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NOTES

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A major problem that continues to confront higher education is that of rising costs. With the average cost of attendance consuming a substantial portion of the median family income, for many Americans what is at stake is nothing less than the continued viability of the American dream. The stakes are high for higher education as well. Caught in a closing vise between new demands for enrollment and declining rates of revenue growth, colleges and universities must figure out a way to do more with less.

Recognizing that tuition increases can no longer be used as a safety valve to avoid dealing with the underlying issues of why costs increase so much, campuses have begun the hard work of cost containment. But after sharpening priorities, sometimes making tough choices in light of those priorities, and asking everyone--administrators and faculty alike--to work harder, campuses are still groping for ways to wrestle costs under control.

At the same time, colleges and universities are discovering exciting new ways of using technology to enhance the process of teaching and learning and to extend access to higher education to new populations of students. For most institutions, however, new technologies represent a black hole of additional expense as students, parents, and faculty alike demand access to each new generation of equipment and software. Most campuses have bolted on new technologies to a fixed plant, a fixed faculty, and a fixed notion of classroom instruction. Under these circumstances, technology becomes part of the problem rather than part of the solution of cost containment. By and large, colleges and universities have not yet begun to grab hold of technology's promise to reduce the costs of instruction.

Containing costs--and making use of new technologies to help contain costs--requires a fundamental shift in thinking. It requires one to challenge the fundamental assumption of the current instructional model: that faculty members meeting with groups of students at regularly scheduled times and places is the only way to achieve effective student learning. Rather than focus on how to provide more effective and efficient teaching, colleges and universities must focus on how to produce more effective and efficient student learning. Faculty are only one of many resources that are important to student learning. Once learning becomes the central focus, the important question is how best to use all available resources--including faculty time and technology--to achieve certain learning objectives. Rather than asking faculty to work harder, we need to enable them to work smarter.

THE CURRENT VIEW

We begin with the premise that responsible members of the higher education community want to control or reduce costs as long as such an effort does not result in a reduction in quality. Reducing costs has a somewhat different meaning for different categories of stakeholders; each is interested in this issue for different reasons, each with different emphases. Some are concerned with reducing the cost to society--i.e., the level of state and federal allocations to higher education; others want to reduce the cost for students and their parents--i.e., the level of tuition and fees. Both of these views tend to come from outside the institution.

Within the institution, there are other reasons for wanting to reduce costs. The belt-tightening activities described above have left many institutions with almost no discretionary funds; life on many campuses has an austere quality. Institutions are faced with the pressure to invest more in information technology,

and many are hard-pressed to find additional funds for such investments. Finally, those in higher education most threatened by the growth of private sector competition need to find more cost-effective methods of operation in order to maintain their position in the new marketplace.

Having said that, a series of assumptions about the relationship among quality, cost and information technology dominate the current discussion, making it difficult to find a solution to the problem. Three of these assumptions are:

- Improving quality means increasing cost.

Conversely, controlling costs means reducing quality--e.g., relying on large lecture courses; increasing the use of adjuncts, TAs and other part-time faculty; or, most drastically, laying off faculty. Very few people in higher education believe that it is possible to increase quality and reduce cost at the same time.

- Adding information technology to the mix only increases higher education's cost.

Very few believe that investments in IT can generate a return on that investment, not only in terms of increased quality but also in reduced costs.

- The use of IT in higher education may even threaten quality.

This belief generally stems from the fear that IT will be used to reduce costs by reducing human contact (or replacing human contact). This fear gets expressed in a variety of ways: the AFT's recent ad campaign about the "Five-Minute University;" the "breakdown in community" argument; and the no "proof" argument ("no one has shown that technology can improve learning"). Since education is a "human" or "social" practice, and it has primarily been practiced in face-to-face settings, physical contact becomes the primary enabler of learning.

NEEDED: A NEW POINT-OF-VIEW

Redesign using technology based on learner-centered principles offers a way out of higher education's historical trade-off between cost and quality. New models are emerging that show us that we can indeed have our cake and eat it too. Our discussion in Roanoke will examine both this idea and some of these new models to establish their validity and their potential for dissemination within the higher education community at large.

