Technology Costing Methodology Project

Technology Costing Methodology Casebook 2004

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October 2004

Contents

In addition to three new cases listed above we have also included the original 12 case studies from the first TCM Project. These cases studies were done utilizing the TCM Handbook only. The TCM Tabulator was created after feedback from these original pilot sites indicated that an automated Excel spreadsheet would be beneficial to TCM users.

The following three white papers were produced through the TCM Project and focus on costing and technology issues in higher education.

Introduction

As part of the second round of the refinement process for the procedures described in the *TCM Handbook*, institutions, systems, and state agencies offered to implement the procedures on a pilot-test basis. In the second stage of the review and refinement process, a specific attempt was made to "test drive" the procedures in a more complex environment—a state system, for example.

While the contexts for the trials were differed, the findings were not different from the initial tests. They reinforced and expanded – but did not contradict – the findings from the initial round of test activities. The key findings are:

1. In almost all the test cases, face-to-face instruction was less expensive than technology-based delivery. This is largely due to the added costs of course development associated with technology-based delivery.

2. Because of the higher course development costs and some other factors, the number of students over whom these course-related costs are distributed has a considerable impact on the cost-effectiveness of mediated delivery. The larger the number of students, the greater the efficacy of technology-based courses—**scale matters**.

3. People costs are by far the dominant element of cost regardless of the form of delivery. Technology-based delivery is more expensive because of the additional **time** required to develop and deliver the content, not because of the costs of the technology.

4. When the costs are "unbundled," it is the cost of content delivery that dominates.

If there is advice to be given based on data derived from two rounds of test activities, it would be:

- Focus attention on the very large courses—those where the benefits of scale can be most readily realized.

- Think about the alternatives to developing your own content; it is this element that often makes technology-delivered instruction more expensive than face-to-face.

- If you do engage in content development, spend time on design; expenditures on design yield savings in development.

- Think seriously about the use of human resources. Regardless of mode of delivery, the people costs represent by far the largest category of expenditures. Use a mix of talent and deploy them in ways that take advantage of their unique capacities.

CASE ONE: University of North Carolina System

University of North Carolina System Overview

The University of North Carolina (UNC) is a public university system consisting of 16 constituent institutions, a central Office of the President, and various affiliates, including UNC Television, the North Carolina School of Science and Mathematics, and the North Carolina State Approving Agency. The system is governed by a 32-member Board of Governors whose members are elected by both houses of the North Carolina General Assembly. The UNC system receives about $1.8 billion in State appropriations, and has an overall operating budget of $4.1 billion.

Recent UNC Activities Related to Instructional Costing

During calendar year 1999 and again in 2001, the University of North Carolina gathered cost data for both on- and off-campus instructional activities. The information gathered was not comprehensive but measured a discrete sample of "course pairs," which were defined as an on-campus and off-campus section of the same (or substantially similar) course offering. The primary purpose of this data gathering was to respond to a special provision passed by the 1998 Session of the North Carolina General Assembly, which provided state funding for distance education instruction and contained a related reporting requirement:

> *North Carolina Session Laws 1998, chapter 212, section 11.7 (UNC Distance Education)*
>
> *This act provides funding to The University of North Carolina Board of Governors for degree-related courses provided away from the campus sites of the constituent institutions of The University of North Carolina. The intent of this commitment is to provide expanded opportunities for higher education to more North Carolina residents, including nontraditional students, and to increase the number of North Carolina residents who earn post-secondary degrees.*
>
> *These funds shall be used for the provision of off-campus higher education programs, including the costs for the development or adaptation of programs for this purpose, and the funds may be used for the costs of providing space and services at the off-campus sites. . .*
>
> *The Board of Governors shall track these funds separately in order to provide data on the costs of providing these programs, including the different costs for various methods of delivery of educational programs. The Board of Governors shall provide for evaluation of these off-campus programs, including comparison to the costs and quality of on-campus education and the educational attainment levels of North Carolina residents. The Board shall provide a preliminary report to the General Assembly by May 1, 2000, and subsequent evaluations, including recommendations for changes, shall be made at least biennially to the Joint Legislative Education Oversight Committee.*

Because the General Assembly's intent was to provide full funding for off-campus instructional activities, the methodology used estimated total costs, including the application of an overhead rate similar to that used for federal grants. The off-campus course sections that were part of the 2001 sample include varied modes of primary instructional delivery, but were deliberately skewed in favor of those employing emerging technologies. The result is that, while about 75 percent of UNC's "distance" course offerings are now delivered through face-to-face instruction, only 36 percent of the off-campus course sections in the sample were delivered in this traditional manner. Thirty-nine percent of the sections were primarily web-based, while 18 percent utilized interactive television and 7 percent were delivered via videotape.

The results of this study indicated that, for the sample, on-campus courses cost about two-thirds as much as comparable courses taught at a distance. Course development played a large part in the increased cost for off-campus offerings. The sections in the sample offered via interactive television were the most costly; those offered in the traditional, face-to-face mode were the least expensive. The full text of the 2002 legislative report may be accessed at http://www.northcarolina.edu/aa/reports/disted.cfm under the title of "Biennial Distance Education Report."

UNC's Participation in the Technology Costing Methodology Project

The population of course sections used in the aforementioned legislative report was used as the basis of UNC's participation in the WCET Technology Costing Methodology project. Participating institutions were asked to use the TCM methodology to measure and report costs on the same sample course offerings used in the 2002 legislative report. Individuals from each campus's fiscal office worked with those in provosts' units, distance education directors' units, and other areas to measure costs.

Data were gathered on 64 course sections offered at the 14 participating institutions. All course sections were taught in either the spring or the fall 2001 semesters; about one-half were on-campus and one-half taught at a distance.

Participating institutions were provided with a hard copy of WCET's *Technology Costing Methodology Handbook*, *Version 1.0,* and the *Technology Costing Methodology Casebook 2001*. In addition, access was provided to the related website, the TCM Tabulator tool, and a telephone number provided for technical assistance. Most participants relayed their concerns and questions through the coordinating Office of the President; some direct contact with WCET staff was used.

UNC Results

Costs were measured according to the TCM methodology using the Objects of Expenditure/Activities Matrix, which group expenditures as Compensation/Operating Expenses, Capital, Central Business Office Compensation/Operating Expenses, and CBO Capital. The overwhelming majority of costs reported by UNC institutions (95 percent) were in the Compensation/Operating Expenses category.

System-wide, costs related to activities broke down in the following manner:

Activity	Total Costs Assigned	Percent of Total Costs
Curriculum Planning	$135,015	10.44%
Materials Development	101,877	7.88%
Content Delivery	683,374	52.87%
Tutoring/Inst Mediation	51,199	3.96%
Learning Assessment	50,643	3.91%
Computing Support	36,791	2.84%
Telecomm Support	9,525	.75%
Library/Info Support	137,889	10.66%
Assessment Support	0	0
Academic Logistic Support	23,600	1.82%
Academic Administration	1,755	.15%
Academic Personnel Dev.	0	0
Academic Advising	2,843	.23%
Counseling/CareerGuidance	907	.08%
Advertising/Marketing	11,430	.88%
Recruitment	591	.05%
Admission	629	.05%
Financial Aid	0	0
FA Counseling/Evaluation	594	.05%
Records Maint/Reporting	594	.05%
Student Employment Svcs	0	0
Student Records	0	0
Institutional Support	43,091	3.33%
Total Costs	$1,292,347	

Cost per student ranged from $68 in a social science course offered on campus at UNC-Greensboro (with an enrollment of 95 students) to $6,757 in an off-campus information technology course offered by North Carolina Central University (with an enrollment of only five students). Similarly, costs per credit hour ranged from the UNCG social science course section of $23 to $2,252 for NCCU's low-enrollment information technology course (extreme outliers excluded).

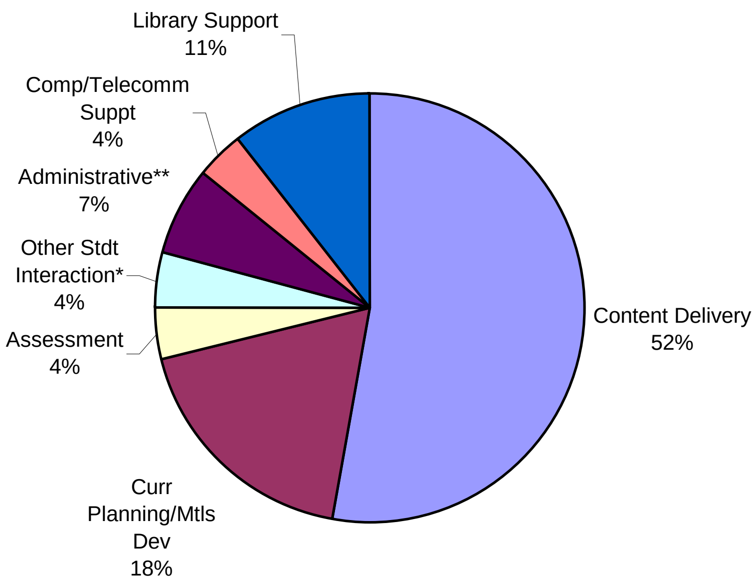
Average cost per student was $803, with a corresponding $276 average cost per credit hour..

Costs for unused capacity were calculated for 19 of the 64 course sections, with an average cost of $1,346. The range was from a low of $180 to a high of $3,547.

Observations

It would not be prudent to draw conclusions from the measured costs of a small sample of course sections. Costs will be influenced by mission of the institution, discipline of course sections measured, primary instructional delivery mode, institutional policies, and other factors. It is possible, however, to make some observations that may aid in management decisions regarding optimal methods for delivering instruction.

Total reported costs for the sample were $1,292,347. Overall, compensation and operating costs reported comprised over 95 percent of total costs. A breakdown of major activity categories is shown below:



*Other Student Interaction category includes career counseling, tutoring and mentoring, academic advising, and financial aid counseling.
**Administrative items include academic logistical support, academic administration, marketing, recruiting, admissions, records maintenance, and institutional support.

Results found that off-campus instruction is more expensive than comparable instruction delivered on campus. This difference is largely attributable to increased course development costs. Curriculum planning and materials development costs were about one and one-half times higher for off-campus courses.

Costs related to content delivery, which comprised about 52 percent of total costs system-wide, were only slightly higher for off-campus courses. Almost all reported library support costs (99.5 percent of the total) were related to off-campus courses, as were 89 percent of computer and telecommunication support costs. Sixty-one percent of the reported costs for learning assessment were for off-campus courses; costs for assessment were reported for only 20 of the 64 course sections. Comparisons of on-campus versus off-campus costs in this category were inconsistent.

Marketing and recruiting costs were reported for a few course sections only; all of these costs were associated with off-campus courses. About 75 percent of administrative costs, including institutional support, were associated with on-campus courses.

As expected, most of the larger enrollments were reported in on-campus course sections. At the extreme, UNC-Chapel Hill had 152 students enrolled in a public health course on campus. Costs are generally high in this discipline, and the total cost of the off-campus section was actually 29 percent less expensive than its on-campus counterpart. Comparing the cost per student for the on-campus section ($542.78) with that for the off-campus section of 68 students ($940.15) clearly demonstrates the cost-effectiveness of operating at higher enrollment levels.

The lowest enrollment for a course (excluding one extreme outlier) was reported at North Carolina Central University, where five students were enrolled in an off-campus course in information technology, at a cost of $6,757 per student. In contrast, the cost per student for the on-campus counterpart with an enrollment of 10 students was $2,326. The off-campus section was taught using interactive video as the primary delivery method; the cost of developing the course using this medium was the primary cost differentiator.

Summary

Participating as a pilot in the TCM Phase Two project provided useful feedback for the University of North Carolina and its constituent institutions. First, the overall results tended to reinforce and validate results obtained by UNC using its own methodology. Both methodologies indicate that, for the UNC sample of course sections measured, costs were higher for off-campus instruction, and that differences in costs were largely attributable to the primary method of instructional delivery and course development costs.

Second, measuring costs based on activities provides management with better information about the resources required for each activity as a basis for making decisions on cost containment or additional allocation of resources, as appropriate.

Finally, the TCM represents real progress toward a standard methodology needed to enable relevant and useful comparisons between instructional costs in different departments, schools, and/or institutions. The University of North Carolina appreciates the opportunity to work with the WCET in this costing study, and we look forward to the benefits provided by a standard instructional costing methodology.

CASE TWO: Ohio Learning Network

Ohio Learning Network Overview

Ohio is a state with a coordinating board and a strong tradition of institutional autonomy. Each institution has a higher education separate board of trustees in which local control rests. Ohio's coordinating agency, the Ohio Board of Regents, and its distance-learning unit, the Ohio Learning Network (OLN), collaborate with colleges and universities on various public policy issues. Funding and costing of e-learning is one of those issues.

Ohio's Participation in the Technology Costing Methodology Project

In January 2002, 10 state colleges and universities met to explore using Technology Costing Methodology (TCM) to better understand the costs related to technology-enhanced learning, as well as distributed and distance learning. Each institution was concerned about investments made at the campus level for these courses and degrees. As such, each institution had a separate focus for the TCM activity. After three months of investigation, five institutions utilized the Tabulator, some to greater extent than others. Those institutions in the pilot that offered final commentary were University of Akron, Bowling Green State University, Kent State University, Ohio University, and Owens Community College. Files from Kent, Akron, and Owens were made available to WCET. Several other institutions used the Methodology as a guide to explore costs, but did not use the Tabulator.

Ohio's Results

After receiving training from WCET, OLN guided several Ohio institutions in using the TCM Tabulator to calculate the real costs of their technology-enhanced, distributed, and distance learning courses and programs. During OLN's pilot study, four institutions of diverse needs and constituencies performed complete analyses with the TCM Tabulator

Owens Community College – a two-campus community college in the northwest section of Ohio enrolling nearly 18,000 students. With more than 160 program areas, Owens is a successful part of the Ohio community college system. Owens has approximately 25 web-based courses and 37 video courses offered via e-learning. Owens used TCM to plan a cost-effective expansion of their distance learning course offerings by comparing costs associated with web and video delivery.

Using the Tabulator, Owens found delivering web courses was approximately twice the cost of video courses ($4,735 and $2,225). Owens then ran scenarios to (1) hold steady the number of web courses or (2) to increase course offerings. Viewed from a financial position alone, Owens found video a more effective delivery method for courses at a distance. The institution did not compare learning outcomes, which was noted to be an important factor in the decision making process for mounting any and all Alternative Learning courses. To answer the original questions of increasing or decreasing courses, Owens determined it was financially beneficial to increase both the <u>number of web courses</u> and the <u>number of video-course students</u>.

University of Akron – is an urban university in northeast Ohio enrolling nearly 22,000 students. The University of Akron (UA) used TCM to compare costs associated with delivering a noncredit teacher education program (the Summer Institute for Reading Intervention Project) either face-to-face or through streaming video.

UA personnel used the Tabulator to analyze labor charges, consulting fees, licenses, equipment, teleconferencing infrastructure, professional development costs, WebCT training costs, and the use of streaming video with RealVideo. The difficulty with the Tabulator was in capturing costs where sharing existed among units. In many fields, average costs were used. If a subsequent test was conducted, the staff would use a cost sheet to gather better data.

Akron found that delivering this summer institute would have been less expensive via traditional face-to-face.

Kent State University – Located in northeast Ohio, Kent State enrolls nearly 35,000 students across its eight campuses. Kent State used TCM to perform both a course-based and a program-based analysis to determine the overall cost-effectiveness of their bachelor's degree in Business Administration.

Kent has information available at www.oln.org/conferences. Kent found that the College of Business is very efficient. They used the Tabulator to calculate unused capacity and technical costs from central units delivery units by videophone. Course-based and overall program analyzes were based on that information Kent was most concerned that the TCM process needs ways to document in the Tabulator -- for example a notes file. Overall, Kent State found using the Tabulator an excellent method for costing. Kent had committed to using TCM prior to its involvement in the statewide project.

Ohio University – Situated in southeastern Ohio, Ohio University enrolls nearly 18,000 students on its residential campus. Administrators at Ohio University used TCM to try to understand the Return on Investment (ROI) on a master's degree in business administration and a master's in public health administration. By performing TCM analyses across multiple graduate programs, Ohio University was able to recognize differences in program costs across disciplines. Ohio University did not submit complete TCM Tabulator files; individuals found data difficult to obtain and were unable to use the Tabulator to compare costs across a full program in complete detail.

Bowling Green State University – Bowling Green State University is a residential institution located in Northwest Ohio. Bowling Green University did not fully use the Tabulator for courses, but offers the following suggestion for improvements.

An essential accounting component for amortization of costs needs to be included as a part of the process. It would be quite misleading and misguiding should an individual or a group interpret the results of costs for enhanced technology produced from such a report. The fact that these costs could be construed as value for only one class session and for one semester definitely would be detrimental. The life of the equipment does exceed this length of time for the duration of one class.

Observations

Across the board, the institutions involved in the OLN pilot study found the TCM Tabulator to be an excellent method for costing e-learning. Perhaps the greatest benefit gleaned from using the TCM tool was an unexpected one: after using the TCM Tabulator, many distance learning directors remarked that TCM was the single greatest tool to help them build advocacy for their programs. According to one institution, the president found the data generated by the TCM analysis so compelling that she chose to increase financial support to the distance learning unit. On another campus, the data were used to bolster existing support for expanding e-learning offerings.

At both institutional and state levels, data generated by TCM continues to be used for ongoing policy studies. On several campuses, the data generated by the e-learning unit was shared with the finance office to help chief financial officers better understand the costs embedded in e-learning activities. On a state level, representatives from Ohio institutions involved in the TCM project are using their newfound knowledge to educate state-level funding policy committees about campus-level costs associated with using technology to deliver educational content.

While using the TCM Tabulator to calculate costs, several institutions identified modifications that could increase the effectiveness of the tool. These included: the addition of a notes file to document completed work; an adaptation that would allow for the calculation of program-level as well as course-level costs; and a way to handle costs that were shared between units within an institution.

Summary

In summary, the findings from OLN's work on the TCM pilot study has informed e-learning advocacy and distance learning policy at both the institutional and state levels in Ohio. Ohio institutions learned more information about campus-level costs via the TCM project. They are now in the process of applying that knowledge to the state costing data to educate the state Higher Education Funding Commission and other state-level funding policy committees about the costs of using technology to deliver educational content.

CASE THREE: The Florida Virtual School

Florida Virtual School Overview

The Florida Virtual School (FLVS) is a state-funded online school that offers a complete high school curriculum, plus a few eighth-grade courses and GED preparation to students throughout the state of Florida. Florida students may take any of these courses for free with the exception of the GED coursework, which must be paid for by students to their local provider of public, post-secondary, workforce education. FLVS also allows students from outside the state of Florida to enroll in its courses on a tuition basis. FLVS generates additional revenue through the sale and/or lease of its course content to entities outside the state, and it sells training and expertise on "How to Create a Virtual School" to individuals and organizations who need these products.

