



E-Learning: Analysis, Design, Development, Implementation and Evaluation

Diane M. Graf

Operations Management and Information Systems, College of Business, Northern Illinois University
Tel: (815) 753-1286, Fax: (815) 753-7460, dmgraf@niu.edu

INTRODUCTION

The literature supports the pervasiveness of e-learning in education. Through the challenges, changes, successes and failures, most institutions are attempting to determine where e-learning fits in their curriculum. The College of Business at Northern Illinois University began discussing e-learning in 1966. Since that time, most of the College of Business' courses are technology and/or Web enhanced to the satisfaction of students, faculty and administration. For the past year, completely online instruction has been debated and experimented in several Colleges at the University. The College of Business' philosophy was to begin with courses that best met the "anytime", "anywhere", "anyplace" requirement within the curriculum.

At the Spring 2000 IRMA Conference, twelve questions regarding Web based education were addressed so faculty and institutions could avoid the pitfalls during instructional development (8). This paper addresses how these issues were handled during the instructional development of the Phase I MBA course for the College of Business at Northern Illinois University. As the analysis, design and development processes evolved, the 12 issues were condensed to five: curriculum, methodology, students, faculty, resources, and legal concerns.

For this paper, e-learning (e-course) pertains to courses taught completely online. Web based learning encompasses e-learning as well as Web enhanced face-to-face instruction.

CURRICULUM

One of the first questions raised by McAlister, Rivera and Hallem (8) is the potential for cannibalizing existing programs. They recommended that Web-based curricula have clearly defined criteria, supplement or complement existing offerings, and have administrative support.

With this in mind, faculty and administration at the College of Business, Northern Illinois University, evaluated their mission and goals. After extensive discussion, the Phase I MBA courses were identified as courses that best meet the mission and goals for an e-learning environment. Perspective MBA students must take the nine Phase I courses if they have not met the course requirements in an undergraduate degree or through continuing professional education. Student input indicated the importance of the Phase I MBA course availability at the front-end; immediate need and anytime learning were paramount to the working professional upon being informed that one of the courses was required for admittance to the MBA program.

The focus of the Phase I courses is foundation content. The courses are condensed and fast paced. Faculty and administration agreed that placing the Phase I courses completely online met the College's mission and student needs. For a pilot test, the Business Information Systems course was selected. All agreed that the learner-based activities would reinforce the technology that the students were studying.

METHODOLOGY

Traditional instruction is professor directed where the material is logically organized for lecture complemented with assigned readings, assignments, and exams. This teacher-centered approach often fails to take into account the way people learn. Modern research in cognitive science shows that people learn by doing, a learner-centered approach (9). Learner-centered instruction enriches e-learning.

Focusing on learner-centered instruction, several instructional design models were evaluated. All the models provide a procedural framework for the systematic "production of instruction." Since instructional design refers to the process of instructional program development from start to finish, the process can be summarized into five general phases: analysis, design, develop, implement, and evaluate.

The analysis phase is the foundation for all other phases. In the analysis phase, all aspects of course intent must be considered. Using the analysis outputs, how to reach instructional goals should be outlined. Some of the elements of the design phase may include writing a target population description, writing objectives and test items, selecting a delivery system, sequencing the instruction. Development builds on both the analysis and design phases. Instructional materials need to be developed. Also, all media that will be used during instruction and supporting resources (hardware, software as well as instructional resources) need to be identified. Implementation is the actual delivery of the instruction. This phase must be effective, efficient and promote students' understanding of the material, support the students' mastery of objectives, and ensure the students' transfer of knowledge from the instructional setting to the workplace. Finally, evaluation measures the effectiveness of the instruction. Evaluation should occur throughout the entire instructional design process – within phases, between phases, and after implementation. Both formative and summative evaluation should take place.

Six instructional design models were evaluated – Dick and Carey, Gerlach and Ely, Hannifan and Peck, Jerrold Kemp, Knirk and Gustafson, and Rapid Prototyping (5). Instructional design models serve different methodology criteria: expertise level, orientation level, knowledge structure, context, purposes and use, and theoretical basis.

Expertise level: The designer's expertise determines which level best serves his/her need. At the novice level, step-by-step descriptions are provided (Dick and Carey, Gerlach and Ely) versus the expert level, which is based on heuristics or a combination of methods from several models (Dick and Carey, Rapid Prototyping).

Orientation level: At the orientation level, a model is either descriptive about the learning environment (Dick and Carey) or prescriptive, outlining how a learning environment can change (Gerlach and Ely, Rapid Prototyping).

Knowledge structure: Procedural models focus on examples and practice (Dick and Carey, Gerlach and Ely) where declarative models emphasize analogies and discovery-type instruction (Rapid Prototyping).

Context: One of the better models for addressing higher education instructional design is the Gerlach and Ely model.

Purpose and use: Three of the models evaluated produce material for lessons in a course (Gerlach and Ely, Dick and Carey, Rapid Prototyping).

Theoretical basis: One model was based on the general systems theory (Dick and Carey).

