

**Development, Delivery, and Effectiveness:
Evaluation of Innovative Online Instruction at a Research University**

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Abstract: This study describes the development and implementation of an evaluation system applied to newly created Masters level online programs at a major metropolitan research university. A systematic approach to evaluation provided formative feedback on the processes and products of course development. Multiple data sources including course documents (Instructional Design Plans, course syllabi, and on-line course materials), individual and focus group interviews (with instructors and designers), and web-based surveys (of instructors and students) were synthesized to provide the foundation of a comprehensive system for evaluating, verifying, and contrasting inferences related to both pedagogical and technological qualities. Results of both quantitative and qualitative analyses support the integrity of the evaluation system and underscore the importance of a carefully planned and executed approach to the evaluation of distance learning courses.

Introduction and Purpose

Online courses are proliferating at institutions of higher learning. The National Center for Education Statistics reported “in 2000–2001, 90 percent of public 2-year and 89 percent of public 4-year institutions offered distance education courses” (Tabs, 2003, p. iii), a marked increase from the 1997-1998 report (78% for 4-year and 62% for 2-year institutions). The advantages of offering a cost effective means for delivering a broad curriculum to students are also encouraging high schools to enter the virtual arena. An independent study by Interactive Educational Systems Design, Inc. (which was sponsored by Apex Learning and Blackboard) reported “more than 50 percent of U.S. high schools are currently offering online courses or exploring them for the future” (Apex Learning Inc., 2002, p. 1). A survey of state technology coordinators (conducted by Education Week in 2002) indicated that 12 states had established a virtual high school; 32 states had e-learning initiatives; 25 states allowed cyber charter schools; and 10 states were planning to administer online assessments (Technology Counts, 2002).

Large-scale evaluation studies have been conducted for several virtual high schools. In 1999-2000, a multiple-method evaluation study conducted for the Florida High School concluded “under scrutiny invited by the school faculty and administration, the curriculum at FHS has met or exceeded standards we expect but don’t always demand of the traditional classroom” (Riders & Connors, 2000, p. 183).

As online courses flourish in high schools and universities, it is important to conduct meaningful assessments. The primary purpose of this study was to develop and validate an evaluation system to examine the development, delivery, and effectiveness of web-based courses at a large, metropolitan research university. The evaluation and regulation of online instruction serves an important role in ensuring quality higher education for students. It is important to note that this research is the first in a series of studies designed to inform the development of a framework to evaluate a 5-year, university-wide technology initiative.

Although the focus of the current study is the evaluation of post-secondary online courses, the implications for K-12 education are numerous. The recent push for a P-16 or K-16 ‘seamless’ education system (Ercegovic, 2003; Reising, 1996), the increasing tendency for students to graduate earlier from high school, the amplified emphasis on college preparation and college-credit classes in high school (Rajala, 2003; Olszewski-Kubilius, 2002), and the prevalence of distance learning in the K-12 system (Donlevy, 2003; Collins, 2001) all support the relevance of this work beyond post-secondary education. Many of these initiatives or changes in educational philosophy are related to policy initiatives such as the recent No Child Left Behind Act of 2001 (Public Law 107-110, 2001). Educators at all levels are expected to provide empirical evidence of the effectiveness of their practices and policies, including distance learning.

Perspective or Theoretical Framework

Large scale evaluation planning and implementation should be grounded in formal models of program evaluation. A consideration of the variety of standards, theories and models for evaluation, within the context and nature of the specific program to be evaluated often suggests an amalgam model or framework that will

provide direction for evaluation planning. Our evaluation blended components advanced by the Joint Committee Standards for Educational Program Evaluation (1994), with models that trace their roots to Stufflebeam's CIPP model, providing a framework for the evaluation of a program's *context, input, processes* and *products* (Stufflebeam, 2002). We also consulted instructional design models such as the systems-based Dick and Carey model (Dick, Carey & Carey, 2004) that focuses evaluation efforts on applications of learning theories and principles that guide the design and development of instruction.