The discussion in Roanoke will build on the existing theory of how to redesign more productive learning environments, which, I believe, is well established. Much has been written on this subject (e.g., Massy and Zemsky, Heterick, Johnstone, Karelis, Twigg, Wilson, etc.), all of whom advance essentially the same argument. Despite the existence of a good theoretical base, these ideas have had very little impact within the higher education community. A major contributing factor is the lack of implementation of these ideas, the practice that proves the theory. Consequently, our discussion will focus on specific ways to implement the theory rather than re-hashing either the reasons for taking action or the theory that points the way.

Another contributing factor is that those in higher education who sincerely want to address this complex issue do not do so either because they are not convinced that it can be done or they do not know how to do it. We will examine whether or not this premise is correct. Assuming for the moment that it is (or, at least, that the idea has merit), we will present a comprehensive planning methodology for review and critique that can serve as a guide to implementation for multiple institutions. Interspersed with that presentation and discussion will be case studies of four large-scale redesign projects. The idea is to iterate between the planning methodology and actual implementations to draw lessons for the larger community.

What follows is a set of assumptions that underlie the planning methodology along with a series of questions to stimulate your thinking about them. Next is a list of questions that will frame the four case study presentations at the symposium. (You will, I'm certain, think of additional questions of your own to ask the presenters.) Then I have included a background bibliography of relevant readings for those of you who wish to delve further into this subject in preparation for our discussion. Finally, there is a case study from the University of Wisconsin-Madison that illustrates the planning methodology.

ASSUMPTIONS

It is possible to redesign learning environments to enhance learning by adhering to sound pedagogical principles and to reduce costs by transferring some of the tasks performed by instructional personnel to technology-assisted activities. Such a redesign planning methodology consists of three interrelated activities and involves multiple stakeholders in the institution:

1. Redesigning traditional course formats based on sound pedagogical principles to enhance learning. For this task, faculty are the key players in collaboration with IT staff and administrators.

2. Planning and implementing these new environments in such a way as to reduce instructional costs. For this task, administrators are essential in collaboration with IT staff and faculty.

3. Assessing the results of both efforts: Did students learn as well or better than in traditional formats? Were institutions able to demonstrate cost savings as a result of the redesign? For this task, assessment experts are needed in collaboration with faculty, IT staff and administrators.

What follows are the assumptions that underlie the redesign methodology:

You must have a strategic focus.

In order to have maximum impact, which includes the potential for scalability, and to achieve the highest possible return on one's investment, redesign efforts need a strategic focus. One example of such a focus is to concentrate on large introductory courses with high enrollments. Studies have shown that undergraduate enrollments are concentrated in relatively few academic areas. At the community college level, about 50 percent of student enrollment is concentrated in just 25 courses. Those same 25 courses generate about 35 percent of enrollment at the baccalaureate level.

In addition to having an impact on large numbers of students, there are other advantages of such a focus. First, large introductory courses are good prospects for technology-enhanced redesign because they have a more or less standardized curriculum, outcomes that can be easily delineated, and content over which faculty are less possessive. Second, by targeting those courses, what is widely regarded as a prime area of ineffective teaching--the large lecture course--will be improved. While recognizing the limitations of the lecture method, many continue to organize courses in this way because they believe that it represents the most cost-effective way to deal with large numbers of students without having thought about alternatives that improve quality and are less costly than lecture-based strategies. Third, those courses serve as foundation studies for future majors. Successful learning experiences in them will influence students to persist in key disciplines like the sciences. Finally, because those courses are feeders to other disciplines, success in them will help students make the transition to more advanced study.

Large enrollment, introductory courses appear to be the most logical target for redesign. Is this assumption correct? Are there other such targets for redesign that can have a significant impact?

You must be ready—i.e., you cannot start from scratch.

The level of interest and enthusiasm in higher education for infusing information technology into the teaching and learning process is notable. It is clear, however, that certain institutions more than others have progressed farther along the learning curve about what is required to do so successfully. Because of their prior investments and experiences, those institutions are, in essence, more ready to engage in large-scale redesign efforts. The way in which an institution answers the following questions is indicative of its readiness to implement such an effort successfully.