To date, most students enrolled with the Florida Virtual School have been taught by full-time instructors. Under this model, each course has an assigned editor who is one of the full-time instructors teaching that course. Other teachers of this course must refer any needed edits to the teacher designated as the course editor. Each full-time instructor receives a home-office equipment package that includes a laptop computer, a combination-printer-scanner-fax machine, a pager, a second telephone line, a long-distance telephone card, and broadband internet connectivity. The capital outlay for the equipment for each teacher is approximately $2,500. The costs of the other provisions, such as a second phone line, ISP connection, pager, and a telephone card, are approximately $100 per month.

To offer more flexibility and to accommodate growth, FLVS is experimenting with the use of adjunct or part-time teachers to supplement instruction provided by full-time staff. Adjuncts are paid on a "piece meal" basis and are generally responsible for teaching one class of 30 students. Unlike full-time instructors where the school is responsible for all overhead and expenses, adjuncts are responsible for providing their own computer, ISP connection, etc.

Florida's Participation in the Technology costing Methodology Project

The issue to be studied in this case will be whether there are alternative course-delivery models that are more cost effective while preserving the level of quality expected by FLVS with regard to course content and instructional interaction between teachers and students. The alternative models to be studied make greater use of adjunct (part-time) faculty. It should be noted that since FLVS delivers 100 percent of instruction through distance learning with no face-to-face instruction, only the variable costs associated with full-time versus adjunct instructors are captured in each analysis.

In this case study, the following three scenarios are analyzed utilizing the TCM Tabulator tool to determine the various costs associated with the delivery of Algebra I:

- Full-Time Only. Analyzes the use of two full-time instructors to delivery instruction. Each instructor is responsible for 125 students, producing a total 250 high school credit hours over a two-semester period. This scenario represents the primary delivery model currently in place for FLVS.
- Full-Time with Adjuncts. Analyzes the use of one full-time instructor to deliver instruction as well as mentoring and training a team of four adjunct instructors. The full-

time instructor is responsible for 125 students and each adjunct is responsible for 30 students producing a total of 245 high school credit hours over a two-semester period. The full-time instructor works closely with the adjuncts to provide the necessary support and to ensure quality instructional delivery is maintained. The full-time instructor receives a supplement of $2,500 per year to act a mentor/trainer.

- Adjuncts Only. Analyzes the use of eight adjunct instructors to deliver instruction. Each adjunct is responsible for 30 students producing a total of 240 high school credit hours over a two-semester period. In addition to teaching other course selections, two full-time instructors are assigned to the eight adjuncts to provide mentoring, training, and the necessary support to ensure quality instructional delivery is achieved. Since the students assigned to the full-time instructors are not measured in this scenario, only the expenses associated with the mentoring/training supplements is counted.

Summary

Staffing Method	**Students Enrolled**	**Per Student Cost**	**Per Credit Cost**
Full-Time Faculty	250	$381.16	$381.16
Full-Time Faculty with Adjuncts	245	$310.98	$310.98
Adjuncts Only	240	$224.30	$224.30

The table clearly indicates that greater use of adjunct instructors should allow FLVS to serve more students at a lower cost per credit. Although initial training and mentoring costs are greater in the two scenarios utilizing adjunct instructors, such costs are more than offset by the higher salary and overhead expenses incurred by a full-time only instructional model. Greater use of adjunct instructors also provides the benefit of greater flexibility in more quickly adding or reducing capacity. This is especially important given the rapid growth FLVS has experienced over the past three years.

Appendix A
Case Studies from the first TCM Project (2000)

Case 1: Eastern New Mexico University
The Cost of ITV

Case 2: Florida State University
An Analysis of Costs Related to Mentor Recruiting, Training, and Support for Student Cohorts in 2+2 Distance Learning Initiative Courses, Year 01

Case 3: Georgia Board of Regents
A Cost Analysis of the French Foreign Language Collaborative's Online WebCT Course

Case 4: Northwestern State University (Louisiana)
Comparison of the Costs Associated with Compressed Video, Internet, and Face-to-Face Instruction

Case 5: San Juan College (New Mexico)
Receive Site Costs are Real

Case 6: The University of Montana—Missoula
- Delivering an Undergraduate Course to a Local Community College
- Delivering a Course Online and On-Campus

Case 7: University of New Mexico
Indirect Costs of Technology-Based Instruction

Case 8: University of Utah—Utah Education Network
The Value of Access

Case 9: Utah State University—Logan
The Costs of Satellite, EdNet, Online, and Face-to-Face

Case 10: Valley State College
Comparing Course Costs Across Five Modalities

Case 11: Washington State Board for Community and Technical Colleges
An English Composition Course Delivered Four Ways: Face-to-Face, Telecourse, WAOL, and College-Delivered Online

Case 12: Washington State University
The Costs of Developing Courses and Teaching Online

Case 1: Eastern New Mexico University
The Cost of ITV

Context

Eastern New Mexico University, located in Portales, New Mexico with branch campuses in Roswell and Ruidoso, New Mexico, is a regionally accredited state institution and the third largest in the state of New Mexico. ENMU-Portales, (henceforth referred to as Eastern or ENMU) the campus that was used for this study, has a student population of approximately 3,600 students.

Given the widely distributed, relatively rural population Eastern serves, distance education is of considerable importance to the institution; so important, in fact, that it is specifically listed in the university's mission statement. Roughly one of every seven ENMU students is participating in classes is doing so via distance education. While the institution offers classes on-site in various communities and via the World Wide Web, the bulk of its distance education is done by way of Interactive Instructional Television (ITV). ENMU ITV courses are available in 17 different communities in Eastern New Mexico, spanning a distance of some 250 miles. Via distance education, ENMU offers over 135 upper division and graduate courses annually, leading to the completion of eight Bachelor's and Master's degrees.

Issue

The Interactive Instructional Television system operates under the authority of Eastern's Vice-President for Academic Affairs and functions with the cooperation of Extended Learning, the university Television Station, the College of Business, the College of Education and Technology, and the College of Liberal Arts and Sciences. The scheduling and rotation of each class is determined by the chair of the department and the dean of that college. Collectively, the deans collaborate to determine the final ITV schedule and to make use of the four ITV presentation rooms.

Eastern faculty are required by contract to teach ITV courses as needed, and many tools are placed at their disposal to help overcome the inherent difficulties involved with teaching at a distance. All ITV classes are taught live in regular campus classrooms that have been augmented (ITV presentation rooms) to include technologies necessary to broadcast the classes; on-campus students take the class simultaneously with distance learning students. (This made it difficult to determine the difference in cost between face-to-face and technology-delivered courses; each technologically delivered course has a face-to-face component involved.) Faculty have access in these presentation rooms to a playback VCR, Internet-equipped computer, "ELMO" document camera, a telestrator, and preview and actual broadcast monitors. Each of these classrooms has two small, remote-controlled cameras, one at the back of the classroom facing the faculty member and another at the front of the classroom facing the on-campus students. In addition to being broadcast to the remote sites, images from this equipment can be easily viewed by students in the classroom through large monitors.

The successful use of this technology requires a good deal of training and skill; and even with the best of both, the operation of this equipment can be a distraction to the actual teaching of the class. To alleviate this inevitable complication and leave the faculty member free to teach, student operators, primarily broadcast journalism majors who have been trained to operate the equipment, handle the "production" portion of the class. These individuals change the camera angles, camera shots, zoom, pan, and control the switching among the document camera, telestrator, computer, and TV cameras. Additionally, they are available to assist faculty with faxing of materials from the classroom and other administrative tasks.

Eastern has two different types of ITV receive sites: full-service, staffed received sites and unstaffed receive sites. A vast majority of the institution's distance learning students takes courses at full-service, staffed sites. Trained ITV facilitators staff each of these sites. These individuals supervise the individual site and assist faculty and students with the mechanics of taking the course (proctoring exams, faxing, duplicating, mailing, e-mailing, and busing of course material, tests and homework). Additionally, ITV facilitators provide an institutional presence in receive site communities; they assist with program marketing and student registration.

Students taking courses at these full-service sites participate with two-way audio, one-way video (i.e., students can see the professor and on-campus students, but not vice versa. However, students at remote sites can talk with faculty and students in the presentation room and at other sites.)

Eastern joined with Clovis Community College and Eastern New Mexico Rural Telephone Cooperative to bring education classes into rural Northeastern New Mexico. These sites are located in public school facilities and do not have ITV facilitators to assist with course mechanics. Hence, students taking courses at these unstaffed sites have to take responsibility for course mechanics. One advantage of the unstaffed sites is the use of two-way audio, two-way video so faculty and fellow students can see the students at the unstaffed sites.

Methodology

Information for the cost of these courses was determined by polling individuals involved with the program; each person was asked to estimate the annual percentage of their time that was spent working on ITV; this percentage was then multiplied against their actual annual salary (including benefits) for the 1999-2000 fiscal year. (Given that the institution's fiscal year ends on June 30, the salary expenditures for the remaining weeks until that date were estimated based on past earnings.) This figure was then divided by the number of ITV classes taught during the past year. The resulting amount was recorded as the annual cost of the class for that individual's time. These costs were then added and recorded in appropriate areas on the chart.

Non-personnel related costs, such as "Duplication of Materials" and "Travel" were obtained by actual recorded figures, and were divided by the number of ITV classes taught during the year. These costs were then added and recorded appropriately on the chart.

Summary

Several major difficulties were encountered in performing this costing study. As mentioned previously, it was difficult to accurately determine the cost associated with technology-delivered courses given that they are also taught on-campus in a face-to-face setting. Along the same lines, difficulty was encountered in determining whether the costs for face-to-face courses should be added incrementally to the technology-delivered courses, which in some cases, they were.

This pilot provides a good starting point for determining the costs of technology-based instruction. The study raised good questions and guided a thorough examination of the policies and practices of not only the distance education program but of the institution as well.

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Case 2: Florida State University
An Analysis of Costs Related to Mentor Recruiting, Training, and Support for Student Cohorts in 2+2 Distance Learning Initiative Courses, Year 01

Context

The Florida State University (FLS) has focused efforts on developing entire distance learning programs. President Sandy D'Alemberte visited the Open University of Great Britain (OU) in 1996 and was inspired by the school's 30 years of experience and success in serving distant students. The two institutions collaborated for a period of 2-3 years, each learning from the other. The major lessons brought to FSU from the OU were the value of team-developed courseware to enable asynchronous teaching and learning and the role of the tutor in providing student support. The team approach is designed to ensure that the user, the student, is considered in every decision about curriculum development and delivery. The tutor, or in FSU's case the mentor, provides an extension of the institution and a personal presence in a high tech, online delivery mode. The programs under development at FSU that were opened for enrollment in fall 1999 are the bachelor's degree completion programs in Information Studies, Computer Science, and Software Engineering. These are dubbed "2+2 Distance Learning Initiative" because students are all upper division, at least junior level, and partnership with Florida's community colleges provides a base of student support, advertising, and seamless entry into upper division. Florida's State University System and Community College System are articulated by legislation that provides for acceptance to any state university for a student who has earned the Florida Associate in Arts degree.

During the first year of program development, the Florida legislature allocated funds specifically for the initial development of the 2+2 Distance Learning Initiative courses. Subsequently, funding has been recurring to the university with allocations to the Office for Distributed and Distance Learning (ODDL) to support academic units in development and delivery of materials-based, mentor-supported courses and degrees. Not all of FSU's distances learning courses are part of the 2+2 DL Initiative. However, this report focuses only on these degree completion programs and, specifically, upon the mentor support aspect.

Course development for the first term of three courses began in 1997. In 1998, the position of Coordinator of Implementation was established. The function of the Coordinator was to develop relationships with community colleges, develop student support mechanisms that would be as much in line with existing processes on-campus as possible, and to develop the mentor profile along with mechanisms for recruiting, hiring, training, supporting, providing continuing education, and evaluating them. The latter process is what was analyzed and reported. The time period considered is the three terms for which courses have been offered, enrolled in, and supported by mentors. These terms are fall 1999, spring, and summer 2000.

A special feature of the courses developed, as part of the 2+2 Distance Learning Initiative is that courseware is developed for use, at the instructor’s discretion, along a continuum that begins with traditional face-to-face instruction to the other extreme of completely asynchronous delivery. All mentor-supported courses also have their on-campus, traditional offering. There are 18 community colleges with which FSU has partnership agreements that provide students with information, library services, and proctored secure testing. FSU pays the community college a fee, which is assessed to the student. So, there is variation in student tuition and fees depending on where that student is, on an FSU campus or supported at a distance. Following registration, the ODDL staff divides students into cohorts that are assigned to mentors who have been selected by teaching faculty and trained during a three-day Mentor Training Workshop held on the FSU campus. Lead faculty (faculty of record) can be assigned 8-10 mentors who can each handle student cohorts of 15-25.

Issue

The TCM project was intriguing because during the first year of the implementation of mentor support, staff was evaluating services, communications, student performance, etc. Getting a handle on costs was just another challenge. Participation in the TCM project has forced a careful look at this one aspect of the program. For the time being, our learning curve is so steep that looking carefully at this one, unique aspect of our model is quite challenging and a good beginning.

Methodology

Actual participation in the project took relatively little time, approximately 16-20 hours devoted to reading the handbook, discussing the project, identifying factors as exhaustively as possible, gathering data relevant to the factors, compiling and then analyzing them. The template was extremely helpful. It is important to remember that this is the first year of an innovative program and includes a total of only nine courses in two departments. These are Computer Science and Information Studies. The model of program development provides for a one to three course "roll out" per term. Therefore, it will take four years for all courses in any one program to be entirely developed.

Outcomes

What the data show for this first year is that sections supported by mentors generated 460 enrollments resulting in 1,498 Student Contact Hours (SCH). This translates to 37.5 FTE (Full Time Equivalents). During the past legislative session, all FTE generated by distance learning were funded by the legislature. This was unanticipated because Florida's institutions have enrollment caps. Using current figures, 37.5 FTE will result in approximately $170,000 in state funding. The entire cost of mentor support was found to be $117,600 ($256/student and $78/SCH). Mentor support cost was based on the cost of recruitment, training, travel to FSU for three days, the salary and benefits for a full-time Mentor Coordinator, materials developed for mentors, and their compensation per course per term. The FTE figure is stated conservatively and the expenses were recorded liberally. What this seems to indicate is that, given the scalability of the mentor-supported model, the costs are justified. We anticipate that enrollments will continue to increase, the numbers of trained and certified mentors will increase, and more courses are being offered each term. Mentor-supported courses resulted in a completion rate of 89 percent for the fall 1999 term and 86 percent for the spring 2000 term. These numbers are remarkably high for distance learning or any independent study model. Surveys of students and follow-up telephone interviews frequently highlight the value added of a mentor.

In Florida, students may fail a course and reenroll in it for a second try at regular tuition rates. The third enrollment is entirely at the student's expense with no state subsidy. This means that the legislature funds some courses twice for the same institution and/or same student. If the higher completion rates can indeed be attributed in part to mentor support, it is also a value to the state to encourage this practice.

Summary

An ongoing concern while working through the method was that this case study does not provide enough information to put it in perspective. The issues of scalability and FTE reimbursement are large in managerial decision-making. It is important to remember just how new this particular program is, which means that care must be taken by both supporters and detractors in analyzing its impacts. Studies such as this TCM project are extremely valuable in helping institutions that are plowing new ground to assess the results of this work. A series of questions in the template forced reflection on how different the results could be at a later date. The learning curve is extremely steep and we might assume that the depth and breadth of our learning on the impact and cost of mentor support would continue to grow for at least three years.

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Case 3: Georgia Board of Regents
A Cost Analysis of the French Foreign Language Collaborative's Online WebCT Course

Context

A decline in student enrollment in French language courses is affecting programs on a number of campuses within the University System of Georgia. While declines in enrollment within lower-level French courses are moderated by the fact that many Arts and Sciences programs of study require them, small programs must often cross-list upper and graduate level French courses. Thus, the decline in students and course offerings not only affects undergraduate programs, but also graduate programs and professional development programs for area teachers. One response to the ebbing enrollment is to decrease the number of upper level offerings. Doing this however, provides an additional hurdle to those studying language and for some students, can delay graduation. Another option—terminating programs—further restricts access to needed foreign language study, limits the variety of program offerings available to students at state universities, and ultimately compels more regional students to migrate to major universities offering full arrays of programs.

Issue

Four institutions—North Georgia College and State University, Valdosta State University, Georgia Southwestern University and Georgia College and State University—have taken a different approach by forming a French Foreign Language Collaborative. The focus of the collaborative is to enable regional state universities to share courses and scarce faculty expertise to make upper level French offerings available to all participating institutions on regular intervals. The foreign language initiative focuses on exploring ways in which technology can be employed to support the development and delivery of upper level and graduate French language courses among the collaborative members.

An initial online course, French Intermediate Grammar and Composition l has been created by a faculty team representing several institutions. A single faculty member has taught the course to students from the participating institutions. Plans are underway to establish more courses that may be developed and delivered in this collaborative approach.

Methodology

The report provides a cost analysis of the development and delivery of the WebCT on-line course, Intermediate French Grammar and Composition I, in comparison to the cost for delivering a traditional classroom Intermediate French course at four separate locations.

The cost analysis also used the French course as a unit of measure; therefore, the analysis did not deal with different course levels and disciplines. In addition, following the TCM Handbook guidelines which specify that only direct cost be utilized for course cost, the analysis did not include indirect cost in the following areas: instruction, academic support, student services, institutional support, plant operations and maintenance.

The French course is one of a number of courses that are supported by the Desktop Learning Project, a special funding initiative of the Board of Regents. The initiative is pioneering a comprehensive system approach to the development and delivery of quality online courses. The primary elements of the comprehensive approach center around three areas—course development, support services, and technology infrastructure.

Course development activities divide into two primary strategies—the production model and the facilitated support model. The production model is a team approach involving faculty experts, instructional designers, and programmers. In this model, the team works to design and produce the course. Funds are allocated to pay for faculty reassigned time, training of team members and programming of the course. The model adheres to standards for online teaching and technology. The System hosts and supports use of the course. This is the model that was used for the French course. The facilitated support model provides training regarding developing and delivering online courses, as well as course hosting and help desk support, but does not provide instructional designers or programming staff. Design and programming are the responsibility of the faculty member.

Support services are those services that must be addressed to ensure that the student who participates in the courses at a distance is provided with comparable services to the student who participates on campus. These include help desk support for students having difficulty getting into their course materials online, behind the scenes 7x24 technical support for the equipment and software, and coordinated access for specialized support such as test administration and book purchasing. The French course benefits from these services.

While many of the institutions provide faculty with access to course development tools, not all campuses provide an infrastructure accompanied by personnel support for a production environment. To ensure that institutions not able to meet technical standards regarding production services are still able to develop and deliver on-line courses, the System has established a course hosting option, which may be used for such services. The System infrastructure includes a WebCT server, a video server, and video production and archiving services. All have redundancy and back-up provisions in place. The French course is hosted on the System server.