Further, special attention was given to Eaton's (2002) recommendations to accreditation agencies for evaluating distance learning. These strategies, entitled *Assuring Quality in Distance-learning*, were gleaned from a publication produced by the Council for Higher Education Accreditation (Phipps, Wellman, & Merisotis, 1998). These suggestions include providing substantive evidence of contact between faculty and students; evidence of effective instructional techniques (e.g., modular learning, collaboration, and attention to varied learning styles); and focused attention on the development of courseware and the availability of information.

In addition to Eaton's (2002) recommendations, the recently adopted standards of the International Society for Technology in Education (ISTE, 2002) were consulted, with careful attention to essential conditions required to create learning environments that are conducive to powerful uses of technology. Although the aforementioned standards were developed specifically for teacher preparation programs, a subset of the essential conditions was deemed appropriate during this stage of our research. For example, the essential conditions of an effective system that coheres around a shared vision for the integration of technology and its use to support new modes of teaching and learning are critical contextual factors in the project. Of course, educators must be skilled in the use of technology for learning, and must have consistent access to professional development in the support of technology use in teaching and learning. Further, the development and implementation of an assessment system to monitor the effectiveness of technology for learners is imperative. These critical components were blended into

the interview protocols and faculty and student surveys. Further, course artifacts such as course syllabi, instructional design plans, and online course materials were examined for evidence of these essential elements.

RESEARCH METHODS

The courses examined in this study were initial components of a comprehensive series of online courses that are anticipated to fulfill the requirements of Master's Degree programs in three distinct disciplines. Data were gathered over two semesters from instructors and students in 16 courses. Four instructional designers provided technical support for the instructors during course development and initial delivery.

The process undertaken reflects a triangulated approach to evaluation, consisting of multiple methods of gathering data to both develop the evaluation system and begin the process of course evaluation. Initially, our 11- member research team, comprised of measurement, technology, and evaluation specialists, looked to the literature to glean information regarding accreditation standards, the use of technology in higher education, and effective course evaluation (see, for example, ISTE, 2002; NCATE Standards, 2000; Barron, 1998; Phipps, Wellman, & Merisotis, 1998; Moore and Kearsley, 1996). Next, we divided into work groups to develop a variety of instruments and processes to gather data on the development and delivery of online courses. Once instruments were developed, they underwent initial validation procedures, including expert reviews and pilot testing. Information gleaned from these steps guided further refinements.

Analysis methods employed included both qualitative and quantitative approaches. Data were gathered from students, faculty, and instructional designers. Three student surveys were administered, each designed to tap a different aspect of the student's experience with the online course. Faculty and instructional designers were also interviewed at the beginning of the semester to gather data on the issues and processes they faced developing and delivering these courses. Toward the end of the semester, faculty members completed a survey consisting of both selected and open

response items related to perceptions of course effectiveness. The collective responses were analyzed for themes in order to identify recommended practices for effective development and delivery of distance-learning courses.

In addition to information obtained from those directly involved with the courses, team members reviewed pertinent course documents (e.g., course syllabi, instructional design plans and online course content). This review was intended to provide evidence related to the breadth and depth of course documentation regarding pedagogical and technological innovations, as well as the degree to which different documents synthesized information for a given course and were reflective of actual course practices. These documents each have a unique purpose and serve to inform different aspects of course development and delivery.

RESULTS

The results of our investigation are organized with respect to the data collection method employed. We first discuss the results of our surveys (both student and instructor). We then provide a synthesis of what we gleaned from conducting interviews, with both the instructors and the instructional designers. Lastly, attention is given to the analysis of pertinent course documents.

Student Surveys

Initial Student Survey. A major purpose of this survey is to determine the entry characteristics of students enrolled in the online courses in order to tailor course design and delivery to their needs. Therefore, the initial survey focused on reasons for enrolling in the online course, previous technology experience, and the resources students planned to use to access the course.