Institutional Readiness Criteria

- Does the institution want to control or reduce costs and increase academic productivity?

It is questionable how many institutions really want to reduce or control costs. Many, for example, believe that rich inputs are characteristic of high quality. This methodology is dependent on the institution's desire to increase academic productivity. Like Alcoholics Anonymous whose program can be effective only if you want to stop drinking, the methodology can help institutions increase productivity if they want to do it.

- Is there a demonstrated commitment on the part of institutional leaders to use technology to achieve strategic academic goals, a commitment that moves beyond using technology to provide general support for all faculty and for all courses?

Almost every college and university in the country provides support for faculty to integrate technology into teaching and learning. Most, however, stop at that general goal without thinking more deeply about how the use of technology enables the institution to achieve its strategic goals. Fewer still target specific elements of the curriculum to achieve maximum impact. Do your institutional strategic plans differentiate between general support and strategic applications of technology in the academic program?

- Is computing firmly integrated into the campus culture?

The University of Illinois at Urbana-Champaign, for example, describes itself as a "computing intensive" campus. What is the level of availability of network access and personal computer ownership (or availability) for students and faculty on your campus? Do you know how many students own computers? Do you have a comprehensive maintenance and upgrade plan for campus computers?

- Does the institution have a mature information technology (IT) organization(s) to support faculty integration of technology into courses? Or does it contract with external providers to provide such support?

How do you characterize a "mature" organization? Can the IT organization provide more than technical support? Does it see the "big picture?" Does it have an understanding of the goals and objectives of the academic program? Does it include instructional design capabilities? Does the IT organization have specific experience with supporting course redesign?

- Do a substantial number of the institution's faculty members have an understanding of and some experience with integrating elements of computer-based instruction into existing courses?

Some faculty may have a great deal of enthusiasm for large-scale redesign but little prior experience in this area. It is difficult to complete a successful project by starting from scratch. Having experience with integrating smaller IT elements into courses helps to prepare for large-scale redesign efforts. Some experts have said that 13 – 15% of the faculty constitutes critical mass.

- Does the institution have a demonstrated commitment to learner-centered education?

This is not a yes-or-no question. What is the evidence of institutional commitment? For example, is there some evidence of implementing teaching-learning models where 1) the locus of activity has shifted fundamentally from the instructor to the learner, and 2) student engagement independent of time and location is not only permitted but promoted? Non-technology-based commitments to student-centered learning would also constitute evidence.

- Has the institution made a commitment to learner readiness to engage in IT-based courses?

Learner readiness involves more than access to computers and to the network. It also involves access to technical support as well as other forms of student support (e.g., help in using navigation tools, course management systems, etc.) How computer literate/network savvy are your students? Do you have processes in place that enable them to gain such literacy? Are students aware of what is required to be successful in technology-intensive courses? Do you have processes in place that assist them in making wise choices or that prepare them for success?

- Is there a recognition on the campus that large-scale course redesign using information technology involves a partnership among faculty, IT staff and administrators in both planning and execution?

Does the institution understand that substantive changes cannot rely on faculty initiative alone? They are systemic and involve changes in such institutionwide areas as policy (class meeting times, contact-hour requirements, governance approvals), budgeting (planning and processes that support innovation), systems (registration systems, classroom assignments), and infrastructure (equipment purchase and deployment.)

Course Readiness Criteria

Just as some institutions are more ready than others to engage in large-scale redesign, some courses more than others are more ready to be the focus of that redesign effort. Because of prior experiences with technology-mediated teaching and learning, and because of numerous attitudinal factors, some faculty members are more ready to engage in large-scale redesign efforts. They have, in essence, a head start on the process. The way in which an institution answers the following questions indicate its readiness to implement such an effort successfully.

- Will changes in the course have a high impact on the curriculum?

Is the course a large introductory, high enrollment course? Is this course taught regularly? Is there a significant academic problem in this course such as substantial failure rates? Does the course face a serious resource problem such as how to manage increased enrollment demand with no commensurate increase in resources?