Both the Gerlach and Ely model and the Dick and Carey model provided the necessary framework for the online instructional development. Both were referenced during the analysis, design and development of the Phase I Business Information Systems e-course.

STUDENTS

E-learning is student centered and according to a survey of 612 e-learners, 82 percent were satisfied with the electronic environment (7). Jupiter Communications, a market research firm, reports that 72 percent of United States teenagers will be online by 2003 (11). According to a Forester Research Study of high school students using the Web, 28 percent reported being online for 20 or more hours each week (11). Certainly, incoming college freshman will be "wired for the future" and familiar with electronic communication and learning.

Another study reports almost 68 percent of students are satisfied to very satisfied with using the Web as the primary source of course materials (2). Reasons for students' satisfaction include accessibility, convenience, flexibility, and student-teacher interaction. Learning in an online environment is student centered; the student is in control of when they will learn, where they will learn, and how often and how quickly they will learn. This level of control by the student should create satisfied students.

The results of these studies are contrary to issues raised by McAlister, Rivera and Hallem (8). The fastest-growing segment of higher education e-learning is the working adult who often finds it difficult to juggle the traditional classroom with jobs and families (12). The learning environment is changing to embrace the benefits of technology that support students' success. Key are "guidelines for success" (1) (6) which both students and faculty must understand and embrace.

Recommendations from the literature, institutional support for both instructional development and technology, following the two instructional design models, and the successes and failures encountered by Northern Illinois University colleagues provided insight about student expectations and needs in an online environment. The design and development of the Business Information Systems e-course incorporates collaborative tools that support learner-centered activities, navigation tags and icons for easy movement through the course Web site, formal and informal virtual office hours, and early activities to develop an online community.

FACULTY

The instructor role in an e-course is different than in a face-to-face classroom. The essence of these differences includes activities must be learner-centered, interaction will be technology facilitated, and information will be accessible through Internet-based technologies.

A focus on learner-centered activities involves a shift in teaching methods and course design. The challenge of translating knowledge through a visual, non-linear hypermedia technology platform requires an "entirely different pedagogy from which [instructors] . . . learned to implement" (4). During the design phase of an e-course, the teacher must be concerned with the transmission of information. Throughout the course, the teacher becomes a facilitator – motivating students and encouraging interaction among students and between students and teacher. Several instructional experts believe that interaction cannot be added to existing courses but must be introduced and integrated in such a way that it changes the instructional design model (10).

Web based teaching is more than learning to use the technology; it is about a different way to teach. Teachers need to learn and understand these different methodologies. Adopting a new instructional design and delivery mode becomes a large development task.

The technical knowledge and skills include familiarity with the course authoring software; communication technology including e-mail, discussion boards, file exchange, virtual classrooms, Internet and electronic resources; and hardware including computer, second storage on the network and peripherals. Faculties with Web page development skills have an advantage when designing the course pages.

General competencies include records management, organizational skills, attention to detail, and time management. Faculty must devise a method of organizing and managing the Web environment in order to provide the necessary encouragement for students and to ensure that the instructor's quality of life is maintained. Typically, interac-

tion with students in an e-course demands more time and attention from the teacher than in a face-to-face classroom. Brown (3) estimated about 40% more interaction time is required since students 'demand' more feedback, and the more they get the more they want! Students develop an intimacy in their communications that rarely manifests in face-to-face instruction.

Two and a half years of teaching the Business Information Systems content with extensive Web enhancements proved to be a beneficial prerequisite for the transition to a total online class environment. The development focused on "anytime," "anywhere," "anyplace" instruction while building an online community between students and students and faculty.

RESOURCES

Truly, a key cause of many systems project failures is lack of senior management support (8). Beyond hardware and software costs there are instructional design support requirements and student technology support.

At Northern Illinois University, the organization made a commitment to e-learning instruction by instituting a Faculty Development Center that supports faculty workshops and staff assistance as needed. Students are supported with a 7/24 help desk to assist with software technology issues. The course authoring software is a University wide platform supported by both the University and College Technology Divisions. The advantage of a University wide platform is the seamless learning environment for students. As more courses are added to the e-learning environment or enhanced by the Web course software, the students' learning curve declines.

However, the best-laid plans have problems; particularly during the first year of a new initiative. There is a learning curve for faculty and staff who support both the Faculty Development Center and help desk. Many times "basic" hardware purchases do not meet the courseware requirements. Also, the network server can quickly become inadequate when Web instruction sweeps the campus. As most individuals who work in the world of technology have experienced, one must be proactive to "win the prize" realizing that issues can be corrected during the evaluation phases and iterations of the instructional design process.

LEGAL CONCERNS

With the growth of the Web and proliferation of e-learning instruction, many legal issues come to the attention of administrators. The issues not only deal with where the material is obtained to develop the course, but what about others copying the online material for some other use. Any content posted online can be easily copied and reused.

This new online learning environment promotes the importance of partnerships among educational institutions, faculty, and publishers. A key question asked by most faculties is "who owns the material?" This varies from country to country. In the United States, the legal term "work for hire" means the company owns work designed by an employee meeting employment obligations. The educational world brings new issues as faculty instructional materials, including published books and papers, typically are recognized as faculty owned (9).