The results suggest that only 20% of the students reported they would have “definitely” taken the course if it were not delivered online. More than half of the respondents reported that they live more than 30 miles from the campus at which the courses were offered, and 40% live more than 60 miles away. Additionally, nearly 70% reported plans to access the course from their homes. The majority of students indicated

that conventional class schedules (85%) and work obligations (78%) were among their reasons for choosing the online course, followed closely by the distance to campus (65%), associated parking concerns (49%) and family obligations (55%). Notably less frequent were students' learning concerns (18%), physical challenges (11%) and apprehension related to personal safety (10%). Participants claimed that the 'most important' reasons for course selection were class schedule, distance from campus, and work obligations.

The questions related to previous experiences suggested that the students were relative novices in learning via online distance education. For example, 32% of the group is enrolled in their first web-based course and an additional 12% have only one previous online course experience. Over 90% of the students are using a PC with fewer than 5% reporting the use of Macintosh computers. One-third report using computers at least three years old and 6% report using computers more than five years old. For the initial assessment of the ease of access, more than 90% of the respondents indicated that it was easy to obtain an ID card and the network ID required to access the course delivery system, to access the Internet and the server, and to obtain a course syllabus. Further, more than 85% of the respondents reported that it was easy to obtain help and to learn about the availability of the course.

Student Midterm Survey. This survey was designed to measure students' perceptions after completing approximately half of their online course. The items on this survey fell within five broad categories, *Technology Efficiency*, *Communication*, *Instructional Content/Information*, *Instructional Materials Presentation*, and *Overall Impressions*.

The majority of the respondents did not experience any technical problems with connecting to their courses, uploading assignments, opening documents and displaying graphics (ranging from 69% - 77%). Minor problems were experienced with broken links (36%), and major problems occurred less than 5% of the time. When asked how often participants used various means to communicate with their instructors, we were not surprised to learn that the most frequently used modes of communication were

email and electronic bulletin board (frequency of use at least once a week, 43% and 40% respectively). In response to questions regarding the utility of various aspects of online instruction, the overwhelming majority of participants were most satisfied with the online submission of assignments and the online grade book (> 80% reporting these aspects of the course to be *Very Useful*). The majority of students also felt that online quizzes and tests, online presentations, online help, audio and video, and links to other online resources were *Very Useful*. Ratings of the quality of graphics, font size, color scheme, language clarity and screen layout were noteworthy, with more than 86% of respondents rating these elements as *Good* or *Excellent*. Sixty-three percent of the participants claimed that navigation was *Very Easy*, and more than 90% believed that taking this particular online course was a good decision. Lastly, when asked to compare their assignments in an online course to those in more traditional course formats, 65% claimed they took about the same time to complete.

Student End of Course Survey. The items on this survey fell within three broad categories: *Delivery of Instruction*, *Technology*, and *Overall Impressions*. In general, responses were quite favorable for the items within the *Delivery of Instruction* subscale. Mean responses, on a 4point scale, ranged from 3.7 (*I completed assignments within specified deadlines, assignments were aligned with course objectives, and course requirements for successful completion were outlined in advance*) to 3.0 (*prerequisite knowledge and skills were beneficial for mastering course content and practice tests reinforced important concepts and skills*). Only one item fell below an acceptable level, (*I was able to skip over course content that was already familiar to me*) with a mean of 2.1. The average response for this set of items was 3.4 ($S = .53$), suggesting successful delivery of many of the aspects of these new courses.

Mean responses for the set of technology related items ranged from 3.3 to 3.4, implying the general availability and access of technological support. For the set of overall impression items (on a 5-point scale), mean responses ranged from 4.3 (*I would consider taking another web-based course*) to 3.7 (*Compared with other courses this course was excellent*). The average response for this set of items was 4.0. Collectively, the students

participating in this 'first wave' of online courses felt that the technology employed in these courses facilitated and motivated learning, and was aligned with students' interest.