- Does the course offer the possibility of capital-for-labor substitution?

Large size per se does not necessarily make a course a good candidate. The University of Illinois at Urbana-Champaign, for example, offers an introductory comparative literature course that enrolls about 250 students a semester. The course is writing-intensive and satisfies the campus composition requirement. In spite of the course size, the possibility for capital substitution may be limited. Competent evaluators must assess the students' written work that is contextually based, thus limiting the possibility of capital-for-labor substitution.

Bill Massy has suggested that IT has strong potential to increase learning productivity in areas of codified knowledge and algorithmic skills. Examples of good target subjects include remedial and basic math, general education courses, and composition courses. In those specific areas, the implication is that IT should supplement human instructors whenever possible—human intervention should be oriented mainly towards making the advantages of IT accessible to all learners.

- Are decisions about curriculum in the department, program, or school made collectively--in other words, beyond the individual faculty member level?

Decisions to engage in large-scale course redesign cannot be left to an individual faculty member. He or she may leave the institution, grow tired of the innovation, change his or her mind, and so on. A collective commitment is a key factor for sustainability of a redesign project.

Are the faculty ready to collaborate? Have they engaged in joint conversations about the need for change? Does the course redesign idea have departmental as well as institutional support and ownership?

- Are the faculty able and willing to incorporate existing curricular materials in order to focus work on redesign issues rather than materials creation?

Ideally, one wants the faculty to have a "head start" in the redesign process if possible. Is the discipline one with a comparatively large existing body of technology-based curricular materials and/or assessment instruments? Are the faculty willing to employ an appropriate blend of "home-grown" (created by local faculty) and purchased learning materials in a non-dogmatic fashion? (Or do they believe that they must create everything themselves from scratch--the "not-invented-here" syndrome?) Are they willing to partner with other content providers such as commercial software producers or other universities who have developed technology-based materials?

- Do the project participants have the requisite skills?

Large-scale redesign efforts will almost always involve partnerships between faculty, IT staff and others. Do each of the parties have the requisite skills (i.e., are they competent to do the job) and are they prepared to partner with others when necessary? Does the potential project have strong leadership? Is there evidence that the faculty and staff involved are ready to move a project forward in a timely manner?

What evidence do you have that the participants possess the required skills? For example, do the faculty have some experience with computer-based instruction beyond putting syllabi on the Web such as developing outlines and storyboards for pilot modules to use as templates upon which other modules can be built; developing computer-based tutorials on the content that is best taught by computer and diagnostic quizzes and assignments keyed to questions in the quizzes; using course management systems that can provide course-specific conferencing and threaded discussions to facilitate student-to-student and student-to-instructor communications.

- Have the course's expected learning outcomes and a system for measuring their achievement been identified?

Successful large-scale redesign efforts begin by identifying the intended learning outcomes and developing alternative methods other than lecture/presentation for achieving them. Have those responsible for the course identified the course's expected/intended learning outcomes in detail? Has the curriculum been built backward from the intended outcomes?

Many campuses have established an "assessment culture" which makes it easier for them to assess the learning outcomes of innovative projects as well as for traditional courses and programs. Does your campus have assessment processes in place—e.g., the ability to collect data? the availability of baseline data? the establishment of long-term measures? Is there a system for measuring the achievement of these outcomes at both the individual student level and the class level? Does the department or program take advantage of nationally normed assessment instruments in its particular discipline?

- Do the faculty members involved have a good understanding of learning theory?

Sound pedagogy is the key to successful redesign projects. When sound pedagogy leads, technology becomes an enabler for good practice rather than the driver. Does the instructor provide a wide range of options for achieving required learning outcomes? Has the instructor systematically thought about and investigated alternative methods for empowering students to learn? Does the instructor seek to use technology to transform the teaching and learning environment rather than merely automating existing instructional practice?

- Is there a business plan for achieving the redesign goals so that the innovation can be self-sustaining in the future?

