to that transformation not yet realized in the technological revolution of the information age society for higher education. What better model for the students of the 21st century?

Suggested Reading

Cleveland, Harlan, *The Knowledge Executive: Leadership in an Information Society*. New York, NY, Dutton. 1985. Paperback edition, 1989.

Senge, Peter, *Fifth Discipline: Mastering the Five Practices of the Learning Organization*. New York, NY, Doubleday, 1990.