RESULTS OF A PILOT PHASE I MBA E-COURSE

After careful analysis and discussion, the decision to design e-courses for the Phase I MBA curriculum was approved by administration and faculty at the College of Business, Northern Illinois University. Analysis, design and development of the first Phase I 8-week e-course, Business Information Systems, followed the framework of two instructional design models: the Gerlach and Ely model and the Dick and Carey model. The analysis outline, course objectives, testing materials and instructional sequence were designed based on input from the MBA Director and the Operations Management Information Systems (OMIS) students, faculty, and staff.

To understand student needs and faculty responsibilities in this new learning environment, a review of literature and Web based development workshops were attended. Throughout the development of the course, the University Faculty Development staff, College of Business Technical Support staff, and two colleagues involved in e-learning provided evaluation and feedback. In early October, 2001, a review of the course by 16 Northern Illinois University and College of Business faculty and staff produced positive feedback with minor revision recommendations.

The first class was offered in the second half of the fall semester, 2001, with an enrollment of 30 perspective MBA students. Since this was the first College of Business MBA e-course, an e-mail describing the environment was mailed to all 30 students. A letter inviting the students to an optional *Introduction to E-learning* session followed the e-mail. Prior to the introductory e-learning session, four students dropped (enrollment errors and conflicts) and one added. Of the 27 students enrolled, 17 students (62%) attended the introductory session. At the end of the e-course, all students indicated that the introductory session should be offered with 69 percent recommending that the introductory session be optional.

Although informal feedback was received from students throughout the e-course, results from a formal feedback survey using a 5 point Likert scale addressed the e-learning environment, learner-centered activities, and teacher as a facilitator. With one student dropping after the fifth week, 26 students completed the final survey with two students not completing page two (questions 25 – 35).

E-Learning Environment

The overall mean (3.2) regarding the e-course as conducive to learning was neutral with a standard deviation (SD) of 1.327. Seventy-nine percent of the students used their home computer. Students experienced technical difficulties in gaining access to the e-course approximately 10 percent of the time.

Students evaluated the purpose and objectives (3.8 mean, 1.1896 SD) and grading policy (4.46 mean, .7060 SD) as clear to very clear. The virtual lectures (4.1 mean, .7317 SD) and online quizzes (3.8 mean, .9469 SD) were evaluated as beneficial. However, student interaction through e-mail, discussion board (asynchronous), and virtual chatroom (synchronous) were not considered as important to their learning (2.9 mean, 1.4400 SD).

Learner-Centered Activities

Ninety-five percent of the students found the course slightly more difficult than other college courses with 75 percent indicating that the workload was higher than other courses. The e-course required learner-centered (hands-on) activities each week to reinforce the session material. The activities started with an e-mail assignment, progressed to an asynchronous (discussion board) sharing assignment, sending material through the system drop box (versus e-mail), and file exchange within groups. There were three required virtual lectures (asynchronous) and the opportunity for synchronous chat. While students were neutral about the activities effectiveness in learning (3.3 mean, 1.2310 SD),

- the course material was considered to be taught at an appropriate level based on their ability (mean 3.7, .8629 SD); Phase I courses are to overcome content deficiencies for admittance into the MBA program.
- the approach to teaching was considered interesting (3.5 mean, 1.0648 SD).
- the teacher encouraged active participation in the course (4.1 mean, .7317 SD).
- students felt the exams and graded activities provided an opportunity to demonstrate their knowledge and level of understanding of the course content (3.5 mean, 1.2703 SD).

Teacher as a Facilitator

In an environment where instruction is delivered without face-to-face interaction, the students perceived the teacher as a facilitator of learning with mixed reaction. Students were positive regarding:

- sufficient feedback provided (4.3 mean, .7883 SD) on a timely basis (4.46 mean, .58173 SD)
- teacher's knowledge of the subject material (4.0 mean, 1.0167 SD)
- treating students with respect (4.6 mean, .6176 SD)
- concern for student learning (3.9 mean, 1.1635 SD)
- challenging students to achieve a high level of performance (3.6 mean, 1.0982 SD)

The following e-learning conditions must be reviewed:

- the teacher facilitates learning (3.3 mean, 1.4717 SD)
- the teacher motivates students to learn (3.07 mean, 1.3834 SD)
- the teacher assists in improving student's problem-solving ability (2.96 mean, 1.3109 SD)

CONCLUSION AND RECOMMENDATIONS

While the overall evaluation of the teaching effectiveness was high (4.0 mean, 1.1000 SD), the course will be revised based on student feedback, review of the instructional design, review of the goals of the Phase I MBA curriculum, and analysis of resources available. In the spring semester, 2002, two additional classes will be offered with an anticipated total enrollment of 60 students. Formal surveys will be administered to the two spring semester classes and results compared with the results from the fall semester, 2001 pilot Phase I MBA e-course. Recommendations regarding e-learning will be provided.

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