In order to be sustained, changes in instructional practice must be affordable by institutions and integrated into their base funding practices. A wealth of experience shows that attempts to add on innovations with external support, and without internal structural change--especially commitment of resources in the institution's core budget--have been almost totally unsuccessful. When the grant funding

runs out, the innovation ends. The most surefire way to tell whether an innovation is for real or is artificial is to look at its funding. Unless an innovation is paid for directly by those who stand to benefit from it, its chances to flourish are dubious at best.

Does the readiness concept make sense? Are these the right criteria? Should others be added? Should any be omitted?

Redesign must adhere to sound pedagogical principles.

The goal of course redesign is to improve student learning. By adhering to sound pedagogical principles, one can create viable alternatives to traditional formats. For this task, faculty are the key players in collaboration with information technology (IT) staff and administrators.

There is a substantial body of knowledge about both the limitations of the predominant form of collegiate instruction--the didactic lecture--and the advantages of certain pedagogical principles that result in increased student learning. A lot is also known about the role of information technology in supporting those principles of good pedagogical design, what works, and what does not work. If instructors merely add on technology to ineffective instructional methods--if they simply technologize the lecture method--there will be no improvement in student learning.

Good pedagogical practice enhanced by technology supports shifts in the nature of the teaching-learning enterprise, making it more active and learner-centered. Technology can be deployed to optimize sound pedagogy by making it more consistent, by providing additional practice or examples, and by making more instruction available on-demand. Technology can provide tools to support teaching and learning as well as tools that replace, augment, or extend the ability to identify, collect, organize, integrate, and generate knowledge. Technology can also support pedagogical models and approaches that change in kind the nature of the teaching-learning enterprise. In effect, the new approaches and mechanisms stand as a new paradigm for student learning.

Planning to enhance learning should lead to a redesigned instructional process that achieves improved learning outcomes. Such high-quality learning environments should exhibit the following characteristics.

- Engage students in active learning. As one math professor puts it, “Students learn math by doing math, not by listening to someone talk about doing math.”
- Provide 24 x 7 access to learning resources where possible, creating environments that are both accessible and flexible, and allowing students to study at times most convenient to them.
- Enable students with a variety of backgrounds and with a range of professional and personal goals to engage successfully with the material.
- Incorporate customized course design including modularization of materials and incorporation of examples from various disciplines.
- Employ a continuous improvement model. If students are having difficulty understanding a particular part of the course, it can be changed and improved in real time.

Are these the right pedagogical principles? Should others be added? Should any be omitted?

There are three ways to reduce the cost of instruction, all of which translate to a reduction in cost-per-student.

There are, of course, a variety of ways to redesign courses to reduce costs. One approach is where student enrollments stay the same but the instructional resources devoted to the course (course expenditures) are reduced. Another approach is to increase enrollments with little or no change in expenditures. A third way is to reduce the number of course repetitions required to pass a particular course. In many community colleges, for example, it takes an average of 2.5 enrollments to pass introductory mathematics courses. This means

that the institution and the student must spend 2.5 times what it would cost to pass the course on the first try. In each case, a translation of the savings to cost-per-student can be used for comparative purposes.

Is the cost-per-student the correct common denominator of all redesign approaches? Are there other approaches to reducing the cost-per-student that are not listed here?

Cost savings are primarily the result of a reduction in time spent by instructional personnel.

There is ample evidence that good pedagogy can lead to more powerful learning. Teachers using paper-based systems can employ these effective instructional methods. But these approaches tend to increase the teaching's labor intensive quality. To illustrate this point, Jack Wilson has described how a faculty member at RPI tried to demonstrate that he could teach an introductory calculus course using all of the positive pedagogical techniques utilized in the studio method but without using technology. After two years, he was burned out and begging for a sabbatical. In addition, there was a high institutional cost for the service of the four TA's needed to grade his worksheets. And, furthermore, his model was not diffused; no one adopted it.