All of the above elements depend upon the existing System supported telecommunications network called PeachNet. PeachNet facilitates sharing, exchange of data, and general access for all 34 institutions to one another and to the Internet.

WebCT French Course Costs

The total development and delivery cost for the WebCT French course is estimated to be $57,914. Development costs account for the lion's share of that, approximately $43,767. Included in that figure is $11,000 that The University System of Georgia specifically allocated for the development of the Web-based course by the Foreign Language Collaborative, $2,397 contributed by the participating institutions and another $30,370 expended by the Board of Regents through its Advanced Learning Technologies Unit. Based on discussions with the members of the collaborative, an estimated useful life of four years has been assigned to the WebCT French course. Therefore, one-fourth of the development cost, or $10,942, would be charged off each school year. The amortization charge for each semester would be $3,647, assuming the course is taught each semester of the twelve-month school year. For spring semester 2000, $3,647 was charged to the delivery cost of the WebCT French course.

Delivery costs for the Web-based French course for spring semester 2000 are calculated to be $14,147. Of this total, $7,956 was expended for personal services, $75 was expended for office and instructional supplies, $2,469 was expended for communication cost, and $3,647 was expended for the amortization of the courseware development cost. The communication cost of $2,469 was based on the use of the WebCT and video servers, maintenance cost of servers, personnel cost, license cost, and student help desk cost. The servers were estimated to have a useful life of three years for computing an annual cost. The annual communication cost was divided by the annual usage hours to arrive at the hourly rate charged to the course based on the hours of student course usage. It appears that for a cost of this nature, it would be best to divide the annual cost by the total users to arrive at an annual user cost for charging out based on usage during the year. Also included in the communication cost is the PeachNet cost, which was based on an annual cost divided by the number of users and then allocated out based on one-third cost for the semester. Facility space and computer lab equipment was not included in the course cost because the students did their class work away from the campuses.

Eighteen students registered to take the Web-based French course, which is a cost per student of $786 for three hours of semester credit. Only nine students completed the course; however, in computing the cost per student for comparison purposes, all eighteen students were used.

Traditional On-Campus French Course Costs
A cost schedule was created for traditional on-campus delivery of the French course to compare all costs associated with the two delivery methods. Developmental costs for the traditional course delivery were not computed in accordance with the TCM guidelines that suggest they should only be considered where specific funds are allocated for that purpose. The inclusion of developmental costs for traditional courses is an issue that should perhaps be reconsidered in the guidelines. The regular classroom French course was estimated to cost $9,377. Included in the cost was $1,135 for use of facilities and equipment.

Outcomes
The total cost of the traditional on-campus French course is estimated to be $4,770 less than that for the WebCT French course

Although the total cost of delivering the WebCT French Course is higher overall than the cost for traditional course delivery, the cost per student based upon actual enrollments is much less ($1,089 per student based on an enrollment of 18 students versus $1,875 per student based on five student enrollments.) This confirms the original goal of establishing the collaborative program since, clearly, if each institution were required to offer the traditional course rather than the WebCT course, overall costs to the University System as a whole would be greater.

The results as indicated above would be different depending upon overall enrollments and probably would not be applicable to institutions with more robust enrollment patterns for all courses. In other words, it may work in this specific example only because the participating institutions do not have large enrollments in French courses. If a single institution were faced with the costs for both delivery methods as indicated, they might determine it to be more advantageous to run a traditional course rather than develop a Web-based course.

Summary

Not showing development costs for traditional courses may be a flaw in the model. However, as mediated course delivery becomes more commonplace, developmental costs may become less significant as a factor.

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Case 4: Northwestern State University (Louisiana)
Comparison of the Costs Associated with Compressed Video, Internet, and Face-to-Face Instruction

Context

Northwestern State University, a member of the University of Louisiana System, serves the central and northwest portion of the State of Louisiana. Created in 1884 by State Legislative Act 1, as the Louisiana State Normal School, the institution became Louisiana State Normal College in 1921, and Northwestern State College of Louisiana in 1944. The school achieved university status in 1970 when the name became Northwestern State University of Louisiana.

The University's enrollment includes students from over 40 states and 20 foreign countries. Located in Natchitoches, the oldest settlement in the Louisiana Purchase Territory, the 916-acre campus is located 70 miles from Shreveport, Louisiana. Northwestern Sate University serves the central and northwest section of the state with a wide range of academic, cultural, and athletic programs that enhance the quality of life in the area and throughout the state and region.

Northwestern is accredited by the Southern Association of Colleges and Schools and offers a wide range of undergraduate and graduate programs through its six colleges and thirteen academic units.

Issue

Northwestern applied the Technology Costing Methodology to compare the costs associated with compressed video, Internet, and face-to-face instruction. Northwestern has been a leader in the electronic instruction arena, and by the spring of 2001, will provide nearly 100 electronic courses. With an increasing demand by students, it is understood that the use of electronic course delivery will continue to grow among the academic areas. The desire to provide cost-effective solutions to instruction that will enable Northwestern to meet student needs is the driving force behind the comparison. The primary players associated with the need to conduct the cost analysis are the students. The primary players associated with data collection include persons associated with electronic learning, telecommunications, systems administration, information systems, budget units, faculty, and university administration.

Methodology

The methodology selected was a holistic approach in which teams of individuals gathered data respective to their specific areas. The data that was collected reflected documented expenditures and estimated costs associated with the delivery of each electronic mode. Cost expenditure formulas were formulated in order to calculate costs per each course. The collection format was identified as being the best procedure to gather data that would best identify the expenditures and related costs associated with each delivery mode.

Outcomes

As anticipated prior to the collection of data expenditures, the costs related with the delivery of Internet courses exceeded the costs compared to the delivery of the compressed video format. This is attributed in part to the number of students allowed to enroll in each course. However, when compared to the face-to-face traditional method, the costs associated with the electronic modes are less than that of the selected traditional courses. Thus far, no decisions have been made to alter the delivery selections and methods by which electronic courses will be delivered. However, due to the increasing demand by students who learn at a distance, trends indicate the need to increase the number of courses and degree programs being delivered electronically primarily through the Internet. There has also been an increase in the number of courses being delivered by compressed video through Northwestern's local area network in an effort to meet the demands of the satellite campuses.

Summary

The Technology Costing Model has been effective in that Northwestern has been able to identify collection procedures that document the costs associated with each delivery mode. In addition, by analyzing the expenditures associated with electronic and face-to-face delivery of instruction, a baseline has been established that will be used for future cost comparisons.

The Technology Costing Model is beneficial in that it allows participants to gain perspective about the costs associated with the electronic delivery modes and when making comparisons to the face-to-face format. The formulas by which you make calculations are critical in order to ensure a successful cost analysis. A team approach is also suggested.

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Case 5: San Juan College (New Mexico) Receive Site Costs Are Real

Context

San Juan College (SJC), located in Farmington, New Mexico, is a comprehensive community college dedicated to providing quality learning opportunities for students and the community. Partnerships with four-year universities are critical in providing programs and courseware beyond the associate degree level. Historically, these courses were delivered to students with in the Four Corners region in a traditional mode, the instructor driving to Farmington to teach the course. Technology has now enhanced the delivery of field-based programs and courses are offered through satellite and video conferencing methodologies.

Issue

San Juan College will explore the costing of being a "receive site" for upper-level university courses being delivered by two-way interactive or video conferencing delivery methods. The decision to focus on two-way interactive/video conferencing over satellite delivered courses was due, mainly, to the increased popularity of these types of courses.

Student learners are demanding the delivery technology to be more interactive than the satellite video and telephone connection. Also, many faculty are more apt to teach with video conferencing technology since it mirrors face-to-face technology.

San Juan College's investment to the delivery of satellite courses was very minor and mainly centered on technical assistance and personal costs, rather than equipment. The sending university usually provides the equipment necessary for receiving the broadcast. In deciding to provide two-way interactive/video conferencing it was immediately obvious that the costs would include dedicated equipment and facilities space, along with associated telecommunication costs and technical support personnel.

Currently, San Juan College has a dedicated classroom for video conferencing. This room has undergone some remodeling to fix some sound proofing issues that would have been done whether the classroom would be for regular use or video conferencing. The new equipment purchased included:

Polycom View Station V.35 and TV from Vie Tech for approximately $13,000,
replaced equipment costing $30,000,
VCR at $450,
Document camera at $1,600,
Laptop computer at $2,300,
Yearly maintenance at $2,300,
Telecommunications costs include:
Switched TI at $2,000 per month,
One time installation cost of $1,000,
Line drivers at $1,000 to extend the TI to the video conference classroom,
Bridging services depending on the connection, averaging at $1,200 per year,

Associated long-distance telephone charges for scheduling and diagnostics that averages out to $1,000 per year.

What makes this more interesting is that with the recent state—wide MCI contract SJC has signed, most of these charges are being subsidized through MCI. They will be included as cost borne by others.

Even though end-user training is included on the cost of the equipment, our technicians have learned this basically through cooperative efforts with University of New Mexico, New Mexico Highlands, and New Mexico State University. Others are encouraged to plan for at least a three to five day technical training workshop from the manufactures of the equipment. These costs run $1,500 - $2,000 but are worth the expense, especially in time and continued happiness of technical support personnel.

Historically, each university requests a "site coordinator" from the receive site to handle the administration of the course. These duties usually include scheduling rooms, point of contact for students, and the repository of materials. With two-way interactive/video conferencing, the complexity of the responsibilities has grown tremendously with the addition of technical problems to the other duties. For SJC this has become a concern. The Media Services staff (the former AV folks) was designated as the site coordinators for two-way interactive/video conferencing. The thinking behind this was that we were not going to be offering as many classes and it would be good cross training since they were already responsible for satellite delivered courses. Quickly, it was realized that this was time intensive in dealing with students and the technical requirements. Any institution looking at video conferencing should designate at least a one-half time administration/technical/student services position up front.

Methodology

In many discussions surrounding our costing project, it was soon clear that the methodology to answer the educational and managerial questions being raised were going to be the deciding factor in how we approached our project. The handbook was of great help in defining what is a cost and how we would approach the data collection to determine the cost. Some confusion was experienced in deciding the process of tabulating by course, by semester, or year. Since we already "do" two-way interactive/video conferencing, the questions for us to answer are how much does it really cost per year and could we easily capture the data from our fiscal structure. Because we knew it was important for our institution to respond to our students needs, funds for equipment were just found. It was and is the technical support and monthly communications charges to sustain the initiative that has been our problem. We found that many of the charges were spread over various departments so it was hard for us at any point to say our commitment to two-way interactive/video conferencing has been x amount. Because of the reasons stated above, we have tabulated our data as year costs.

Based on above assumptions and the descriptions in the handbook, it was decided that our unit of analysis would be based on the delivery method as opposed to the course unit. From our experience, the costs associated with the alternative delivery method are costs of support and infrastructure. These are very real costs that an institution should be aware of when thinking about multiple delivery methods. Too often the costs associated with direct instruction are given greater emphasis when in reality the support costs are what can make or break a successful delivery experience.

Outcomes

We finally have a total cost of creating a two-way interactive/video conference room and ongoing costs of support have been defined. Going through the process allowed us to actually put cost numbers to specific functionality. A sidelight is that we have a greater appreciation for what goes on in a two-way interactive/video conference course and how dedicated students are. The data from other schools will allow us to make better and more informed decisions when it comes to expanding our scope of courses in a distance education arena.

Summary

The Handbook is very black and white when it comes to costs associated with direct Instruction (1.0) and those with Academic Support (4.0) and Student Services (5.0 and 5.9). What was interesting was that if the academic support issues were not addressed then direct instruction usually did not occur using technology. In other words, if the connect was not made correctly or if technical problems occurred then students at the receive site usually did not benefit from direct instruction. When this happens, secondary measures need to be implemented and that involves the support personnel who will contact the send institution, be the point of contact if a tape will be sent, and notify students when the tape will be in. It was found that we don't figure these hours into the cost equation very well.

The unused space question is very misleading in its results. It was decided to focus on the hours the room is typically scheduled for courses. Because the courses are usually completion courses for bachelor and master degrees many of the people who would attend are working people. The hours of capacity were figured from 5:00 to 10:00 p.m. Monday through Thursday. The two-way interactive/video conference room is used for meetings, interviews, seminars, training, and also community business use the other hours.

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Case 6: **The University of Montana--Missoula**
Delivering an Undergraduate Course to a Local Community College
Delivering a Course Online and On-Campus

Context

The University of Montana-Missoula is a comprehensive university offering both undergraduate and graduate programs. For the past several years, off-campus students have been provided access to field-based and/or online programs at both undergraduate and graduate levels through the Center for Continuing Education working in close collaboration with the academic units. These programs initially were self-supporting, however, in the fall of 1998, they were converted to state support. This conversion stabilized programs, lowered student tuition, and provided institutional commitment.

Following is a list of these programs:

Masters of Education in Educational Leadership (online delivery)
Masters of Curriculum Studies (Compressed interactive video, online and face-to-face delivery)
Masters of Business Administration (Compressed interactive video, online and face-to-face delivery)
MBA Pre-requisite Foundation Courses (online delivery)
External Pharm D (online delivery)
Bachelor of Arts in Liberal Studies (Compressed interactive video, online and face-to-face delivery)
Library Media Endorsement (online delivery)
Certificate Program for Educators: Computers in the Classroom (online delivery)
GIS Certificate Program (online delivery)
Wilderness Management Distance Education Certificate Program (online and Correspondence delivery)

Off-campus programs at The University of Montana are administered jointly between the academic departments and Continuing Education. In the fall of 1998, all off-campus degree programs were converted from self-support to state-support, thereby becoming FTE-generating.

The External Degree Programs are funded through two budgets: a state-appropriated budget pays for instructional and coordination salaries as well as some general operational expenses, and a designated budget, which is funded through Distributed Learning Fees charged per credit, pays for all associated costs.

Because the budget that covers the distributed learning expenses is not actually saving $15/Student Credit Hour for the courses not delivered on campus, this budget will never have a projected positive balance.

Issue

Two projects were selected to which to apply the Technology Costing Methodology: C&I 480 *Collection Development, the Curriculum and Technology* which is part of the Library Media

Endorsement program; and ENLT 320, *Shakespeare*, which is part of the BA in Liberal Studies program.

In regards to the history, overview, major players and other contexts relating to C & I 480, the following information is being submitted:

C&I 480, *Collection Development, the Curriculum, and Technology*, was converted to an Internet-based format in Fall 1999 as the first phase of moving the entire Library Media Endorsement Program to online delivery. eCollege, the company hosting UM's portal for Internet courses through umtonline, provided the software for the course. Faculty in the School of Education collaborated with staff at Continuing Education and at eCollege to place the course online.

Course development:
The course instructor worked with eCollege staff to develop the course content. eCollege was paid $3,000 for development costs. Continuing Education provided the funds for development from a state-appropriated budget, then staffed and funded all outreach efforts through a combination of state and self-support funds.

Course logistics:
Continuing Education staff assisted students with admissions, registration, and payment processes. Students had online access to the university bookstore and library. eCollege provided technical support. The instructor was responsible for all academic components of course delivery.

Course funding:
Students paid tuition plus a distributed learning fee. A portion of the distributed learning fee was used to pay eCollege's $40/credit/student fee. The remainder of the fee went to Continuing Education's umtonline account to cover staff time and resources (portal fee of $25/student). Staff was also paid for their time on the course through a state-appropriated account. The instructor taught the course as part of load.

In regards to the history, overview, major players and other contexts relating to ENLT 320, the following information is being submitted:

ENLT 320, *Shakespeare,* was taught at Flathead Valley Community College (FVCC) in Kalispell, MT as part of the BA in Liberal Studies. Students complete Lower Division courses through FVCC and earn UM credit for Upper Division courses taught on the FVCC campus.

This jointly-administered program is funded entirely by UM. FVCC provides classrooms, library services, and a staff person to serve as an adviser and liaison between students and UM; all of these services are paid for by UM, with funds generated from the courses' distributed learning fees. Faculty and Continuing Education staff is paid through a state-appropriated account.

Courses are taught in the evenings and on weekends, either by FVCC instructors or UM faculty who drive to Kalispell (115 miles one-way). The Liberal Studies department is responsible for hiring and supervising faculty and for more advanced advising issues. The "single point of contact" staff member at FVCC is responsible for advising prospective and enrolled students on academic and administrative issues (assisting them with planning their courses, sorting out transfer credits, obtaining financial aid, paying bills on time, etc.). Continuing Education staff has administrative duties such as paying faculty, maintaining budgets, managing course logistics, promoting the program, and assisting with difficult student issues.

Methodology
For both programs, data were calculated by individual course.

Outcomes
The data indicate that for C&I 480 the online course costs $100 more per credit hour than the on-campus course. For the course ENLT 320, the data indicate that the course at FVCC costs nearly six times as much as an on-campus course.

Summary
This method of analysis was not particularly useful to us in analyzing the cost-effectiveness of our off-campus courses because it did not factor in two things: (1) how much revenue is generated by the off-campus enrollments (while expensive, these courses still generate funds for the university); and (2) the educational access these courses provide to students in remote locations. Continuing Education's mission, as well as the mission of the university, is to provide education to Montanans—these courses are for those students who would otherwise be beyond our reach.

It may be more cost-effective to deliver one course to 1,000 students in a massive lecture hall, but that is not in keeping with the spirit of the institution. As long as we maintain a balanced budget, we want to deliver the highest quality of education possible to as wide-ranging an audience as possible.

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Case 7: **University of New Mexico**
Indirect Costs of Technology-Based Instruction

Context

The University of New Mexico (UNM) is the largest institution of higher education in the state, with total enrollments exceeding 30,000 students. In addition to the main campus in Albuquerque, UNM includes a health science center, four branch campuses, and two graduate centers. Each year, UNM delivers several thousand credit hours by technological means, including instructional television (satellite, ITFS, and cable), video-conferences, and most recently, Web-based courses.

Problem Description

At UNM, we have delivered courses by instructional television (ITV) for many years, and we have considerable experience analyzing the direct costs of this particular mode of delivery. Although we have less experience with videoconference and Web courses because of their recency, we do not regard analysis of the direct costs of these technologies to be particularly problematic once the critical assumptions are specified. (More discussion of the importance of assumptions is included below.) What we do regard as problematic is analysis of the *indirect* costs of delivering instruction by technological means. Such indirect costs include the costs of student services, library, administration, and equipment and other physical facilities. Unfortunately, the indirect costs of technology-based instruction are given only cursory treatment in the TCM Handbook.

Outcomes

After a fair amount of discussion of the purposes of the TCM and our own experiences to date, we decided not to crunch numbers as part of this project. We believe that a critique of the TCM based on our long experience here at UNM will be a more significant contribution to the project than going through another exercise in direct cost calculation.