Faculty Survey

End of Course Survey. The faculty end-of-course survey consisted of 30 selected response items (using a 4-point satisfaction scale, ranging from *Very Dissatisfied* to *Very Satisfied*) and 16 open-ended items. This instrument, designed to augment the information gathered through instructor interviews, tapped subscales of *Instructor Satisfaction* (with student learning, technical and collegial support, and satisfaction with the course as a product), *Experiences in Course Delivery*, *Dissemination Activities* and *Future Plans*. The instructors participating in the first round of course offerings reported being *Very Satisfied* on 21 of the 30 selected response items, including items addressing student performance, availability of technical support, working with the instructional designer, and satisfaction with the course as a product. Further, the instructors reported being *Satisfied* with seven of the thirty items, including interaction and communication with students, technology dependability and support received from the department and college. The instructor reported being *Dissatisfied* on only two items (support received from other instructors and ability to interact with other faculty using technology in teaching).

The open-ended responses corroborated the data obtained from the selected response items. The instructors reported being very pleased with the quality of the students' work in the course and the experiences collaborating with the instructional designers. Further, the instructors indicated improvements to be made in future offerings of these courses in terms of clarifying instructions for students and facilitating communications. Although no dissemination activities have been undertaken, the instructors reported plans for presenting information on their experiences at professional conferences in the future.

Interviews

Instructor Interviews. An interview protocol was developed consisting of 36 questions falling within six general areas: *Background/Training/Experience, Commitment, Support, Innovations, Satisfaction, and Concluding Remarks.* Eight interviews with six of the eleven faculty involved in the project were conducted during the first two semesters of the initiative (two instructors were available for both semesters). Two team members met with each faculty member to discuss their experiences with the delivery of their online course. The backgrounds and previous experiences with online course delivery varied greatly. One faculty member, for example, had delivered technology-driven distance learning courses in a variety of modes (e.g., web, email, satellite) for over five years. Conversely, two other faculty members indicated no previous experience delivering courses from a distance and had received minimal, if any, training beyond their own self-study. All faculty members interviewed, regardless of their previous experiences with online instruction, were enthusiastic about delivering their courses via this method.

Common themes were evident across the interviews despite notable differences in experiences and perceptions. Virtually all of the instructors indicated that the time required to design, develop, and deliver their course online was intense and, in many cases, much greater than what had been anticipated. Assistance for faculty, in the form of teaching assistants or other graduate student help, also varied, with some faculty receiving no additional support through graduate or teaching assistants to others with more than one assistant. All faculty members had the benefit of working with an Instructional Designer to help develop and deliver their courses under the grant. All faculty indicated that working with their designer(s) was a very positive experience and felt that the assistance of the designer was invaluable to successful and effective delivery of their courses. In addition to differences in support, variability in student load was also evident. One instructor had a cap of 5 students while another had nearly 70 students enrolled.

The degree to which technological assistance (in the form of hardware and software support and troubleshooting) was considered adequate also varied across instructors. While some instructors felt that they had the necessary, and even high quality, support almost the same number cited technology problems that interfered with both their ability to deliver instruction and their students' ability to receive instruction. One instructor discussed a situation in which they almost lost a student from the course due to the student's inability to acquire the student network ID needed to access the course over a four-week time period. Other issues included problems with download speeds, inoperability of certain tools in the course delivery platform, and lack of software available to do some of the instructional activities planned (e.g., upload and edit videotaped presentations by other faculty). Instructors also indicated varying experiences with developing a positive and community-oriented atmosphere online. Although at least three instructors felt that they had been able to foster a very strong sense of community and partnership both between themselves and their students, as well as between the students themselves, other instructors considered this an issue of potential concern. Two instructors cited instances in which one or two students began cultivating a 'negative' atmosphere online through inappropriate discussion postings and emails. Both instructors quickly attended to the situation by addressing their classes on the appropriate professional conduct needed in an online environment. In both cases, the instructors indicated that the problem was eradicated and that other students in the class thanked them (privately) for taking action.