How can information technology be used to reduce costs and increase academic productivity? Many experts on the subject have pointed out that moving away from our current credit-for-contact mode of instruction is fundamental. Some approaches employ a greater reliance on asynchronous, self-paced learning modes while others take place in a traditional, synchronous classroom setting but with reduced student/faculty contact hours. Both rely on shifting faculty time-on-task to the technology or lessening the labor-intensive quality of instruction. In each case, they are designed to transfer the locus of activity from the faculty to the student: the focus is on student problem solving and projects rather than on presentation of materials.

For example, RPI's traditional physics course involved six contact hours per week (two lectures, two recitations and two labs). The studio course structure reduced that to four contact hours while keeping credit hours constant, thus reducing the faculty resources devoted to each course, with no diminution of learning results. Of course, it's possible to reduce contact hours and save money, but without the use of IT, and the redesign of the instructional process, quality would most certainly decline. With technology, RPI is able to serve the same number of students at a lower cost--and serve them more effectively.

In summary, we know that it is possible to redesign learning environments to enhance learning by adhering to sound pedagogical principles and to reduce costs by transferring some of the tasks performed by faculty to technology-assisted activities.

Is this assumption correct? Are there other ways to achieve cost savings in instruction?

Financial planning involves analyzing the cost of traditional methods of instruction as well as new methods of instruction utilizing technology.

Financial planning to reduce costs involves the following steps:

1. Identify the tasks associated with preparing and offering the course in a traditional format and the categories of personnel involved.

2. Determine all personnel costs expressed as an hourly rate.

3. Determine how much time each person involved in preparing and offering the course in a traditional format spends on each of the tasks.

4. Repeat steps 1 through 3 for the redesigned course format.

5. Compare the two costs and calculate the savings.

(Please see the sample spreadsheets included in the UW-Madison case study for an illustration of this process.)

This methodology utilizes activity-based costing, a process generally regarded in higher education as difficult and unpopular. Is activity-based costing necessary to understand this issue? Are there alternative approaches that can work as well or better?

The planning methodology compares operational costs and does not include developmental costs.

This planning model compares the *before* costs (current/historical/traditional) and the *after* costs (forecast of what the course will cost when it is fully operational, say for example, in its "third" offering)—i.e., it asks you to plan what the redesigned course will look like at the end of the developmental process. It does not include the up-front developmental costs of either the traditional or the redesigned course.

The reason for this approach is twofold. The first is that we are trying to show institutions that by investing in IT-based course development, they can see a return on their investment provided that they redesign the course. The goal is sustainability—how to sustain redesign efforts over the long haul—and sustainability results from permanent changes in operating expenses. The second reason is that, while the developmental period for course conversion has costs associated with it, those costs can be paid for from one-time allocations, such as grants from foundations, federal agencies, or the institution, and/or they can be amortized over any number of years. If institutions can see that they will ultimately realize a return on their investment, they will have an incentive to make the needed developmental investment. Then, of course, questions about how much to invest for how much return come into play.

Is this a reasonable approach? Are there issues or problems that such an approach overlooks?

Institutionwide support services and administrative overhead are not included in the comparative cost analysis.

The assumption is that these costs are constant—are part of the campus environment—for both the traditional and redesigned courses.

Is this assumption reasonable?

Infrastructure and equipment costs are not included.

Calculating costs in this planning methodology leaves out the cost of infrastructure unless the item is specific to the particular course. Campus networking, site licenses for course management systems and desktop PCs for faculty, for example, are part of the campuswide IT environment. (Software, equipment and professional staff that are particular to the specific course, however, should be included.) There are three reasons for not including the cost of infrastructure in the planning model:

1. Universities and colleges are investing (and will continue to invest) in IT infrastructure and support--as are all businesses and organizations--because it is a necessity for doing business in the 21st century. If we never redesign courses to take advantage of this investment and continue to add IT on to existing academic and administrative practices, the investments (and the cost increases) will continue--for communications, for research, for library and other student services, and for supporting traditional academic practices. So the investments will continue to be made. The point of the planning methodology is to show institutions that by taking advantage of that infrastructure to redesign courses and save primarily on personnel costs, they can receive a return on their infrastructure investment.