Summary

Based on our experience, the TCM Handbook is a good general discussion of direct cost components at the course and delivery mode levels. There is also useful discussion of facilities and equipment cost procedures, as well as an introduction to inter-institutional exchanges of cost data.

We have several suggestions for improvement:

The TCM Handbook does not adequately address the economics of cost, which are more complex than some would-be cost analysts recognize. Perhaps an entire section of the document should be devoted to a discussion of various types of costs, such as direct/indirect, fixed/variable, average/marginal, current/amortized, and incurred/contributed. This section would expand on the useful discussion of the Jewett model. Such a discussion of cost could then be referred to elsewhere in the document as needed to make specific points.

The critically important role of key variables and assumptions is not emphasized in the TCM handbook. The costs of courses delivered by technological means will vary enormously depending on the particular technology used, the rank and compensation of the instructor, and the types of costs included in the analysis. In the case of instructional television, for example, the costs of delivering a course depend heavily on whether it is delivered by satellite, ITFS, or cable. Such key variables have to be made explicit for meaningful comparisons to be made, especially across institutions.

A key variable worthy of special mention is scale. Since some costs are fixed and some variable, the total and per student costs of a course or delivery method will depend heavily on the number of courses offered and the number of students served.

Our experience is that knowledgeable people can be asked how much a specific thing costs and then come up with radically different answers because they include different kinds of costs, make different assumptions about key variables, and employ different allocation methodologies. For comparisons of costs across institutions, use of a common, precisely defined model is essential to achieve valid comparisons. As it is, the TCM Handbook is simply too general to be regarded as such a model. As a practical matter, therefore, the Handbook will be much more useful when it contains detailed models and examples of cost analyses utilizing those models.

As stated above, the TCM Handbook (draft version, August 1999) touches only lightly on the subject of indirect costs. This is unfortunate since, in the words of the handbook itself (page 20), "...many of the costs incurred in service to students are not direct costs of instruction (they are costs of associated support functions)." While we agree with the handbook that measurement of indirect costs is difficult, we regard this as the most important cost issue facing technology-based instruction. It is particularly important to UNM because the New Mexico state funding formula currently does not provide funding for indirect costs of student credit hours delivered outside the boundaries of our campuses, and many—but not all—of these "extended services" credit hours are delivered by technological means.

Three examples will help illustrate some of the issues surrounding the indirect costs of technology-based instruction:

Library resources. Frankly, this subject has been given inadequate attention in the past, but if we are to create and maintain quality technology-based programs, it must be addressed sooner rather than later. The "electronic library" may be the solution, but the costs are great, and traditional libraries will be the norm for years to come.

Student services. Distant students may not use the union building or student health service, but they do present a number of challenges if they are to be served effectively. New approaches to admissions, financial aid, advisement, registration, and tuition payment all must be developed and maintained. The up-front and ongoing costs of providing specialized services to distant students are substantial.

Facilities. Distant students do not require the same kinds of "bricks and mortar" expenditures as on-campus students, but they do require facilities of one kind or another on both the send and receive ends of the instruction. ITV and videoconference facilities are quite expensive to set up and maintain, and the costs of the computer infrastructure needed to support Web-based courses are also substantial. Moreover, depending on the technology, some of the costs of facilities may reside outside the institution delivering the instruction, thereby creating the need in some cases for third-party compensation for facilities use.

For TCM to realize its full potential, it must address the issues surrounding indirect cost. Perhaps the most effective way to do this would be to commission several institutions each to study a particular element of indirect cost in depth. The resulting studies could then be used to establish rules-of-thumb regarding the indirect costs of technology-based instruction.

In its current form, the TCM Handbook is a great start in addressing a very important and timely subject. We believe that further development of the Handbook will be a major contribution to technology-based higher education.

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Case 8: University of Utah – Utah Education Network
The Value of Access

Summary

The Utah Education Network (Network) appreciates the opportunity to have been invited to participate in the WCET Technology Costing Methodology Project. We believe that an attempt to clarify and to standardize, at least to some degree, a method by which the costs of using technology in support of the educational process has real merit and can be of enormous value in the challenging decision-making process of how, when, and to what level it is justified to expend precious and limited resources.

We understand that the inclusion of the Network in the pilot was premised upon the fact that we are the major provider of inter-campus telecommunications services for all of the institutions of higher education in Utah; and thereby, represent a significant portion of the costs associated with providing distance education opportunities to students throughout the state. We also appreciate the fact that the process was also part of the pilot and that it would be refined as experience during the test indicated.

The purpose of this document is to chronicle our experience with the model and the process as it evolved.

One of the challenges that we faced, was that, as the process evolved, the Network's role became more clearly defined in the area of "costs borne by entities outside the university or system office." It became evident that the Network did not fit directly (or even indirectly) into the model as defined. However, we did an evaluation of the kinds of information that might be successfully obtained about how the Network supports higher education's distance education efforts and identified a set of conditions that complicated our ability to utilize any part of the model to determine how costs might be appropriately allocated. The set of conditions include the following:

Since the Network supports both public (760 schools) and higher education (nine institutions which generally act as hubs for the public education traffic), it is problematic to define the appropriate traffic volumes related to higher education versus public education.
Both administrative and instructional traffic traverse the network, it is therefore, virtually impossible (without enormous manual reconstruction) to assign relative or prorated costs of administrative versus instruction traffic.
Many courses are provided to high school students, but who are taking courses for which they will earn college/university credit. These "concurrent" enrollment classes further blur the line between public and higher education regarding how costs for support/facilitative technologies should be allocated.

We again recognize that these issues may be, if not unique, very unusual and that it would be virtually impossible for any model to anticipate every possible variable. However, in Utah, the conditions under which we operate provide enormous benefit to both public and higher education simply because we have a cooperative/shared network that allows the significant synergy derived from this arrangement to benefit both systems.

The point is that the model seems more focus upon fairly discreet systems and may not have adequate depth and breadth to permit an "easy fit," especially for the circumstances under which we at the Utah Education Network operate.

Our evaluation is that the model, which attempts to carefully identify and describe the costs associated with distance learning courses, is an excellent starting point in the very difficult arena of providing decision-makers with the information necessary to make the best and informed decisions possible. However, it is also a concern that the stated outcomes of measuring cost savings and providing policy makers with reliable and valid data to judge the value of financial investments in technology may be too focused on the "costs" and not adequately representative of the "value" component.

In Utah, for example, most distance education classes are primarily based upon access. In many (if not most) of the instances where distance education classes are provided, they are for students who are not able to take a class in any other way. Simply stated, if they are not able to take the class in a distance (or online) environment, they would not be able to take the class at all, or would be significantly delayed as they waited for another opportunity to attempt to get into an on-campus class.

Traditionally, in Utah, educational technology has been implemented so that students would not be disadvantaged because of their geographic location or the inability of an institution to directly service their needs in traditional classroom settings. It is our recommendation that the model be expanded to more completely address the value of access. The challenge is that decision-makers often rely on the results of models to make, what they hope to be, informed decisions. If the model lacks a very key element, then there is a high likelihood that the decision may be flawed.

We hope that this critique will not be viewed so much as a criticism, but as a plea to enhance the model's value to decision-makers by including the major criteria for utilizing technology in offering distance or online education

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Case 9: Utah State University--Logan
The Costs of Satellite, EdNet, Online, and Face-to-Face

Context

Utah State University is a Research I four-year, state university founded in 1888 on a 400-acre site overlooking Logan in Cache Valley, northern Utah. More than 20,000 students are enrolled on campus or at education centers throughout the state. About 76 percent of students are working on undergraduate degrees. Typically, some 80 countries and every state in the nation are represented in the student body.

As the state's only land-grant university, USU supports the research and dissemination efforts of Extension agents and specialists in every county. USU has an active distance education component; some 450 distance-learning students received degrees in 2000.

Distance education at Utah State University (USU) traces its beginnings to 1911 when correspondence study, or independent study, was organized to serve the needs of off-campus students. The curriculum was composed of several agricultural courses and a variety of general education courses. Students could enroll in these courses for the modest sum of $2. Textbooks were extra and nearly doubled the cost of taking a course! Enrollments were small when this program started, but in only a few short years hundreds of students in rural Utah and some of the surrounding states were taking advantage of correspondence courses.

From these humble beginnings, USU has emerged as a leader in distance education and has gained an international reputation.

USU currently offers 45 degrees and credit programs to over 10,000 students at a distance. Six master and four bachelor degree programs are delivered electronically over Satellite/EdNet technology and a master's in technical writing is entirely Web-based. The electronic courses and degree programs are delivered to more than 3,750 students in 120 classrooms at 57 different sites each semester. The 57 Utah sites include all USU County Extension offices and Continuing Education centers, six higher education institutions, five high schools, and four correctional institutions. Additionally, increasing numbers of students are venturing onto the World Wide Web to pursue college credits and degrees.

Student services are an essential component of all USU distance education programs. Utilizing the Logan campus Student Services and academic department resources, the various Continuing Education centers and county Extension offices provide nontraditional students assistance in admission, registration, advising, and all other support services required in order to complete their education programs. Much of the success of USU's distance education programs can be attributed to the highly effective infrastructure and the academic support services it provides.

Issue
Growing competition in the field of distance education and scarce faculty resources have encouraged USU Continuing Education Administration to investigate and accurately quantify costs associated with several different distance learning delivery methods. The analysis undertaken by USU was designed to provide these accurate figures for the differing technologies on an intra-university cost level. From the information generated, several decision-making benefits will arise:

Assistance in the allocation of future resources,
Assistance in determining the optimal delivery method per differing situations,
Direction in future accounting measures,
Direction in future program development and marketing approaches,
Assistance to USU in evaluating the technologies used in delivering distance courses to students.

Methodology
The study undertaken by USU was designed to specifically fit the needs of Distance Education Administrators at the University and the requirements of the *Technology Costing Methodology (TCM) Handbook.*

In accordance with the *Technology Costing Methodology Handbook: Preliminary Draft (February 2000)*, USU selected the Alternative Unit of Analysis for this study. Instead of using the course as the unit of analysis, the method of delivery is being used as the unit of analysis. Four delivery methods were directly evaluated:

Satellite – One-way video, two-way audio
EdNet – Two-way video, two-way audio
Online – Web-CT Operating System
Live – Face-to-face instruction

USU deviated from using the course as the focus of analysis for several reasons:

Existing models and information lent themselves to the Alternative Unit of Analysis method.
Accounting structure allowed for straightforward access to most of the data needed to complete the cost information.
Desire of Distance Education Administrators to have information formatted according to the Alternative Unit of Analysis method.

Our efforts focused on collecting all material costs associated with Satellite, EdNet, and Live costs over the course of the 1998-1999 fiscal year (July 1, 1998–June 30, 1999), and online costs for the 1999-2000 fiscal year (July 1, 1999–June 30, 2000). Additionally, total Student Credit Hour (SCH) completed during the same time period was collected. This allowed us to determine costs per SCH for each delivery method. This specific information was of particular interest to Continuing Education Administrators at USU. The findings allowed for cost comparison between differing delivery methods.

To show the complete cost of delivering an SCH via the technology studied, contributions from outside entities were determined. The calculation of these additional costs borne by other entities show the total cost of delivery, which will be of important to USU as well as other institutions of higher education.

All other information generated by USU has been in an effort to conform to the TCM Model. While USU has deviated from the fundamental framework given in *the* TCM Handbook, we nonetheless find our information to fit comfortably in the framework. The method we have used has served our needs and in turn we anticipate will meet the needs of the greater study.

Outcomes
Our greatest interest was in determining the costs that directly affect us. Consequently, we were primarily concerned with institutional costs. As a result, the majority of research time was spent breaking these costs down. Costs borne by other entities were determined by a recent cost study completed by the Utah State Board of Regents. The following table highlights USU's results. A more thorough description of our study can be found in the *USU Technology Costing Model: 2000 Template*.

Cost Expenditures (per SCH)	Satellite	EdNet	Online	Live
Institutional Cost	137.85	138.28	163.38	137.51
Total Cost Borne by Other Entities	66.22	108.67	--	--
Total Cost	$204.07	$246.95	$163.38	$137.51

Significance of Findings
On the surface it would appear that the online course/degree approach is most cost effective. However, the following items demand consideration:

A 1999 survey of USU's distance students indicated that online technology was the least desirable method of receiving instruction.
The Cost Borne by Other Entities was not added to our online delivery because online development has been borne by the faculty. Faculty may continue to absorb the cost of development if they use the same courseware for their traditional on-campus courses.
A 2000 USU faculty survey indicated that instructors used some form of Web use in 1,345 courses. This would indicate that the acceptance of online courseware would improve over time.
The cost per SCH for live instruction is low because we won't allow a course to be taught with low enrollment. However, if every course that is taught over the satellite or EdNet system were also taught live the SCH cost would be six times as great.
Electronic distance education's greatest virtue is access. By far, the majority of the courses taught through this media could not be taught face-to-face due to low enrollment at each of the sites. The average number of students per site is less than seven.

The study did not analyze level of instruction and degree verses course delivery. Since the income is greater in graduate programs than for undergraduate programs it would be possible to use more costly delivery systems for those graduate programs.

The cost study will now allow the University to more fully analyze the mix of technologies. It could be that the satellite/EdNet delivery could be cut by two-thirds and increase the online instruction by the same percentage. This would allow more programs to be delivered while decreasing costs.

However, it has recently been noted that computer laboratories on the USU Logan campus and several centers and branch campuses throughout Utah are seeing a substantial increase in use by students enrolled in online courses; this is problematic for the following reasons:

Computer laboratories have been generally developed to serve short-term needs for all course work. This development ties up computer equipment and networks for large amounts of time for single courses.

Universities do not have enough computer laboratories or network capacity to serve the added online needs.

The cost of overall instruction could increase substantially if overall enrollment does not increase. The problem will be smaller face-to-face courses and larger numbers of students enrolling in Web-based courses, the net result being more instruction costs for the same number of students.

Some faculty indicate that more time is spent per SCH through Web based instruction than through traditional classroom instruction.

Higher education must reassess the need for substantial increases in computer technology and Internet and systems capacity. It may be that all classrooms of the future will have computers at each seat.

How do institutions of higher education pay for the added technology costs? Perhaps face-to-face instruction particularly for larger classes will always be the most efficient.

Summary

The methodology assisted us in several ways. The following list delineates several benefits that were of value to us. This is likely not an all-inclusive list, but nonetheless highlights the key benefits we experienced.

The methodology provided a framework that enabled us to get information on paper in a useful and organized manner. Much of the information in our study has been available to us for some time. However, the use of that information has been limited because of accessibility issues. By using this methodology, we were able to get the information organized and placed into a useful and accessible format.

Flexibility. We approached the problem differently than what the Handbook called for and what other participating universities did. However, our information still fit into the Handbook's models (for the most part). This is a useful feature because it will allow universities to easily insert information that is tailored to what they have been doing without expending great amounts of effort to change their information to conform to the requirements of the Handbook. Additionally, it is anticipated that this same feature will make comparability between current and future participating universities a much easier thing.

Closely related to the issue of flexibility, is the managerial utility this provides to Distance Education Administrators at USU. We approached the study our own way to provide certain information that we felt was pertinent and needed by USU. The level of flexibility associated with this project enabled us to tailor the study to meet our needs and hopefully the needs of others viewing our findings.

The process of evaluating costs and placing them in a useful format is a worthwhile venture. It is a time consuming process, but yields valuable information. The process experienced at Utah State leads us to suggest a few things that might be of benefit to other institutions that implement the TCM Handbook.

Make wise use of program directors. There undoubtedly will be some confusion when undertaking a project like this. Program directors can provide valuable clarification and positive affirmation that what is being undertaken doing will work and be beneficial.

Invest ample time in this project. It will not only benefit you, but others.

Adjust the Handbook if necessary. While it is imperative that the study conforms in general to the framework established in the Handbook, it also is wise to tailor the undertaking to fit your needs and provide the utility that you seek.

These are only a handful of ideas. The most imperative points to realize are, first, a grasp on your costs will only help your institution in the future. And, second, the costs of other institutions will help you understand your position and costs better. The TCM Project will assist on both points.

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Case 10: Utah Valley State College
Comparing Course Costs Across Five Modalities

Context

Utah Valley State College is a state college comprised of two interdependent divisions. The lower division embraces and preserves the philosophy and mission of a comprehensive community, while the upper division consists of programs leading to baccalaureate degrees in areas of high community demand and interest.

Utah Valley State College is dedicated to providing a broad range of quality academic, vocational, technical, cultural, and social opportunities and experiences designed to encourage and assist students in attaining their goals and realizing their talents and potential, personally and professionally. The institution is committed to meeting student and community lower division and upper division needs for occupational training; providing developmental, general and transfer education; meeting the needs for continuing education for personal enrichment and career enhancement; and providing diverse social, cultural, and international opportunities, and student support services.

UVSC is the fastest growing college or university in Utah. The institution has 300 full-time faculty. The total headcount for enrollment for fall 1999 was 20,062. Total FTE enrollment was 12,770. Enrollment has increased 8-10 percent per year in recent years. Over 70 percent of the students come from Utah County, over 90 percent come from the state of Utah, 7 percent come from other states in the U.S., and approximately 2 percent come from other countries. The mean age of students is 21.7. The institution operates 1 million square feet of open space in 20 buildings on its campus.

UVSC has a 15-year history of offering courses via distance learning and technology based courses.

<u>Live Interactive</u>. The institution has offered live interactive courses for fifteen years. These courses are two-way video, two-way audio originating from a technology classroom on campus and broadcast via microwave or fiber optic cable to as many as 23 simultaneous sites throughout the state. Fall 1999, the institution conducted 13 interactive courses involving 1,100 students. UVSC provides a proctor at each receive site. Each instructor communicates with students via facsimile, Web-based materials, and e-mail. Faculty compensation for an interactive class is usually load plus overload. The course is taught face-to-face to a group of students in a multimedia classroom. That group of students is the load assignment. Faculty receive an additional per-head dollar amount for each student in remote sites. Other personal costs include a campus technician and proctors at remote sites. The largest cost for interactive courses is the investment in equipment and lease fees for fiber and microwave. These costs are shared by the institution offering the class and the statewide Utah Education Network.

<u>Television</u>. UVSC has offered courses on broadcast television for the past 10 years. Taped in an on-campus television studio, these courses are re-broadcast successive semesters on one of Utah's public television open access channels. Eleven television courses were offered fall 1999, reaching 520 students. Television courses are supplemented with a Web site, student chat

sessions, and e-mail. Faculty compensation for a broadcast course is entirely overload, based on a per-head dollar amount. Course development costs include studio time and equipment, studio staff, and development stipends for faculty. Another large cost is some percentage of the costs to the Utah education Network for staffing, development, and operation of the public television station.

Internet. UVSC is in its third year of Web-based Internet courses. Fall 1999, 24 separate Internet courses were offered to 535 students. Much of the development effort for these courses is done in a campus faculty resource center called the Multimedia Creations. Faculty compensation for Internet courses is a per-head dollar amount of overload. Development costs include a course design team and some software and equipment costs. The costs to put the course one the Web are not large.