All of the instructors seemed pleased with various aspects of innovations that occurred either as a part of their online course delivery or as a result. Three instructors indicated that putting together a class online required more thought and careful consideration of the organization and presentation of course material. A few noted that they had changed methods of assessment to both take advantage of the opportunities presented in an online environment (e.g., having students make web pages as a means of introducing themselves and communicating their learning) as well as circumventing potential problems with cheating (e.g., more project based assessment processes). Three

instructors also indicated that their experiences developing and delivering online courses had helped them make changes in courses they delivered face to face. Two instructors provided feedback on the different characteristics that they had noted for students to be successful in an online environment as compared to an in-class delivery mode. One instructor was particularly adamant that both modes of delivery are needed to meet the learning styles of different students.

Instructional Designer Interviews. A semi-structured interview protocol was used as a guide in interviews with three instructional designers. A team conducted the interviews, asking the instructional designers questions from the protocol, audio-recording the conversation, and taking notes. All participants were encouraged to elaborate on any issue to ensure all designers were comfortable during the interviews and that all of the information obtained was correctly interpreted by the evaluation team. A four-stage process was used to analyze the content of the designers' interview discourse; 1) information was synthesized from notes taken during the interviews, 2) the original audio recordings from the interviews were reviewed to verify the content of the notes, 3) data reduction resulted in a matrix containing seven domains of interest including both positive and negative themes for each, and 4) the matrix was sent to the instructional designers for review and verification.

The final domains include *Faculty/Designer Interaction, Monitoring Maintenance and Evaluation, Course Management System, Resources, Designer Perspective, Instructional Design and Instructional Development*. Overall the resulting matrix represents issues the instructional designers found both challenging and rewarding throughout the process. One of the most prominent positive results was a strong collaborative relationship built between the instructors and the designers, while the most prominent negative theme stemmed from restrictions placed on design due to the available systems for online course development and short time frames for development.

Document Analysis

Course Syllabus. When examining this particular document, we looked for the presence of key elements identified during other phases of our investigation, as well as evidence of the integration of technology with respect to six categories: *Contact Information, Online Resources, Course Delivery and Interactions, Processes and Products, Course Administration, and Software/Tools.* These six categories were identified by a team of measurement and technology specialists while developing a checklist instrument to analyze individual course syllabi.

Each category in the checklist contains at least five indicators representing the domain of interest. For example, with respect to *Online Resources*, syllabi were reviewed for explicit references regarding specific online resources for students such as: course syllabi, class notes, readings, or specific websites to view. As expected, the courses varied with respect to the availability of online resources, with some providing online readings, while others provided class notes. In all course syllabi examined (n=7), websites were provided for additional course materials.

The majority of the courses were offered via Blackboard; however, one course was delivered exclusively through the web and one via satellite. With the exception of a single course, all of the courses required students to create or interact with technology to produce course projects or presentations, and required some form of online submission of student work. Further, as might be expected, all of the courses required some form of asynchronous discussion or posting. Surprisingly, only one course made reference to the use of an electronic portfolio. Lastly, all of the course syllabi contained references to the technology requirements of the course (e.g., software, hardware, plug-ins, internet connections).

Instructional Design Plan (IDP). The primary purpose of the IDPs is to document the analysis for the course and provide a mechanism for communicating learning objectives, design strategies, and production schedules between the instructional designer and the course instructor. The instructional designers construct the IDPs based on preliminary syllabi from the courses and on-going discussions with the course

instructors. Although individual IDPs differ slightly based on the content and the designer, they all cover the *Analysis*, *Design*, *Technical Specifications*, and *Production Schedule* of the course. The *Analysis* portion of the IDP consists of goals for the course, learning objectives, and audience analysis. The *Design* portion provides information relative to the instructional strategies, course structure, and specific tools (such as bulletin boards and chat) that will be implemented into the course. The *Technical Specifications* section covers aspects of both the development and delivery environments. The *Production Schedule* outlines the tasks, responsible parties, and due dates.