2. Even if we include the cost of IT infrastructure and institutional support staff in the cost model, it would be a minor fraction of the course costs. 80% of institutional costs are personnel; IT is generally between 3 and 5% of the institutional budget. So, for example, if we pro-rated the introductory chemistry course's share of the UW infrastructure (which has multiple uses as indicated above), it would be a tiny, tiny fraction of the cost of the course.

3. The major information technology corporations--IBM, Sprint, AT&T, MCI-WorldCom, Microsoft, etc--are spending trillions of dollars over the next decade to significantly upgrade and enhance the nation's and the world's telecommunications infrastructure and the intelligent software to take advantage of it. The consequence of these trillions of dollars of investment is to dramatically reduce the cost of telecommunications infrastructure while simultaneously even more dramatically increasing the capability of smart software. Compared to five years ago, the cost of a full function PC has dropped from about $1500 to $600 and the capability of that PC has increased even more (80 to 400 MHz processor speed, 40 to 4,000MB disks, 512 to 64,000 kb RAM, etc.). Long distance phone rates have dropped from 25 to less than 10 cents a minute, average net connectivity has risen from 9.6 to 56 Kbs, cable companies are offering connectivity at megabit speeds for less than $40 a month, and we have yet to reach the market clearing price.

It would be less than clever if higher education did not try to leverage these investments by the corporate world. The marginal cost to add teaching and learning applications to our campus infrastructure (my argument above) is almost nothing and clearly pales beside the cost of human mediation. The argument is like investing in 401K plans: if your employer is going to do an order of magnitude better match to your contribution, you would be foolish not to contribute.

Some believe that savings in instruction cannot compensate for research and administrative investments. At the University of Illinois--and probably at most R1 universities--the IT investment is funded in large part out of ICR funds. For example, the northern part of the campus recently was re-wired for Internet II and financed this way. Another college's re-wiring is being financed by the gift of a wealthy alum. These campuses will look to the research return--in prestige and future ICR--as a primary justification for the investment. Administrative computing is a second huge factor. Gains from instruction are tertiary and quite distant from the first two. If the point of the planning methodology is to rationalize the overall investment by gains in instruction, with an audience of say campus administrators, it will not be a convincing argument. What this methodology can show is that incremental investment in instruction is valuable and that a sufficient fraction of the gains can be captured by the university as to make it self-financing, so as to not put the university further in the hole.

The counter-argument is as follows. On most R1 campuses, the research budget is 10-15% of the total and the administrative budget is 5-10% (subject, of course, to the criticism that nobody really knows how much goes into anything because of hidden cross subsidies.) It is the classic 80/20 problem: 80% in instruction and 20% in the rest. The rest (research and administration) take a significant interest in the bottom line, but generally instruction does not because such a large percentage of its costs are fixed--salaries, building maintenance, student support services, etc. If you assume these costs are fixed, then the argument might hold together. If you do not assume instructional costs are fixed, then a 10% reduction in them is worth four times as much as a 10% reduction in administrative and research costs. (Bill Massy argued this indirectly in his paper about the core and periphery.) Small improvements in instructional costs can yield large returns. We ought to be looking for cost improvements where the costs are highest.

One could argue that infrastructure improvements from the research or administrative budget simply demonstrate that they are not considered fixed and are subject to tweaking. Why not make the same argument about instruction? In point of fact, 25 years ago similar arguments were made about research and 40 years ago they were made about administration.

This is clearly a complex area. What do you think about these arguments?

Assessment involves both impact and implementation.

When planning for assessment, one must distinguish between impact--finding out whether the ultimate goals of an alternative method (better learning at lower cost or the like) were accomplished--and

implementation--finding out whether the institution actually did what it said it was going to do. In any innovation/action research project, both are important.

To assess impact, it is important to be clear about what one is after conceptually. The real premise of the methodology--and that which ought to be assessed--is not just learning but learning productivity. This conceptual framing of the methodology's dependent variable has several important implications. First, the perspective of analysis is by definition consciously comparative of the innovation(s) against an established baseline of current practice. This implies collecting data on learning and costs in both innovative and comparable standard practice settings, such as comparing outcomes directly for a technology-enhanced course with those of a course delivered in the usual way. Second, the variables used in the comparison to define impact need to include both learning outcomes and later behavior--things like retention rates, course completion rates, and the like--as the latter can significantly impact the learning productivity equation even if learning outcomes are equivalent.