CD ROM Software. UVSC is completing its fourth semester of offering mathematics and English courses using commercial propriety software from a company called Academic Systems. These courses are taught in computer classrooms, with much of the content, drill, and practice occurring on the personal computer. These courses are primarily taught as load. Extra costs to the College include the costs of a computer classroom and stipend amounts for faculty training. There are no costs outside the institution.

Methodology

For purposes of the TCM study, UVSC selected six courses that were taught spring 2000 in a traditional classroom setting in at least two of the four other modalities. The study compares similar costs across the five modalities.

Outcomes

The method of delivery that had the lowest cost per SCH was the traditional classroom. This occurred in part because it was not possible to include a cost per classroom other than annual operating and maintenance costs. If brick-and-mortar replacement costs were included, these costs would conceivably be much higher. Traditional classroom delivery lacked three costs which occurred in the four types of technology-delivered courses—higher faculty costs, course development costs, and costs of specialized equipment.

Costs per Student Credit Hour (SCH) were quite low for Web-based Internet-delivery courses. No classroom costs occurred, and there was very little in terms of specialized equipment needed to deliver the course.

Courses delivered over broadcast television was costly because of course development costs and higher incentive-based faculty costs.

Courses that were interactive or delivered using proprietary CD-ROM software were costly because not only was a classroom utilized, but also a special classroom was required. Interactive classes utilized a statewide network, which also added fixed costs.

Summary

It is apparent to this investigator that UVSC has offered courses via technology without the cost of delivery as a decision variable. UVSC intended to expand access, to improve instruction, and experiment with technology, but with little consideration for relative costs. This pilot study may help the UVSC evaluate its course delivery efforts, viewed in terms of cost delivery.

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Case 11: Washington State Board for Community and Technical Colleges An English Composition Course Delivered Four Ways: Face-to-Face, Telecourse, WAOL, and College-Delivered Online

Context

For more than 20 years, Washington Community and Technical Colleges (CTC) have been using video and telecommunications technology to deliver courses at a distance. Within the past five years, colleges have been using the Internet for content delivery and interactivity. During Fall Quarter 1999, enrollments in online courses surpassed telecourse (pre-recorded video) FTEs.

The state's 34 CTCs have joined together as the Washington Online (WAOL) consortium. Faculty from across the system have cooperatively developed 20 online courses that transfer to the state's four-year colleges within an Associate Degree. Starting fall 1998, colleges have been pooling WAOL enrollments such that one class section will contain students from many colleges. Students enroll through their home college. The home college retains the FTE credit and tuition revenue. The college that teaches the course is reimbursed at $40 per credit by students' home colleges. During fall 1999, WAOL enrollments accounted for 23 percent of all online enrollments in the CTC system. The remainder of the online enrollments was in locally owned and delivered courses.

Issue

The TCM Handbook was used to compare costs based on four modes of delivery—face-to-face, telecourse, WAOL, and college-delivered online. To manage the scope of this pilot project, comparisons were limited to Fall Quarter 1999 English composition courses offered by colleges in the Spokane district.

Methodology

Two focus groups were formed, one to provide information about Instruction and the other with expertise in Student Services. Participants were invited based upon their firsthand knowledge of expenditures in their area, as determined by financial officers at the Spokane district. They received written materials before their focus group meeting. The materials described the TCM project, the model, the information requested, and the methodology.

Within each activity area, participants received four sets of spreadsheets that represented each of the delivery modes. The Instruction group had two sets of spreadsheets for the activity areas of Instruction and Academic Support. The Student Services group also had two sets of spreadsheets for Student Services and Student Access Services. During the focus group meetings, the spreadsheets were projected on a large screen and completed based upon the information provided.

On March 23 at Spokane Falls Community College, the Instruction Focus Group met in the morning, and the Student Services group met in the afternoon. Both focus groups were also attended by the Vice President for Financial Affairs of the Spokane District, the Managing Director of WAOL, the Chief Budget Analyst at the State Board for Community and Technical Colleges (SBCTC), and the Director of Distance Learning at the SBCTC. The focus groups were audio recorded and subsequently transcribed for analysis.

This methodology was selected because it would bring those with direct knowledge about costs together at one time, making the collection of data efficient. The focus group format was also selected to provide a forum by which to draw out forgotten or hidden costs during the course of discussion.

Outcomes

The methodology itself, the act of unbundling costs within activities, helped participants think about evaluating distance learning in new ways. It helped to consider how the costs of specific activities could be mediated through additional collaborations across institutions, by expanding collaborative course development and pooled enrollments. It also is helping us consider efficiencies in combining student support services, by activity, for all CTC distance learners.

By evaluating multiple modes of delivery, focus group participants were provided real-time comparisons of how they were spending their money. Within the Instruction focus group, participants discovered that telecourses represented the best value for their instructional dollar.

Having two focus groups, one for Instruction and the other for Student Services, it provided the organizers the opportunity to compare their assumptions and perceptions of each group. Whereas the Instructional focus group could detail their time and effort and its related costs, the Student Services group tended to consider it all in the course of their "regular work." Similarly, the Instruction group could identify related compensation, or lack thereof, yet the Student Services group did not identify increased compensation related to the delivery of services at a distance. Furthermore, the Student Services group considered distance services really "no different" than face-to-face services.

Although the focus group method did give the participants permission to fully discuss and discover the costs of distance learning, it was difficult to keep them on task. This was especially true of the Instruction group. It became apparent that we provided a much needed forum for the participants to express their frustration at being under-funded and unacknowledged. If this method were to be used again, scheduling a series of focus groups, to both allow for the emotional venting, as well as to collect the required information. As it turned out, three hours did not provide sufficient time to collect all the information needed.

In the morning session, we only had one faculty member. Alone, she was not able to provide sufficient information. More faculty input is needed. Also, by comparing four modes of delivery, we found that many of the discrete unbundled costs were the same. This resulted in a lot of repetitive data collection. Learning from the morning session we changed our collection strategy for the afternoon Student Services group, to "tell us what is different in this mode of delivery from face-to-face."

For the most part, the members of the focus groups were participating as a favor to the VP of Finance. They lacked a personal or professional interest in the outcomes of the groups.

Summary
When using this methodology, keep the scope manageable and use it to provide information that you really want to know. Make sure that you enlist those with firsthand knowledge of costs. For those who participate, make sure they see how this analysis will benefit them directly. When decision-makers use the cost analyses that result from this methodology, they should use it as one piece of information in context with the mission and policies that govern the educational enterprise, including a commitment to quality learning environments.

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Case 12: Washington State University
The Costs of Developing Courses and Teaching Online

Context

The Center for Teaching, Learning & Technology and the Extended Degree Program at Washington State University (WSU) collaborated to use the Technology Costing Methodology (TCM) to analyze and improve WSU's pilot Program Development Process. The Program Development Process was used to develop 10 courses for the fall 1999 semester. All or some of the students in each of the 10 courses were distance learners. All courses relied on technologies for student access. All courses were developed for first time delivery, so the process and courses were prototypes.

The TCM costing process complemented the Center for Teaching, Learning, and Technology's previous cost assessments using the Flashlight Cost Model. The addition of the TCM approach has been, therefore, consistent with WSU's commitment to using technologies effectively and efficiently.

WSU is committed to a five-step assessment process for all courses developed using the Program Development Process. Instructors are surveyed to determine their goals for the course. Two formative surveys are conducted of students, the first to determine student goals and access to technology, the second to determine students' experiences with interaction. Instructors go through a focus group to assess the job of the course development team and finally, the costs of each course are assessed using activity-based costing techniques as introduced in the TCM Handbook. The focus groups and cost assessments provide benchmarks for improvement.

Finally, we realize that the benchmark assessments of courses adapting new technologies may be used for comparisons with courses taught in traditional modes. However, such comparisons should be done cautiously since the history of evaluation illustrates the enormous variation among purportedly similar modes of instruction, often times as much or more variation within teaching modes as there is between different modes. Our primary purpose in using the TCM model, therefore, has not been to determine if integrating new technologies into instruction for distance learners is cheaper or better, but to determine how we can improve the efficiency and effectiveness of our efforts.

Issue

10 courses were analyzed, all were taught during the fall 1999 semester. The following information outlines the courses under investigation:

An interdepartmental, multidisciplinary team developed the 10 courses.
Courses analyzed were from eight departments.
The course development team was composed of members from Extended Degree Programs (EDP), the Center for Teaching, Learning, and Technology (CTLT) and the Student Advising and Learning Center (SALC).
Time estimates were gathered from 40 faculty and staff.
169 students completed the courses in the analysis.

Methodology
Activity-based Costing (ABC), which the TCM is based on, was used to analyze costs. ABC is an accounting system that assigns costs to products based on the resources they consume. The traditional accounting system is still used and the ABC structure is an add-on or "shadow system" to be used when specific information is needed for a decision. Ten activities were used for this analysis. The focus of this TCM analysis was the WSU course development process so the activities chosen follow the "course development lifecycle." A brief "activity dictionary" is included in Table 1.

Table 1 – Activity Dictionary
Activities Chosen to Reflect the Course Development Lifecycle

Activity	Summary Description
1. Faculty Development	Faculty work with professional staff on new models of teaching or specific technology concerns; or a student technical assistant, hypernaut, introduces faculty to technology resources such as threaded discussion lists and other features of the online course environment
2. Course Design	Course development team works with faculty on syllabus generator, course goals, grading rubrics, et. al.
3. Speakeasy	Time spent setting up activities in the online learning forum—the Speakeasy Studio
4. Worldware	Time spent on Word files, HTML pages, or similar "worldware" programs.
5. Multimedia	Time spent programming JAVA or FLASH animations, etc.
6. Video	Video pre, field, studio, and post production and set maintenance
7. Copyright Research	Acquiring copyrights or reviewing Web sites, videos and course material for possible copyright infringement
8. Text Editing	Reviewing course material for grammar and accuracy
9. Delivery and Maintenance	Teaching the course and any updates made during the course, grading and interacting with students on the Web, via e-mail, telephone, or other methods
10. Assessment	Cost of surveys of instructors and students and gathering of information for cost analysis

The following expenditures were estimated by activity:

Payroll (direct labor),
General administrative,
Extended Degree Program (EDP) administrative,
Center for Teaching, Learning, and Technology (CTLT) administrative,
Estimated plant maintenance and depreciation (10 cents for each dollar paid to an instructor or developer).

Table 2 Illustrates estimated expenditures of the 10 courses before allocation to activities. Some of the expenditure types accrued to specific activities while other expenditures occurred in almost all activities for all the courses (e.g., salary and wages).

Table 2 - Average Expenditures per Class and per Student
"Traditional View"

Traditional Expense Accounts	Average per Class
Total Direct Labor Hours	*546*
Salary and Wages	$ 8,264
Benefits	1,801
Total Payroll	$ 10,065
Video tape & travel cost	$ 150
Allocation of administrative labor	579
Assessment Costs	544
EDP Administrative:	
Marketing	60
Advising	186
Registration	276
CTLT Administrative:	
Equipment	50
Goods & Services	574
Telephone	8
Travel	27
Carry forward	63
Computer Services	1
Payroll	1,402
Plant Maintenance / Depreciation	27
TOTAL COST	$ 14,012
Average Number of Students Per Course	16.9
Average Cost per Student	$ 829

The average cost per student per course (of the 10 courses delivered during the fall 1999 semester) was $829 per student per three-credit course. The average cost per student per three credit course for all WSU students was $751 (per the 1997-98 Washington State Higher Education Coordinating Board Education Cost Study). The 10 courses were the first courses WSU developed for online learning that used the new course development process. These were, in effect, prototype courses. The average cost per student per distance course is expected to decline as the process is refined and enrollments increase.

Outcomes

The following activities were consolidated:

Design combines the Faculty Development and Design activities.
Develop combines activities for developing Speakeasy studios, "worldware" programming, multimedia programming, video production, copyright research and text editing.
Deliver reflects time spent teaching the course, grading student work, adjusting content to meet learner needs, and other activities associated traditionally with "office hours," such as interacting with individual and groups of students on the Web, via e-mail, telephone or other methods,
Assess refers to the cost of developing, implementing, and analyzing surveys of instructors and students and gathering of information for the cost analysis.

Table 3 summarizes the cost of each course by major activity, i.e., by Activity Based Costing (ABC) view. This view provides more useful information for analyzing and refining the course development process.

Table 3 – Cost Estimates by Major Activities – "ABC View"

Course	Design	Develop	Deliver	Assess	Total	Direct Hours	Students
AS (SE)	$2,845	$2,575	$ 7,123	$961	$13,504	888	30
ComSt (SE)	2,167	5,718	5,195	975	14,055	574	14
CrmJ (SE&V)	5,941	3,721	2,275	928	12,864	269	4
C / S (S&V)	6,396	2,054	3,651	922	13,023	482	14
Soils (S&V)	5,574	3,802	5,783	996	16,156	470	9
Dec S (SE)	3,524	3,548	6,546	953	14,570	597	12
Fin (SE)	3,210	3,432	3,832	956	11,430	456	14
HD (SE)	3,206	3,151	4,250	1,001	11,608	631	24
HD (SE & V)	2,679	8,699	5,579	941	17,898	545	32
MIS (LS)	5,825	3,491	4,675	1,026	15,017	546	16
Averages	$4,137	$4,019	$4,891	$966	$14,012	546	17

"SE" stands for Speakeasy, "V" means class used videos, "LS" means course used List Serve

Table 4 summarizes the proportion of cost by each activity. This table indicates the variability of the costs of each activity as a percentage of total expense.

Table 4 – Average Proportion of Total Expense by Major Activity

	Design	Develop	Deliver	Assess	Total
AS (SE)	21%	19%	53%	7%	100%
ComSt (SE)	15%	41%	37%	7%	100%
CrmJ (SE&V)	46%	29%	18%	7%	100%
C / S (S&V)	49%	16%	28%	7%	100%
Soils (S&V)	34%	24%	36%	6%	100%
Dec S (SE)	24%	24%	45%	7%	100%
Fin (SE)	28%	30%	34%	8%	100%

HD (SE)	28%	27%	37%	9%	100%
HD (SE & V)	15%	49%	31%	5%	100%
MIS (LS)	39%	23%	31%	7%	100%
Average	30%	28%	35%	7%	100%

"SE" stands for Speakeasy, "V" means class used videos, "LS" means course used List Serve

To analyze the implications of the cost/activity distribution in the preceding tables, correlation's were run on direct labor hours of each major activity and revealed the following:

The total cost of each course is most strongly correlated to development.
There is a moderate inverse correlation between design and development time, which means more time on design yields less time on the more expensive development time.
There is a strong correlation (.735 with a ρ-value of .015) between the number of hours spent on the course (including Design and Development) and the number of students who enrolled in that course. However, the correlation between the cost of each course and the number of students enrolled is almost zero, which indicates the relatively "fixed" nature of most of the costs.

Discussion and Next Steps
The correlations make sense. Development time is the most expensive, requiring more personnel and equipment. The inverse correlation between design and development throws into relief the importance of planning and, to a considerable extent, the costs of not doing so. Design time saves time in both development and delivery. The correlation between the number of hours spent on the course and the number of students enrolled in the course reflects some amount of anticipation on the part of developers and an increased audience. But more clearly it reflects the time spent teaching more students and, consistent with reports now coming from around the country, the recognition that facilitating online learning generally increases the time faculty spend interacting with students. Finally, the "fixed cost" nature of designing and planning a course was verified.

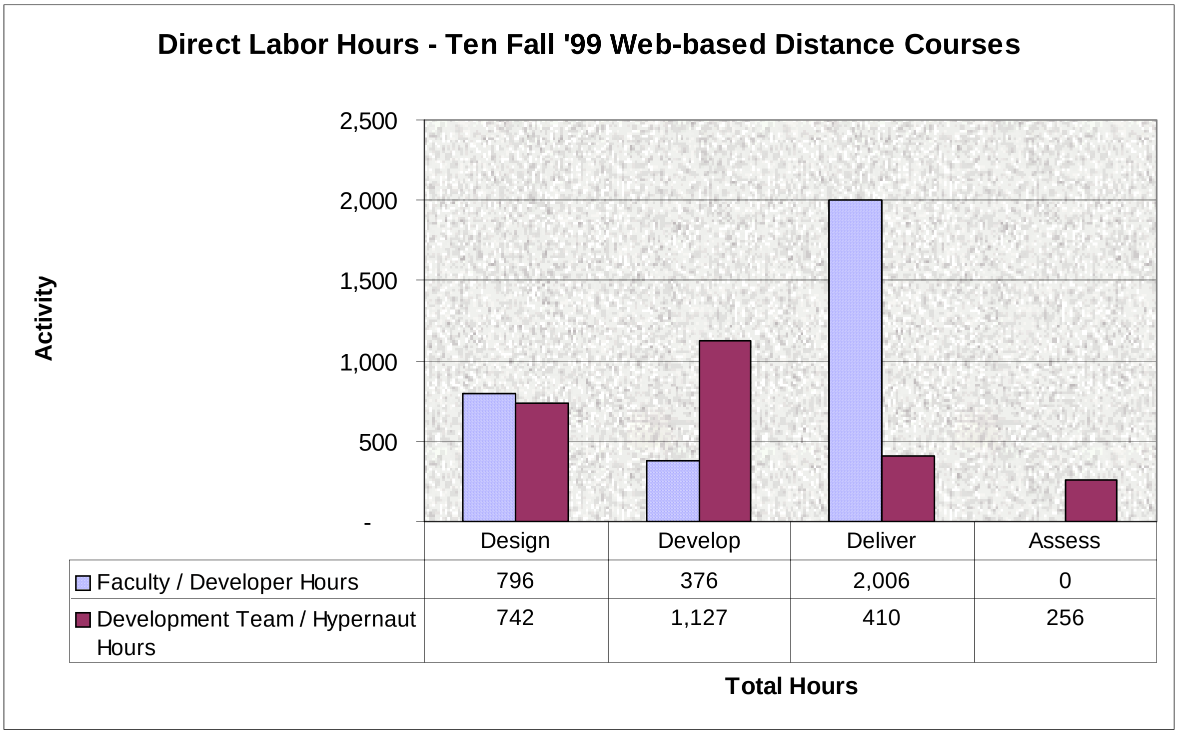
It is also interesting to note that the design and development phases, on average, consumed slightly more than half (58 percent) of the resources. WSU plans to continue this study for spring and fall 2000 courses. Several of the courses that were analyzed in this fall 1999 study will be taught again. It is important to track the cost of design on additional offerings of the course as faculty gain experience teaching online and as courses are taught by different faculty. It is expected that design and development—or redesign and redevelopment—will be less intense; faculty will optimize their instructional techniques.

One of the main conclusions that can be drawn is that the proportion of costs consumed by each activity is unique from one course to another and so the total cost of each course is unique. It is therefore premature in the evolution of the integration of new technologies with teaching and learning to make generalizations about cost differences between courses that use new technologies and traditional courses that do not.