Currently, the IDPs have been examined from the standpoint of the design strategies implemented and the “innovativeness” of the strategies. A total of nine IDPs were reviewed. Within the IDPs, we noted a variety of approaches across the courses. From this review, two major themes emerged – an emphasis on collaboration and project-based learning. In every case, the design plans stipulated that students would engage in discussions (synchronous and/or asynchronous) and work in groups to produce projects related to the course objectives. Several innovative uses of technology were also noted – seven of the design plans explicitly mentioned narrated presentations, and several plans called for the implementation of video, either as an introduction ($n=7$), presentation of content ($n=5$), or student project ($n=3$). All of the courses were divided into several units, with related content, links, and assignments for students. Only two of the courses included activities with immediate feedback (e.g., computer-assisted instruction tutorials).

Future planned analyses with respect to the IDPs include an examination of the relationship between the information in the IDP and the course syllabus, as well as an investigation of the consistency between the content of the IDP and the actual course content and delivery.

Course Content. A review of the online courses was utilized to understand how the courses use technology and innovative strategies for teaching and learning. A multi-category checklist was created to assess technical and pedagogical innovations

found within the online courses. The current version consists of four major domains, *Course Design, Instruction and Collaboration, Assessment and Learner Support*, which describe how the courses are implementing innovative strategies in ways to increase interactions and effectiveness. The review of the courses in this manner provides additional information that complements the other data sources, providing a vivid picture of the overall courses and the processes that cohere to create online programs.

The online course content analysis revealed many aspects of technology innovation being exhibited within the courses studied. Some of the innovations that were noted include; narrated, web-based presentations from the instructor, an online syllabus that hyperlinks content within the course to outside resources, webcast, video presentations that enhance content with authentic examples, and student use of technology such as making web pages and multimedia presentations.

We were also very interested in the extent to which instructors provided sufficient information regarding how to use the technology embedded in the course. In most of the courses, information was effectively communicated on how to use the interface, plug-ins, and other technologies required. Overall, the instructors and designers are building courses that implement levels of innovation appropriate for the students within the courses and specific contexts.

DISCUSSION AND CONCLUSIONS

The results of this study provide strong evidence that delivery of distance-learning courses needs to be carefully and thoughtfully planned and implemented. Both faculty members and instructional designers indicated that effective development and delivery of distance-learning courses is predicated on a close and collaborative working relationship.

The initial results of the field test of the student evaluations suggested satisfactory evidence of content validity with internal consistency estimates ranging from .70 to .90 for the individual subscales within the surveys. With respect to the essential component of interaction, students indicated that communication was a key

element in course effectiveness as well as the availability of resources and assistance. Findings from the examination of the psychometric integrity of the instruments will guide further refinements and enhancements to the planned system of evaluation.

As the proliferation of distance-learning opportunities continues in this era of educational accountability, educators, administrators, and institutions will need to have tools and methods available to ensure that the courses and programs they offer continue to meet the requirements of accreditation, policy-making, and funding agencies. This study provides a foundation upon which to build and further develop a system to meet the needs of a host of individuals and groups involved in higher learning, including faculty, administrators, and regulating or granting agencies. We anticipate that a variety of diagnostic tools and innovative methods will be necessary in order to meet the needs of large-scale evaluation endeavors in the future.

Initiatives for the retooling of higher education have generated a variety of programs in which technology plays integral roles. There is an attendant need to plan for creative teaching opportunities and the establishment of mechanisms to link them to widely accepted standards and accountability systems. Clearly, the development and implementation of such programs requires a carefully planned and executed evaluation strategy.

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