To assess implementation, one needs to pay attention to questions of how things are acted out in the course of a project. Those can be assessed using simple questionnaires that include questions such as: Were resources and people in place as planned that might have gotten in the way of impact, including equipment, support, training, and orientation? What were the specific glitches that occurred and what might their impact have been? Did the process of teaching and learning change in the view of participants? Did faculty report different ways of teaching and if so, what were the differences? More important, did students report changes in how they approached the material, studied, and spent time on task?

These ideas provide a framework for how to think about assessment. Are there specific things that need to be assessed in each instance? Are there others that do not because of established practice?

Sustaining innovation is the primary goal.

The primary goal of the planning methodology is to show how ongoing investments in technology-based redesign can be supported based on a return-on-investment strategy. In order to be sustained, changes in instructional practice must be affordable by institutions and integrated into their base funding practices. A wealth of experience shows that attempts to add on innovations with external support, and without internal structural change--especially commitment of resources in the institution's core budget--have been almost totally unsuccessful. When the grant funding runs out, the innovation ends. The most surefire way to tell whether an innovation is for real or is artificial is to look at its funding. Unless an innovation is paid for directly by those who stand to benefit from it, its chances to flourish are dubious at best.

This planning methodology will enable higher education institutions to fund their own future development in this arena rather than relying on external sources. It can be used by individual institutions to support ongoing innovation. It can also be used by systems of higher education and by states as a mechanism to fund future investments in instructional technology.

Do you agree with this last point? Does the methodology provide a way for institutions to fund their own development?

An End Note: More productive learning environments are not synonymous with distance learning environments.

In announcing plans to develop the Western Governors' University, Colorado's Governor Roy Romer was quoted as saying, "This is a revolutionary idea. Many people can't afford the traditional way of getting a higher education degree, which is learning by sitting in the classroom. Technology can be an effective and cheaper way to help people learn." The implication is that distance learning delivery is inherently cheaper than classroom delivery.

The problem with this idea is that cost-effectiveness depends on the design of the distance learning course or program. The more one replicates the traditional campus model, the more one's operating costs will resemble or exceed traditional campus costs--e.g., instructor-led models such as televised classes or computer conference-based courses which rely on the same student/faculty "contact" as traditional models. Similarly, if one uses site-based delivery methods (versus desktop delivery to the home or office), the same borrow-rent-buy facilities issues found on campus will arise.

A common approach to online learning is the following. Full-time faculty design and then offer asynchronous courses or asynchronous parts of courses over the Internet. Many faculty find this approach educationally sound, but also inordinately time-consuming. That is because the medium itself permits active participation by all students in every discussion; faculty can feel obliged to respond to dozens of student postings each day. Whatever the learning virtues of this kind of instruction may be, it does not lower per-student costs; it raises them. In many ways, this mode is more costly than traditional classroom delivery.

What evidence do we have that 1:15 online faculty/student ratios produce more effective learning than other models? Is appropriate use of faculty time a key to ongoing sustainability? Can the planning methodology help individuals and institutions think more clearly about the design of online learning?

QUESTIONS FOR CASE STUDY PRESENTERS

What prior experience and investment made you ready to engage in redesign?

Whose idea was this?

What do you see as the benefits of your redesign? for students? for faculty? for your institution?

Why do you think students will be able to learn in your new environment? Do you think students will learn better?

How have you challenged the fundamental assumptions of the traditional instructional model?

What does learner-centered mean in your environment? What is does it not mean?

How would you characterize student attitudes toward your redesigned environment?

Have you asked faculty to work harder or to work smarter?

What technologies are you employing and why?

Will you generate cost savings?

What are the necessary elements for successful implementation?

Will your redesign scale beyond your particular class or your particular institution? Why?

What were the barriers or obstacles you encountered in implementing your redesign? How did you overcome them?

How do you plan to assess impact and implementation?