However, the analysis of averages does suggest that shifting the focus from course costs to the activities in developing those courses should yield increased efficiencies. The finding that an increase in design time indicates less time on the more costly development and delivery time, for instance, has important ramifications for the course development process and accompanying policy. As we improve the allocation of resources and incentives for faculty to participate more fully in course design and to spend less time in course development, we can anticipate additional efficiency gains.

Chart 1, Hours by Major Activity, reflects a grouping of activities designed to track and improve the course development process. It clarifies the development goal so that over time faculty time on design should be increased. Correspondingly, we anticipate fewer faculty and development team hours on development, fewer development team hours in delivery, and, in order to improve effectiveness as well as efficiency, more faculty hours on assessment.

Chart 1 - Hours by Major Activity



Summary

The TCM study has given WSU useful information and insight into its course development process. WSU plans to use this information and the TCM model to compare the cost of subsequent courses to the fall 1999 course and to support policy changes that will encourage more design time.

There is evidence that the TCM model as it was applied at WSU gave cost estimates that make intuitive sense. After the analysis was first computed, costs of activities were combined into four "major" activities. A correlation analysis was done on those costs, total time devoted to the course and the number of students who completed the course. This argues for future applications of Activity Based Costing (ABC) methods “on top” of the existing accounting system.

Traditional costing systems provide little indication as to where major business cost contributors lie. Activity-based Costing as used in the TCM helps to more closely estimate the specific elements or "drivers" of those costs. In the WSU case, approximately $100,000 of salary, wage, and payroll expenditures can be better analyzed and managed by identifying the activities where faculty and development team professionals allocate their time.

The courses analyzed in this study were developed and assessed by an interdepartmental team. ABC focuses on activities rather than traditional departmental costs; therefore, WSU can better focus and manage cross-functional processes by adapting ABC.

WSU plans to continuously and systematically refine and improve the application of the TCM model and other assessment techniques and to continuously improve both the effectiveness and efficiency of courses that use new educational technologies.

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Appendix B

Three White Papers

White Paper One: The Transformation of Instruction by Information Technology: Implications for State Higher Education Policy

Written by: Dennis Jones, National Center for Higher Education Management Systems (NCHEMS)
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Technology as means, not end

Why are states and higher education institutions so interested in integrating greater use of technology into their higher education systems? There are, of course, many reasons, including specific problems that information technology may be able to help states solve. However, it may be fair to say that the main reason is simply that policymakers and education leaders recognize that information technology is now integral to the world economy and has transformed most U.S. industries, with the exception of education. The realization that higher education has not changed very much in its fundamental forms of organization – whether in how programs are delivered or human resources are utilized – seems increasingly out of touch with what is happening around it.

Certainly higher education has begun to make greater use of information technology, especially on the non-instructional side of the enterprise – administrative functions in particular. The application of information technology to instruction, however, is still in its early stages, even though states and institutions have begun to invest considerable sums to incorporate its use into courses and academic programs. Until now, the main focus on technology has been to tap into its potential to enhance the quality of education. More and more courses incorporate tools such as e-mail or web resources, and a small but growing number use even more advanced techniques such as simulation and multimedia, which expand and diversify the pedagogy traditionally relied upon by higher education. This use of information technology in higher education is, however, almost always an add-on to the traditional delivery system with the primary purpose of enhancing the educational experience. As such, it tends to drive up costs, both for the technology itself and the increased time demands on both faculty and highly skilled technical staff.

The ubiquitous nature of technology and its extraordinary promise are raising expectations among constituents for higher education, state policymakers among them, who see technology as the vehicle by which higher education institutions can respond to a variety of state priorities. A good example is improving the preparation of students for postsecondary education – an issue receiving increasing attention by states, not least because it is part of a strategy of improving the quality of K-12 education. More outreach from higher education to the schools, such as taking college-level or advanced placement courses to high schools, is a preferred strategy in many states. Several states have invested in statewide technology networks to deliver more courses from higher education institutions to schools, and changed policies to encourage this type of outreach.

States are also looking to technology to overcome geographical access barriers to higher education, especially for adult learners. As state economies become increasing dependent upon emerging high technology industries, or as their own local industries (such as agriculture or manufacturing) are transformed by technology, more and more jobs demand levels of education that were previously available to relatively few. As a result, it becomes imperative to the economic vitality of the state that all of its communities have ready access to postsecondary education. While the need for ready access to learning opportunities is widely recognized, the nature of that need is variable and difficult to predict. At various points in time, the need may be for basic literacy training of adults; short-term training in computer applications in allied health fields; or graduate degree programs in business, computer science, engineering, or social work. This variability places a premium on flexibility – a requirement that makes technology-based distance education an attractive option.

States facing rapidly increasing enrollment demands are starting to expect technology to provide an avenue for expanding capacity – maintaining or increasing access without the costs associated with building new campuses and hiring a proportional number of new faculty members. While the specifics of how this might actually work remain largely a mystery to most policymakers, the expectation that "technology" will help solve this problem is nonetheless real.

Whether their enrollments are expected to grow or not, all states are hoping that technology can help constrain cost increases, for students and states alike. In most of the states expecting enrollment increases, the majority of the growth will come from populations with relatively low income levels for whom college affordability is a critical issue. Financing growth through substantial tuition increases would undermine access for these citizens. Further, with very few states being exempted, the long-expected economic downturn has finally arrived. A very favorable fiscal climate in historical terms over the past five years has allowed states to add capacity to their higher education systems without confronting the thorny problems of restructuring or incorporating greater use of technology.

Even worse than the current rapid downturn in the outlook for state revenues is that during the recent expansionary period many states took steps to limit their ability to adjust revenues to meet changing economic conditions. The grim forecast of Harold Hovey's 2000 report for the National Center for Public Policy and Higher Education, *State Spending for Higher Education in the Next Decade: The Battle to Sustain Current Support*, appears to be coming true. Resources are becoming scarce at precisely the time that higher education is facing the need to invest more, not less, in technology—to provide a quality education to students, to pursue state priorities, and to achieve desired efficiencies.

In this environment, states and higher education institutions look to technology as a way to reconcile expanding demand and constrained resources. The alternatives are not very appealing – either for states or higher education institutions. Further limiting access to higher education, increasing tuition rates far beyond increases in personal income, denying communities the educational infrastructure necessary to support economic growth – none of these alternatives are viable state policy options. Just as other industries have looked to technology to improve quality and productivity in an increasing competitive environment, states expect that higher education institutions will more cost-effectively utilize technology to reach and serve a growing and diverse array of student populations, while maintaining or enhancing the quality of the educational experience. However, this change of focus means that unquestioned assumptions about the costs and benefits of technology will be challenged (as will assumptions about the form and structure of traditional higher education). The focus of policy will increasingly be on the purposes for which the use of technology is being prescribed. These discussions will center on the major accountability questions: Who is being served? In what numbers? At what cost? To what end? The analysis will be comparative: How does education that relies heavily on the use of technology stack up against the way we do things now?

Understanding the structure of higher education programs

To make sense of these questions, it is necessary to understand some basics about the structure of higher education programs – how they are organized, staffed, and delivered. These basics are independent of the method of delivery. In all educational programs, whether traditional or technology-mediated, certain activities must be performed.
The basic categories of functional activities related to the development and delivery of higher education programs are the following:

Figure 1: The Unbundling of Higher Education Functions

Instruction	Curriculum and course design/planning
	Materials development
	Content delivery
	Tutoring/mentoring of students
	Assessment of student learning
Academic Support Services	Information resources
	Access to/use of technology
Student Services	Admissions
	Advising
	Counseling
Administrative Support	Recordkeeping
	Budget and finance
	Collection of fees
	Facilities

In a traditional higher education institution, these functional categories create the organizational structure of the institution. The first category, Instruction, is organized around colleges and departments. Likewise, Academic Support Services, Student Services, and Administrative Support are separate organizational units.

Technology can, and has, been incorporated into all of these functions. In the latter three categories, technology has been used in fairly straightforward ways to increase productivity or improve customer service. Library collections have been computerized and card catalogues are remembered with fond nostalgia. Financial and record keeping operations at most campuses are also computerized now, and an increasing number of campuses are using the internet to dramatically improve such functions as admissions, registration, and the paying of bills. However, the application of technology to instruction is the most difficult issue for states and institutions to face, because it gets to the heart of our understanding of the nature of higher education itself.

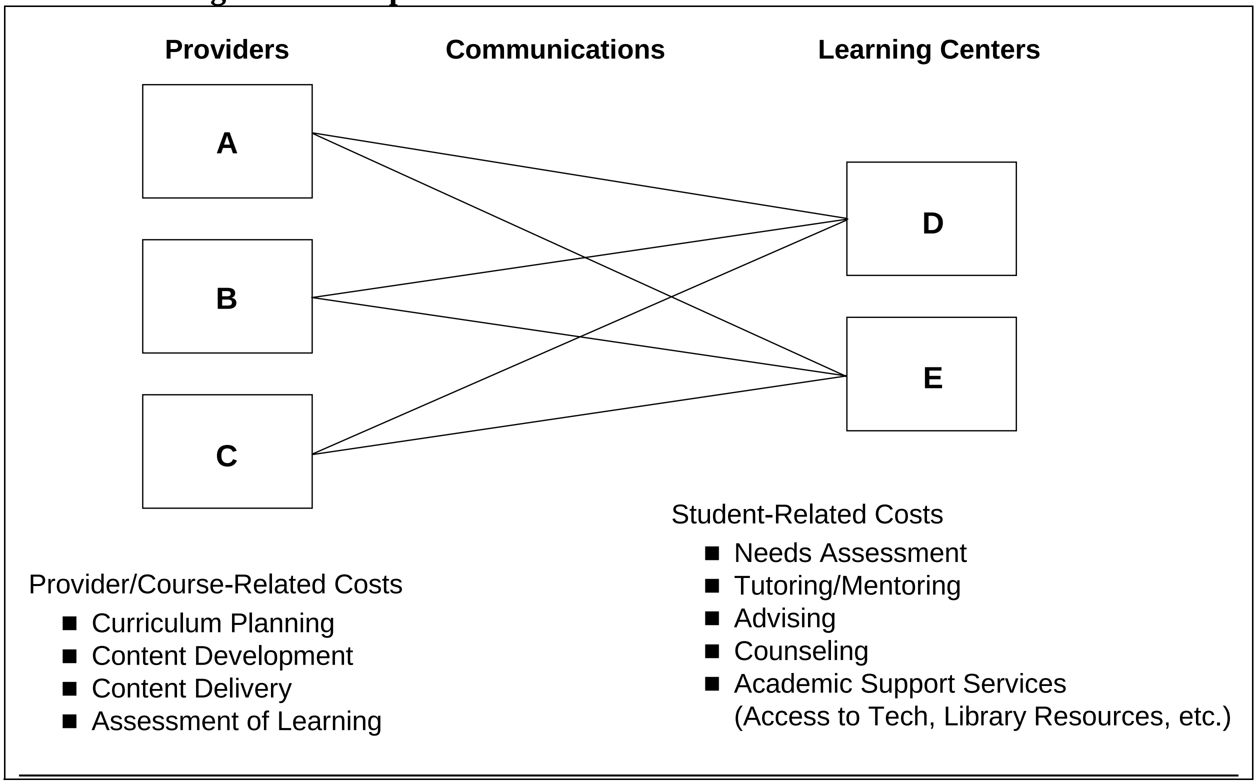
Part of the promise (and, for some, the threat) of the use of technology in education is that it allows the educational process to be organized in a very different way. Traditionally, the functions listed in Figure 1 have been organized within a single institution at a single site. Technology allows these activities to be "unbundled" and geographically distributed. As an example, Figure 2 illustrates a situation in which:

- Those activities that are "provider-centric" – related to the development and distribution of course content – are located in one place, and those that are "student-centric" – related to student support and assistance in acquiring and absorbing course content – are located in a geographically separate place.

- Students located in one geographic area can be served by multiple institutions, not necessarily located in the same state or even the same country. They do not necessarily "belong" to a single institution.

- Institutions located in one place can serve students located at multiple (geographically dispersed) sites, not all of which need to be located in the same state, or even the same country.

Figure 2: Components of Education Costs – Collaborative Model



This set of circumstances, enabled by technology, is what raises expectations regarding delivery of instruction to communities throughout the state on an as-needed basis. It is also the condition that raises fears that everything held dear by many in the academy is being sacrificed on the altars of economics and convenience.

<u>What do we know about use of technology in instruction?</u>

By any account, incorporating technology into instruction is still in its infancy. However, just in the past few years there has been a dramatic increase in the development and use of technology-based instructional media, including such innovations as web-based courses. In this new environment, many institutions have invested substantial resources in instructional materials development, acquisition of the technology needed to deliver content in new ways, provision for student access to and use of technology, and the faculty and staff professional development needed to ensure that they could use the technology effectively. Based on this experience, it is now possible to draw some conclusions about the effective use of technology in instruction.

- Technology-based instructional **materials must be well designed** to be effective. Materials that meet this test foster active learning by using the technology to emphasize interaction and feedback. However, it has become clear from the early experience of institutions that doing this effectively means that courses have to be reengineered and infused with modules that give students hands-on experiences with the material being studied. This can be very expensive. Experience has shown that up-front investment in design partially offsets the costs of development of instructional programs. However, there is no way to develop truly effective courseware on the cheap.

- Effective use of technology in instruction requires that particular attention be paid to student **tutoring and mentoring**. For many students, success is dependent on personal interaction – both with faculty and other students. It takes special attention to this issue to get course completion rates to the same level as those for classroom instruction. Contrary to some early expectations, expanded use of technology usually increases the amount of interaction between students and faculty. As a result, institutions must either keep classes and course sections small, thus negating achievement of scale, or find less expensive ways to handle the student mentoring component of courses. This latter objective can be accomplished, but only through design and development activities that explicitly recognize this requirement. Referring to Figure 2, the reality is that most attention (and funding) is lavished on the provider-centered activities while little attention is given to the student-centered activities that include tutoring and mentoring.

- **Good design and development** of technology-mediated instruction is expensive and is becoming a major cost driver in some institutional budgets. These costs can be absorbed, but only through the effects of scale – it is necessary to spread these costs over the largest possible number of students. Another necessary strategy is to find ways to use content that has been developed elsewhere, either through outright purchase of modules or entire courses, or through participation in consortia such as Merlot or the Southern Regional Electronic Campus.

- In order to get the scale required to make technology-based delivery cost-effective, it is often necessary to achieve the **collaboration** of two or more institutions. By designing programs that can be delivered to multiple sites, providers of instruction can achieve the economies of scale that justify the investment in high quality technology-based instructional programs. In the same fashion, economies of scale apply to the providers of telecommunications connections and services, which in many cases is the state. Less obvious is that the same scale effects apply to other elements of instructional delivery, namely academic and student support services including mentoring. Small numbers of students can be cost-effectively served at a given site, if numerous students at other sites are being served simultaneously.

- Another reason for states to expect, and demand, greater levels of collaboration across their institutions is that technology allows institutions to **contribute their particular strengths** to programs. For example, an institution with expertise in a content area may develop a high quality instructional program, but then partner with another institution that has the ability to provide high quality student support services to a population of potential students. Yet another institution (or a state agency) may provide the technology network over which the program can be delivered. Rather than the current case-by-case ad hoc arrangements under which programs are structured today, collaboration across institutions will increasingly be seen as the normal state of affairs in technology-based education, and will be recognized as such in both state policy and institutional decision making.

To summarize, the early experience of states and institutions has shown that in the absence of sufficient economies of scale, technology-based delivery is more expensive than classroom instruction. The higher costs of technology-mediated instruction are a result of both the costs of communications and course and program development. While the obvious focus has been on the direct costs of the instructional technology itself, the major cost driver in technology-based education just as in traditional instruction are the people costs – for both faculty time and technical support. If technology is utilized in such a way that people are utilized differently, it is possible to achieve some of the desired economics. If personnel are utilized in traditional ways and technology is added to the mix, the result is inevitably higher cost instruction.

Implications for Public Policy

The growing incorporation of technology into state higher education systems poses significant new challenges for public policy. Technology is expensive, it remains controversial (especially among faculty), expectations often exceed reality, and the capabilities of technology are constantly changing. In this environment, policymakers need to think clearly about the implications of acting to expand the incorporation of technology into their higher education systems, or of choosing not to act.

One: Defining expectations. The first step in developing sound policies regarding higher education technology is to have a clear, up-front understanding of the purposes of investing in technology. This understanding includes defining expectations regarding who is to be served by technology-based instruction, as well as how and through what functions or activities (such as instruction and its subcategories, student services, etc.) the needs of these populations are to be met. This process of defining the expectations of the state regarding its higher education system forms the basis of accountability.

Two: Understanding options. Public policymakers need to understand that good content development for technology-based instruction is inevitably expensive. As a result of this reality, states must decide from among the available options for developing programs that incorporate the use of technology. The options for states include:

1. Living with "not-the-best" – establishing a presence on the Web, but using courses and programs that were not designed for the Web.

2. Buying or leasing programs from third-party developers instead of building all courses and programs within the state system.

3. Investing in course and program development only where demonstrable scale effects offset the increased costs.

4. Accepting higher costs as necessary to the achievement of other purposes.

Three: Providing for student services. States need to explicitly recognize the importance of various student-oriented functions, such as mentoring, academic support, and student services. These functions are critical to the success of technology-based programs and tend to be overlooked as states and institutions consider the implications of technology on instructional design. States must insure that these critical support functions are in place, and that finance mechanisms recognize these functions separately from instruction, including content delivery.

Four: Demanding (and allowing) collaboration. States must recognize the roles that numerous actors are required to play in order to effectively deliver education through technology. One of the toughest issues for state policymakers to understand is that technology-based education is often inherently collaborative in nature. As such, effective programs will often require the collaboration of multiple institutions that normally see themselves as competitors – either for students, prestige, or state revenue. As a result, state higher education policy, and especially finance mechanisms, should recognize the contributions of all participants. The main way to accomplish this is for states to provide incentives to institutions to collaborate in the development and delivery of programs. Policymaking is made more challenging by the reality that some of the best – and most cost-effective – partners to the collaboration may reside in other political jurisdictions.

Five: Knowing when to centralize. Along these lines, states must address the question of which assets or functions can most effectively and efficiently be held or conducted centrally instead of being replicated in all or most institutions across the state system. One specific option that states will need to consider is when it may be appropriate for one institution to be staffed and funded to provide a service to many across the system. It is likely that states will find it inappropriate to have each provider replicate all functions in a technology-based delivery model – especially when many are client-based and can therefore be best met by institutions that are in geographic proximity to learners. The learning center model in place in several states is an example of this approach to structuring programs. In other states, some of these functions (e.g., networks, servers, help desks, etc.) are performed by a state agency rather than by any one of the institutions.

Six: Developing capital funding alternatives. States must recognize that technology-based education is capital-intensive. For this reason, states must create mechanisms that allow institutions to amass the resources necessary for the acquisition of expensive technology assets, including programs. These mechanisms must also ensure the renewal and replacement of these assets on an appropriate cycle. One approach is to create revolving accounts against which institutions can borrow with repayment conditions such that terms are no longer than the expected life of the asset being purchased. In a significant departure from past history, the capital-intensive assets of technology-based education go beyond traditional capital outlay categories such as equipment to include resources that have always been thought of – and funded – as renewable, annual expenses, such as courseware, faculty, and technical staff.

Seven: Utilizing people effectively. States need to understand that the major costs of instructional delivery and provision of student services will continue to be people costs – not the costs of technology. Policymakers must always demand to know the people costs of technology decisions. They should also take steps to ensure that personnel policies don't get in the way of cost-effective use of technology. The use of technology in instruction—and the "unbundling" of the instruction function required if economic returns to scale are to be realized—almost demands that peoples' time be used in ways different from that which has historically been the norm. Policies and procedures that don't recognize this reality often get in the way of innovation. For example, the so-called "12-hour rules' that require faculty members to teach 12 credit hours per semester stand in the way of using senior faculty members as content development specialists who actually teach few, if any, sections directly.

Conclusion

A simple rule for states to follow to bring these issues much more readily into focus is to direct attention to the clients to be served, rather than the technology itself. By doing so, states can keep accountability consistent with their intentions or expectations. If states cannot be clear about accountability a priori, they probably should not be investing in technology-based programs and the capacity to deliver them. "Because everyone else is doing it" is not a good enough reason for states to start down this path.

Few continue to doubt that information technology will fundamentally transform the structure and delivery of higher education. In spite of this realization, however, few states are addressing the changes in state higher education systems and policies that will be the inevitable result of this transformation. Without change, state higher education policies will unnecessarily delay and obstruct the ability of higher education institutions to respond and adapt to the new environment resulting from the revolution in information technology. With the right kind of changes, however, state policy can foster and support the transformation of higher education systems so public higher education will continue to play a vital role in the economic and social life of states.

White Paper Two: Funding and Cost Containment of Educational Technology: Shifting Policy and Practices

Written By: John Opper, Florida Community College Distance Learning Consortium
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Introduction

Education funding comprises the largest single element of any state budget. As a result, the philosophical, political and practical debate over the very nature of the education process engenders great passion among policymakers and citizens alike. The character of this debate does not radically change from year to year, yet the increased use of technology and the funding challenges it presents demonstrates the need for a sharper focus on:

- reliable methods for cost containment and
- realization of the changing nature of the instructional process.

Technology is changing the nature of instruction and the classroom activities in the schools, colleges and universities and states and institutions need to find better ways of matching financial resources with the way education is delivered.

Statistics from the U. S. Department of Education indicates that distance learning enrollments doubled as percent of total student enrollments in higher education from 1994-95 to 1997-98. While no recent national follow-up study has been completed, anecdotal evidence and individual state statistics indicate steady growth over the intervening years. Similarly, student enrollment data for Florida's state universities indicates that courses reporting technology as a secondary form of delivery (6,754 sections) outpaced those where technology was reported as the primary form of instructional delivery (4,790 sections) during the 2000-01 academic year.

Challenges to the status quo

Despite technology's growing presence as a central component of instructional delivery, approaches to educational technology funding have not advanced to match the speed of this change overtaking our states and institutions. An examination of traditional funding practice in several areas illustrates the need for new approaches to funding and financial management. Areas such as:

- infrastructure development and maintenance,
- acquisition of instructional content,
- operation of the library and its increased reliance on digital content,
- faculty and staff workload, and
- student support services.

On most campuses today these issues are becoming increasingly difficult to address using existing budgeting and finance strategies.

Infrastructure
The delivery of instruction and services using technology requires a robust highway upon which to travel. This highway or basic technology infrastructure is a complicated network of telecommunications circuits, routers, switches and personal computers linked together and controlled by software systems. As the Internet has grown and the speed of technological change has increased, more institutions and states have wisely moved from trying to build and own infrastructure to leasing or contracting for levels of service. Two primary areas where this has occurred involve hardware (computer workstations and telecommunications circuits) and software systems. In Florida, like many states, contracts exist for the leasing of both telecommunications circuits and computer hardware. The Florida Information Resource Network (FIRN) is the primary state-level education network for schools, colleges and universities. FIRN is a combination of state-owned equipment and leased network access circuits that are secured as a part of an overall state-level procurement process that leverages the buying power of the all of the agency needs for Florida. As a result, all of the state agencies receive the benefit of discount pricing based upon combined purchasing power and the majority of the costs associated with obsolescence are avoided. The purchase of computer hardware and software has been addresses in much the same way. The public community colleges have combined their purchasing needs for computer equipment and the resulting RFP under the name Technology Refresh Program has resulted in a three year agreement that includes equipment, pricing, maintenance, financing, leasing and trade-in, producing a possible long-term relationship. The agreement is open to all education institutions in the state and provides savings and benefits beyond existing state government contracts.

For the most part, technology infrastructure may show up in budget worksheets as computer hardware and payments to telecommunications vendors for network services. The maintenance of this network, which is the basis for every aspect of student instruction, support and service in distance learning as well as administrative data processing, must be provided for on an annual basis. Without recognition that ongoing funding is needed for continued maintenance and operation of newly integrated equipment and services, a stable infrastructure cannot be maintained. As increased use is made of the network for instruction, there is not enough understanding on the part of policymakers about the actual critical nature of the infrastructure itself. The reality simply is that like bills for electricity or salaries for faculty, the costs of telecommunications infrastructure are ongoing and must be a part of the operating costs of education budgets.

With students learning activities becoming more prevalent outside of a traditional classroom environment, increasingly some software systems or tools to provide organization to content and manage faculty-student interaction inside and outside of the classroom have emerged. These content management systems are increasing in their frequency of use throughout education and they are often integrated into management and student information systems at the enterprise level. The Campus Computing Project 2001 survey results indicate that one-fifth (20.6 percent) of all college courses now use course management tools, a 5.9 percent increase from the previous year. These content management systems (examples include Blackboard and WebCT) are licensed for use over a one or multi- year period. The systems have capabilities that increase in integration capabilities or student capacity depending upon the level of the product licensed. While some institutions may have a content management system that they own, the majority licenses such software. Considerable concern has emerged over changes in features and licensing models that have resulted in price increases of as much as 500 percent for some institutions. Although many institutions have serious questions about future licensing of such systems that manage the critical student-faculty learning process, the capital cost and complexity involved in developing an alternative is beyond the capability of most institutions. Master agreements to leverage buying power have been used in Florida to establish access to discounted pricing and a stable relationship with vendors. In both Georgia and Louisiana, single vendor enterprise-level agreements have produced considerable long-term cost savings. Stability in pricing and feature sets may be sometime off as standards and alternatives currently under development in the public and private sector emerge over the next two years.

Instruction

Typically instruction requires at least two types of content.

1. Curricular content in the form of courseware and textbooks
2. Library materials that enable students to expand the breadth and depth of learning.

Curricular content has been and, to a large degree is still, the purview of the faculty member teaching a class. Traditionally faculty members would use a core set of materials, usually a textbook, and then augment or adapt their materials to further enhance the actual instruction. Advances in telecommunications technologies have provided access to new student markets and demands for service from additional populations unable to physically attend classes. To be done well, the process of developing content for delivery over the Internet or via video can be expensive and lengthy. Development has been viewed as a significant drain on technology funds. A far cheaper and easier route is to purchase a pre-developed course much like a textbook or telecourse and adapt the materials for campus use. The Florida Community College Distance Learning Consortium has consolidated the licensing of instructional content successfully since its creation in 1996. Specifically, the Consortium has saved approximately 50 percent or more over the individual institution costs by combining purchases and leveraging resources to make upfront buyouts of high use course content. In the area of information technology training where the course content may change rapidly, the Consortium has achieved favorable results in state-level master agreements for IT courseware by working with individual institutions to pool their resources towards larger purchases in order for all participating institutions to receive the benefits of large volume discount pricing. A key distinction between licensing and development activities is that licensing curricular content for use becomes an ongoing expense while development has been viewed as one time up front cost. The truth is that any course whether developed from the start or one that is licensed and adapted requires revision within a year or two. So in the long run, development can cost more up front and still not free the institution from the later maintenance cost. When considering the build versus buy decision for curricular content, the stability of the content over time and the number of students that the cost can be applied against are critical factors.

Similarly, digital content in the form of databases of journals, periodicals and other primary source material represent a highly valued resource for students and faculty. Access to sites that aggregate digital content is contractually licensed for a given period of time. The access cost can be a per student user rate or a flat fee enterprise-level license that recurs each contract period for continued access. Florida's Distance Learning Library Initiative and Georgia's GALILEO Project are two examples of state-level procurement of these digital resources for all students. In Florida, a certain set of core materials forms the basis for the funded agreement and individual institutions are free to purchase additional resources for their particular student base. As more of these digital resources are relied upon to fill student reference needs, a danger exists. There are no ownership rights provided and should funding become unavailable, access to the digital content would cease resulting in an immediate dilution of the materials available for student use. Not only could the quality of instruction be endangered but program or institutional accreditation could also be questioned if core reference materials were lost for certain educational programs. As a result, such funds and their connection to the institutions core mission must be protected as a part of basic continuation funding from year to year.

Faculty

Education is by its very nature a labor-intensive business. Faculty and staff are the core of any part of the enterprise and at the heart of many of its funding challenges. Recent estimates from Florida's community college system estimate labor costs comprise over 80 percent of institutional budgets. People are the most expensive part of any organization and effectively using this core resource to keep costs low is the hallmark of efficiently run educational institutions. At the center of many of the costing issues surrounding the faculty negotiated state and institutional policies and contractual agreements that specify course load, student class headcount, office hours, and promotion requirements.

An accepted strategy for controlling costs is to teach larger section sizes of general education or lower division courses using teaching assistants or adjunct faculty to mediate the load on assigned faculty members. In the case of larger survey courses, a team teaching approach may be utilized again with the assistance of teaching assistants who meet with smaller groups of students in "lab" sections. Increasing the section size to spread the total costs of the course over more students allows an institution to amortize the upfront costs of acquisition or development. Collective bargaining agreements or existing contracts designed for application in the classroom environment often constrain this approach. Caps on student online enrollments of 20-25 are not uncommon. Further, required student-faculty contact hours include actual classroom and office hours when students could be assured of interacting with a faculty member teaching their courses. In online courses, the concept of student contact hours in actual practice includes the use of online chat sessions; responding to email and monitoring threaded discussion lists.

Students are more likely to increase their demand for interaction with faculty in the online environment. This phenomenon has translated into an increased workload and student "online" contact hours for faculty beyond the scope of the traditional classroom based environment. Requiring faculty teaching online to maintain regular physical office hours seems out of place considering the mode of instructional delivery and the regular level of electronic interaction. State policies and faculty collective bargaining agreements in terms of workload, and contact hours have not been redefined to meet the challenges presented by the electronic environment. Alternatives that might address these issues concern how individual faculty workload is calculated and managed. Current methods often calculate faculty workload based upon the number of students enrolled in a class with the assumption that the faculty member will provide a full range of services to those students. As instruction is "unbundled" the scope of faculty time devoted to supporting students can conceivably be lessened as other support services and staff take on those responsibilities. As a result, with proper staffing of student support services and the assistance of paraprofessional staff, individual faculty members or teams of faculty should be capable of providing instruction to larger numbers of students. Collective bargaining agreements and state policy can be revised to recognize ways in which faculty workload can be mitigated through proper support services.

Student support services

Decades of experience and research have validated the importance of student interaction and support services in the retention and academic progress of students. The costs for providing expanded or around the clock support services to students receiving instruction online are considerable. In order to meet those student needs, the same technologies used to deliver the instruction can also be used effectively to engage and support students. One option for the creation of some of these support systems is to use one time or capital resources for the purchase of hardware and software systems for their delivery. Examples of such systems include call center operations, websites with frequently asked questions documents, online tutoring systems, electronic advising systems, and help desks for technical or library support. Such systems can be operated continuously such that assistance is routinely available to the student as needed. Although such technological solutions provide for some cost avoidance over traditional staffing patterns, the maintenance and labor costs are still an issue. Another common approach is to outsource many of these services to a private vendor with expertise in the specific service areas needed. Although such contracts with private business can be financially beneficial in the short term, they have met with varied levels of success. Perhaps the best solution involves collaboration among several institutions to provide or contract for a common menu of services to support their collective students. Costs and/or workloads can be shared among the participating institutions and particular institutional strengths in certain support areas can be exploited on behalf of all of the partners. Florida State University has an existing partnership with community colleges in the state to support its distance-learning students with a range of mentoring services. The university pays faculty members at the community colleges to provide mentoring services. The model has been very successful in both controlling costs and increasing student performance levels. The completion rate for students in the FSU online mentored programs during academic year 1999-2000 (fall, spring, summer) was 87%. The next academic year the completion rate was 93% (fall 2000, spring & summer 2001). The fall 2001 completion rate has continued the trend rising to 94%.

Structuring a new landscape

The challenge to "keep up" with technological change requires new thinking about how we fund and conduct our schools, colleges and universities. Educational technology, as a primary or secondary method of instruction is often misunderstood and it can be an expensive proposition from initial funding through its continued operation. Because educational technology expenditures have been primarily viewed as capital purchases, policymakers often do not consider technology costs as recurring. As a result, such funding often arrives in the form of one-time special funding with no additional support for implementation or sustained operation. New ideas and methods of funding educational technology need examination as its utilization in our educational institutions continues to grow and change. Another aspect of the challenge concerns sustainability over time. Once funded, the costs involved in operating technology-based instructional programs can escape institutional control. There are several reliable methods that have been used to control the costs of instruction, regardless of the delivery method, that are worthy of re-examination. Although some of these cost containment strategies are not particularly new, their application to distance learning and technology cost containment has not been as wide spread as that of traditional undergraduate education. Outmoded faculty workload policies that negatively impact the education business model need revision. Further, a better understanding of the nature of the changes underway and a review of proven funding and cost containment strategies is essential for policymakers.

- <u>Technology use is growing across the education enterprise</u>: Enrollment in distance learning courses and programs appears to growing steadily across the country. When "blended" or "mediated" courses are also considered, the scope of technological use and its relationship to core instructional activities is considerable. Continued reliance on email, web-based information delivery, content management systems, online advising, registration and student support systems and access to digital content will continue to place demands for technology funding upon institutional budget

- <u>Education has become a multi-partner enterprise</u>. Whether face-to-face in a classroom or delivered via technology, instruction has become an unbundled function that involves participants both internal and external to the institution. Depending upon the legal relationship, schools, colleges and universities are able to exert various amounts of control over the pricing, content, range of products and service providers that now comprise the new instructional model. As a result, education often involves partners from outside the academic enterprise where contractual relationships have gained a prominent role in how instruction is organized, managed and delivered.

- <u>As a majority of technology costs settle in expense categories budgetary flexibility can be constrained</u>. As more instructional content and services are licensed or outsourced, increasing segments of the instructional budget move to expense categories requiring annual renewal. With more of the education budget committed to private vendors for necessary services there is less room to adapt during difficult budget years. Budget reductions would mean that student access to digital content, the ability of institutions to maintain telecommunications circuits, leased equipment, and licenses for curricular content or applications programs would be at some risk.

- Funding formulae should contain weights or multipliers for technology support. Three aspects of the formula issue should be addressed. First, removing any disincentive for distance learning in using only physically present students in the calculation of building construction and maintenance funding. Second, funding for physical infrastructure should include considerations for technological infrastructure as well as traditional bricks and mortar. Finally, since many of the technology costs for licenses, telecommunications circuits or computer workstations are directly affected by student enrollments, any calculation of projected need should include a constant for technology expenses tied to enrollment growth.

- Costs can be significantly reduced through leveraged purchase at the state level or through regional or national procurement programs such as the AT Alliance. Infrastructure costs for telecommunications circuits, computer workstations, instructional content, and digital database access costs represent a necessary part of the instructional core of the institution and they are a growing part of the budget. Such costs are routinely incurred by educational institutions and therefore can be effectively mitigated by state-level procurement. Such efforts need not depend upon obtaining unanimous adoption of a particular platform or product. Within most large states, usage volume of many mainstream products and services is such that cooperative purchasing can bring about significant savings.

- Faculty and staff workloads and student support services must be managed in the face of the realities of the technology cost equation. In order to cover the costs of content acquisition and technology to deliver instruction, more students will need to be served. Staffing to accommodate additional workloads must be planned for in order to achieve favorable student achievement levels within costing factors that can be sustained.

- Collaboration is a powerful strategy for controlling costs: Institutions can control costs for developing content and services through collaboration. Specific individual institution strengths or expertise can be exploited on behalf of the group. Costs and workloads can be shared in providing student support or development services.

- Long-term contracts and licenses can help in cost avoidance. Long-term contracts for products and services have provided an opportunity to avoid significant cost increases in areas critical to the operation of the institutions. However, predictable increases in telecommunications capabilities and functionality among hardware and software vendors suggest that regular reassessment of technology policy and strategic direction should be done as significant shifts in the marketplace are detected. As a result, despite the financial incentives, careful consideration should be given before entering into multi-year contractual agreements for infrastructure related products and services.

Redesigning courses is essential to managing the increased costs of instructional technology. The utilization of instructional technology within a course results in an additional cost factor that must be added to existing budgetary calculations. In order to manage the added expense, a fiscal balance must be created for the overall costs of a course of program. Taking advantage of leveraged procurement of content, equipment or services, using telecommunications delivery to serve more students or utilizing technological tools to reduce the labor costs involved in instruction or support services can help offset the increased expense of instructional technology. In the absence of such a balance, the utilization of instructional technology would become unaffordable for most institutions.

White Paper Three: Evaluating (and Improving) Benefits of Educational Uses of Technology

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Introduction

In education, we sometimes study costs and we sometimes study benefits. But rarely do we study both. That's one reason why people are fearful of cost studies: they assume that the cheaper alternative will be favored over the more expensive one, because no one will know whether the more expensive alternative also has better outcomes.

This failure to study benefits and costs simultaneously is not a coincidence. It's difficult to assess benefits. Imagine that we want to study the costs *and* benefits of two types of activity (a course, major, service, or institution-wide educational use of technology) in order to decide which of the two is better. We'll refer to these competing activities as Program A and Program B. This might be a 'before and after' comparison, a comparison of two competing pilot programs, or a comparison of a real activity with a hypothetical alternative, for example.

Let's simplify the problem a bit by assuming that the educational benefits of interest are who can learn, what they learn, and the consequences of those outcomes. Here are a few of the barriers to studying such outcomes while also studying costs:

- Outcomes are sometimes more difficult to measure than are costs. How would you measure the impact of a course on a student's character? Or on the economic welfare of the region? Because some benefits are difficult to assess, analysts often surrender and measure *outputs* (for example, how many students completed the program?) rather than *benefits* (for example, how were students and the community affected in the short and long term by the fact that the student took the program?).
- A study designed to measure benefits may focus on a 'chunk' of education whose costs are unusually difficult to measure. Suppose, for example, that the key benefit is the employability of the graduate. Employability is influenced by many courses taught by different departments, as well as a variety of extra-curricular experiences. What did the set of courses and extra-curricular experiences cost? How much of those costs should be allocated to this particular benefit?
- It would be wonderful if we could reduce benefits and costs to the same quantities and calculate ratios. "Does Program A produce benefits that are worth at least 10% more than its costs? Does Program B have an even better ratio of benefits to costs?" But what's the dollar value of a 5% increase in test scores? It's difficult or impossible to translate into dollar terms such outcomes as improvements in skill or extension of minority access to education.

Even though studying benefits while studying costs is difficult, it's not impossible and it's certainly important. This chapter will explore three key questions that you would need to answer in order to design such a study.

1. Are the program's outcomes intended to be the same for all its beneficiaries? If not, how can you assess them?
2. To help design assessment procedures, how can we be more specific than merely saying that the technology is meant to cause "better educational outcomes?"
3. What kinds of data about benefits might help the people running the program to improve those benefits (paralleling the way that activity based cost data ought to be able to help policy makers control costs)?

Are benefits intended to be the same for all beneficiaries?

What's a typical example of the kind of outcome goal that ought to be measured? "All students should learn to think critically (though perhaps to different degrees of skill)." "All students should get jobs (perhaps at different salaries)." In other words, the goals assume that everyone is supposed to benefit in the same ways. If that were true, it would certainly make things simpler to measure – the analyst could devise one test of achievement of benefit (e.g., a test of critical thinking skill) and apply it to all the beneficiaries. But what if some students are gaining in critical thinking while others are mainly improving their creativity and still others are gaining in interpersonal skills?

As those examples indicate, there are two ways to look at almost any educational program. One perspective focuses on program benefits that are the same for everyone ("uniform impacts") while the other perspective focuses on benefits are qualitatively different and somewhat unpredictable for each learner ("unique uses") (Balestri, Ehrmann, et al., 1986; Ehrmann and Zúñiga, 1997, 2002). This section of the chapter explains these complementary perspectives on education. The following section will use these ideas to suggest ways to assess specific types of benefits.

A. Uniform impacts

To some degree, all students in an educational program are supposed to learn the same things. As shown in Figure 1, such learning by two people can be represented by two parallel arrows. The length of each person's arrow represents the amount of growth during (and sometimes after) the program. Students usually enter a program with differing levels of knowledge, grow to differing degrees, and leave with differing levels of achievement. The uniform impact perspective assumes that the desired direction of growth is the same for all students.

In an English course, for example, uniform impact assessment might measure student understanding of subject-verb agreement, or skill in writing a 5 paragraph essay, or even love of the novels of Jane Austen. The analyst picks one or more such dimensions of learning and then assesses all learners using the same test(s). I've labeled this perspective "uniform impact" because it assumes that the purpose of the program is to benefit all learners in the same, predesigned way.

B. Unique uses

However, that same English course (or other educational activity) can also be assessed by asking how each learner benefited the most, *no matter what that benefit might have been.* I've termed this perspective "unique uses" because it assumes that each student is a user of the program and that, as unique human beings, learners each make somewhat different and somewhat unpredictable uses of the opportunities that the program provides.

In that English course, for example, one student may fall in love with poetry, while another gains clarity in persuasive writing, and a third falls in love with literature, and a fourth doesn't benefit much at all. (See Figure 2)

Faculty members cope with this kind of diversity all the time. An instructor may give three students each an "A" but award the "A" for a different reason in each case. The only common denominator is some form of excellence or major growth that relates to the general aims of the course. There are multiple possibilities for growth and it's likely that different students will grow in different directions.

Notice that uniform impact methods tend to miss a lot when benefits are better described in unique uses terms. In that English class for example, imagine that the instructor had decided to grade all students only on poetry skills. One student would pass and the others would fail. Or imagine that the instructor tested all students on poetry, persuasive writing, and love of literature, and only passed students who did well on all three tests: everyone would fail the course. Meanwhile, an instructor using a unique uses approach (seeking excellence in at least one dimension of learning) would pass three of the four students.

Uniform impact and unique uses are both valid, and usually are both valid for the same program. The challenge for the analyst is to make sure that the assessment approaches are in tune with the program's goals and performance. If, for example, the program's goals are strongly "unique uses" then it is inappropriate to employ only "uniform impact" measures, and vice versa.

How can unique uses benefits be assessed? Most unique uses assessments follow these steps:

1. Decide which students to assess. All of them? A random sample? A stratified random sample?
2. Assess the students one at a time. Ask the student what the most important benefit(s) of the program have been for him or her. (At this point, the respondent's statement should be treated as a hypothesis, not a proven fact.) This hypothesis about benefits can also be created or fine-tuned by asking the instructor(s), peers, or job supervisors about the program's benefits for that student.
3. Gather data bearing on this hypothesis. If the student said that the program helped her get a job, what data might help you decide whether to believe the assertion? (For example, did the student really get a job? If the student said that certain skills learned in the program were important in getting the job, did the interviewer notice those skills?) If appropriate, assess the benefit for the student (for example, if the benefit is a skill, assess how skilled the student is).
4. If appropriate, quantify the benefit for that student. Panels of expert judges are sometimes useful for this purpose. Their expertise may come from their

experience with programs of this type. (This is exactly what teachers do when they grade essays.)

5. Identify patterns of benefits. Was each student completely unique? Or, more likely, did certain types of students seem to benefit in similar ways? These findings about patterns of benefit may suggest ways in which the program can be improved. For example, suppose program faculty consider "learning how to learn" to be only a minor goal of the program. But 50% of their graduates report that "learning how to learn" was the single most important benefit of taking the program. In that case, the faculty might want to put more resources into "learning how to learn" in the future.
6. Synthesize data from the sample of students in order to evaluate the program's success.

<u>Additional defining questions about benefits</u>

Here are some additional questions to ask yourself before you begin assessing benefits.

Outcomes or Value-Added? When studying benefits, are you interested in outcomes (the state of things after the student completes the program) or in value-added (how much did their math understanding improve from the beginning of the course to the end)? Outcomes can often be improved simply by recruiting more skilled incoming students, while value-added is more a result of the education.

When is "after"? Imagine two programs about literature: A and B. Program A teaches a thousand facts about novels that can be easily memorized but that are quickly forgotten soon after taking the final exam. In contrast, Program B teaches students to love novels so that they continue reading and rereading books after the course ends. Program B also encourages students to join or organize book clubs so that they can talk with friends about the books they've been reading. Program B's students finish with less factual knowledge than students from Program A but, over the years, Program B graduates become increasingly knowledgeable about literature. An exam taken immediately after the completion of the two programs might show higher scores for graduates of Program A. But in another exam, given three months later, Program B's students might outscore Program A's. Two years later, the advantage of Program A over Program B might be even larger. There are many factors to consider in deciding when to assess benefits. The purpose of the program is one of those considerations.

Same Outcomes, or Just Similar? When comparing learning outcomes of Programs A and B, ask whether the two programs are trying to teach <u>exactly</u> the same things. If they are, comparing benefits is easier: use the same assessment measure for both programs. That's the assumption that many people make about assessment: the most fair and appropriate approach is to the use the same test of outcomes on the two competing programs.

But that equivalence of goals is rare, especially when technologies are used differently. Instead the two programs usually have goals that only overlap, as shown in Figure 3.

Imagine that Program A is taught mainly via lecture in a classroom. The competition, Program B, uses videotapes of that faculty member's lectures supported by an online seminar that is led by an adjunct staff member. Goals distinctive to Program A include benefits of face-to-face contact with a tenured faculty member. Goals distinctive to Program B might include benefits of greater student freedom to explore topics of individual interest, greater in-depth exploration of certain topics in the online seminar, and learning how to collaborate online with other students. A study of benefits that only attended to the common goals (learning of course content, for example) would miss some of the major reasons for choosing one program over the other. In cases such as these it's important to assess all the important goals, not just those that are common to the competing programs.

Categories of benefit and how to assess them

There are many categories of benefit from technology use for education, including:

A. Enrollment and attrition (access to education)
B. Better outcomes on traditional goals (teaching-learning effectiveness)
C. New outcomes not previously sought or emphasized (e.g., computer-dependent aspects of disciplines such as geographic information systems in geography)
D. Variety of offerings available to each learner
E. Consequences of A, B, and C for the graduate (e.g., employment)
F. Consequences of A, B, and C for the community in its economic, social, spiritual, and political life.
G. Consequences of gains in personal and program efficiency (e.g., writing more because it's easier to use a word processor than a typewriter)
H. Cost savings and revenue increases
I. Helping the institution attract and retain students and staff who expect a certain degree of technology access.
J. Helping the institution attract and retain support from outside constituencies who expect to see a certain level of technological infrastructure.

This chapter will focus on methods for analyzing benefits A, B, C and D. The rest of this volume focuses mainly on benefit H: cost saving and revenue gains.

A. Access benefits

Some programs are designed to produce gains in access to education: people who couldn't otherwise have taken courses of this type; people who can now take more courses; people who would have been less likely to pass such courses.

The uniform impact perspective usually invites attention to changes in total enrollment and retention either for all learners (total enrollment) or a particular target group (e.g., students of color). To assess changes in enrollment obviously requires counting students (not as easy as it sounds) and, sometimes, getting data to indicate why they are enrolled. For example, evaluators of distance learning programs need to know not only how many students are enrolled but also how many of those course enrollments would have occurred even without the distance learning program.

The unique uses perspective raises the question of whether particular types of students are especially aided or impeded by program features. For example, do online programs tend to attract and retain students who are more comfortable in that environment than in a face-to-face class?

It's important to look at these unique uses issues in enrollment and retention. Historically, changes in educational structures have opened access for some groups while restricting access for others (Ehrmann, 1999a). The analyst and the policy maker need to deal with whether the net change is positive, whether the groups who benefit especially need that benefit, and whether the groups that are impeded are groups that have been excluded by past arrangements as well.

B. Better outcomes on traditional goals

In this situation, the goals of the two competing programs are the same.

In a uniform impact assessment, it's appropriate to use objective tests of student performance students from Program A and B. A high degree of skill is often needed to design objective tests, but only a low amount of skill is needed to "grade" the results: how much time did the student take to finish the task? Did the project designed by the engineering student actually function? How many questions were answered correctly?

One sign that a unique uses perspective is important for assessment is that there is more than one way to define "successful learning." Then a high degree of expertise is usually needed to assess and grade student work, e.g., evaluating an essay or term paper, judging a student project.

C. New outcomes, better outcomes?

Computers are often used in order to change the goals of instruction: a new course of study in e-business or computer music; education in how to solve problems in a virtual team, an increased emphasis on complex problem solving and abstract thinking in a course where computers can now handle the skills that once required memorization of rote problem-solving methods. So part of the value comes from outcomes that are unique to one program or the other. This brings us back to the challenge of comparing programs whose goals are at least somewhat different (figure 3) or even wholly different.

In these cases, program A and program B use different projects and tests to assess student learning. Even if we discover that students in program A scored 5 points higher on test A than students in program B did on test B, that tells us nothing about which program is more valuable. What about giving students in both programs a test that includes everything in both program A and B? Testing students on something they weren't taught often leads to rebellion.

There are at least two feasible ways to assess learning outcomes in programs with different goals.

Criterion-based assessment: It is sometimes possible to assess learning against a standard. Program A is teaching pilots to fly airplanes while program B is teaching students to ride bicycles. Program A's students also learn to fly, while program B teaches only half its students to ride a bicycle without falling over. In that sense Program A is more successful than Program B, even though different tests have been used.

But that kind of comparison doesn't deal with the value of teaching people to be pilots versus bicycle riders, and that's a tough question. But suppose advocates of Program A and Program B could agree on a panel of expert judges to assess their programs. Those judges would be given materials describing the programs' goals and teaching methods, the tests and projects used to assess student learning, and the results of the assessments (test scores, student projects). Using these materials, the judges could then compare the two programs. For example, suppose a disciplinary association in graphic arts was considering two ways of teaching, one of which was more technology-intensive than the other. A panel of employers and graduate school representatives might examine data about entering students, the curricula, tests, and artwork from seniors. The panel would then report on which Program they preferred, and why.

D. Variety of offerings available to learners

Education is being transformed by our uses of technology (e.g., Ehrmann, 1999a). One benefit of that change is the variety of offerings, learning resources, experts and peers that are potentially available to each learner. How might the analyst assess the value of this variety – both what's offered, and what's actually used?

The uniform impact perspective treats all learners and potential learners as equal. For example, in comparing Program A and B, the analyst might ask how many sources of information are used by students doing research papers. In comparing a virtual university to a campus-based institution, the analyst might compare the ways and places where faculty members were educated: does the virtual institution offer a more varied set of teachers than the campus?

The unique uses perspective focuses on the different experiences of each learner. It tends to direct attention toward the ways in which different types of students exploit the available resources. Perhaps a unique uses evaluation would conclude that Virtual University A fostered a greater variety of student learning, due to its flexibility and ability to reach out for resources than did Campus B, whose students learned more in lock step, using similar academic resources for similar purposes.

Assessing activities

The previous section focused on four categories of outcomes and how (using uniform impact and unique uses methods) each might be assessed.

But assessing outcomes alone doesn't tell us much about how to *improve* those outcomes (e.g., Ehrmann, 1999b) We need, at minimum, to look at activities, also: what people are actually doing in order to produce those outcomes. For example, knowing that mathematics scores are higher in Program A than in Program B doesn't tell us how to improve math scores unless we also know whether and how students learned math in each program. That's as difficult as finding out how people spend their time in cost studies: what students are supposed to do in programs is not always the same as what they really do. But it's people's actual activities that determine educational outcomes, not pedagogical theories.

So, if one purpose of a benefits study is to guide future action, the study must look not only at outcomes but how people actually used the technology to behave differently in program A than in program B. For example, if program A was spending money on an advanced e-mail system, did faculty use it to communicate more frequently with students? If so, is there evidence linking that change in faculty-student contact to better learning outcomes?

The study can go even deeper in looking for data to understand and improve benefits: *why* did faculty and students choose to use the advanced e-mail system as they did. Why did others fail to use it at all? If, for example, some students didn't use the system because they didn't know how, a modest investment in technical support might improve use of the system, faculty-student contact, and learning outcomes. If other students didn't use the system because they thought the faculty member didn't want to be bothered, the faculty member could take steps to correct that impression, which would also ultimately help improve learning outcomes.

Years of research indicate that improvements in activities such as faculty-student interaction, student-student collaboration, time on task, and active learning usually lead to gains in benefits. So some studies treat the changes in those activities as the benefits of interest. The Flashlight Program (http://www.tltgroup.org/programs/flashlight.html) has developed survey and interview questions (the Current Student Inventory and the Faculty Inventory) to help carry out such studies.

Summary

It's not surprising that cost studies often ignore benefits: there are many reasons why benefits are difficult to study at the same time as costs. But failing to analyze benefits creates the risk that the cheaper program option will automatically be considered better.

Before designing the particular instruments for studying benefits, one needs to consider some challenging questions first:

a) Is the program mainly trying to attain the same benefits for all learners (uniform impacts)? Or is the program also designed to help each learner make unique use of its opportunities? Most college and university programs have both goals, and each set of outcomes needs to be assessed differently. In particular, when studying unique uses, one needs to assess each student in the sample separately and then afterward synthesize these assessments in order to evaluate the program.
b) Is the study going to consider educational value-added (students at the end of the program contrasted with students at the beginning) or only outcomes? If value-added is to be evaluated, then some kind of pre-test is necessary.

c) Is the study going to measure benefits as the program is concluding (e.g., final examination), and/or some time after the program ends (e.g., at a time when students would actually be making use of what they learned in the program)? During this waiting time, some knowledge and skill will diminish while other educational outcomes may improve (if the student continues to use them).
d) Different categories of benefits (e.g., access outcomes; traditional learning outcomes; technology-related learning outcomes; variety of offerings) need to be assessed differently. The uniform impact/unique uses distinction also suggests alternative ways of assessing each of these types of outcome.
e) If one of the goals of the study is to improve program effectiveness, it's important to gather data on what people are actually doing in the program ("activities") as well as about outcomes. It's even more useful to gather data on why people are behaving as they are. For example, study factors affecting their choices about whether and how to use technology; those insights can be used to foster more appropriate and successful use of technology to improve learning outcomes.

References

Ehrmann, Stephen C. (1999a) "Access and/or Quality: Redefining Choices in the Third Revolution," *Educom Review,* September, pp.24-27, 50-51. On the Web at http://www.tltgroup.org/resources/or%20quality.htm

Ehrmann, Stephen C. (1999b), "What Outcomes Assessment Misses," in *Architecture for Change: Information as Foundation.* Washington, DC: American Association for Higher Education. On the Web at <http://www.tltgroup.org/programs/outcomes.html>

Figures

Figure 1. Uniform Impacts

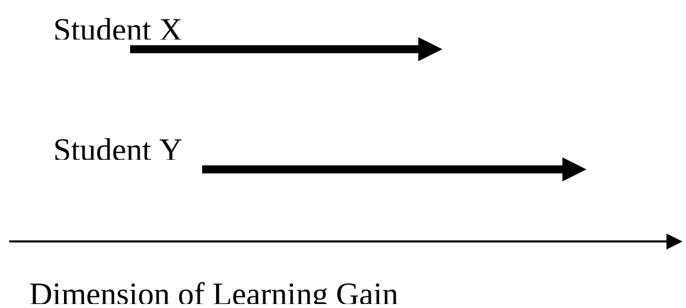

Figure 2. Unique Uses

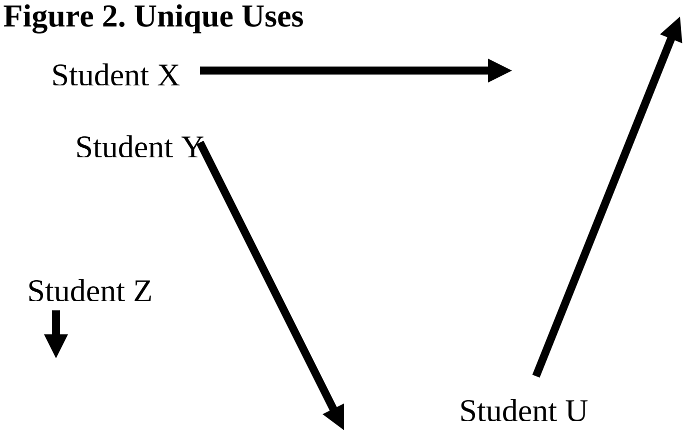

Figure 3: Comparing the Learning Goals of Two Competing Program Designs