

# CREATING E-LEARNING PROGRAMS: A COMPARISON OF TWO PROGRAMS

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**Abstract** <sup>3/4</sup> The University of Texas at Austin recently developed two online certificate programs. Both followed a standard development process, and both aimed at the use of an instructional model based on learning objectives. They were dissimilar in that one converted an existing, traditionally taught program, while the other was a completely new development. The expectation was that the new development would have certain advantages in that it could be designed for online from the beginning, unfettered by legacy. The surprising result is that the residual “teacher” model from the existing course contributed to the success of the conversion. The most compelling notion, gained from both experiences, is that all development must share fundamental process and quality characteristics to be successful in the e-learning environment. This paper describes our development process, compares the results from development of the two programs, shares lessons learned, and outlines plans for future elearning in the College of Engineering.

**Index Terms** <sup>3/4</sup> continuing education, e-learning, lifelong learning, instructional development, online learning.

## INTRODUCTION

Opportunities to distribute education and training, afforded by the Internet, can become *challenges* when older paradigms are applied to new technology. Students now expect much more than simple online access to course materials, and as such are contributing to the demand for change in instructional delivery.

We define e-learning as the experience of gaining knowledge and skills through the electronic delivery of education, training or professional development. It encompasses distance learning and asynchronous learning, and may be delivered in an on-demand environment, or in a format customized for the individual learner.

A standard model of the instructional process provides three stages for the teacher: the preteaching stage; the teaching stage; and the postteaching stage [1]. In our development of the two elearning programs described in this paper, we converted one course that used the standard instructional process and for the second program, we shifted to more of an instructional design model where the “teacher”

is not as integral to the development process. That is, we did not convert a traditionally taught class for the second program, but instead we created content without a “teacher” involved. This raises the question: Is the process to develop e-learning consistent with what we use to develop traditional instruction?

There is a wealth of literature and research regarding “teaching” and in this paper, we will instead focus on our experiences developing e-learning programs using a systematic design of instruction, also known as instructional systems design (ISD) and the lessons that we can share from these efforts. We are not suggesting that e-learning needs to be derived from the standard model of instruction, but rather we will share with you our experiences taking one traditional course online and our experiences creating original content into an online program. As you will read, both processes needed ISD. The lessons we learned can help others build upon our experience, creating a better awareness of issues that impact online course development.

## E-LEARNING DEVELOPMENT PROCESS

Instruction is not enhanced by technology when it is merely shuffled from one medium to another, failing to take into account the strengths of different media, or forgetting that learning is an active process. It is very difficult to take what goes on in a traditional classroom and transport it into an e-learning environment. Early attempts at online learning failed to engage learners because the instruction was static and non-interactive. It can be difficult to sit at a computer, watch streaming media with a “talking head” and stay engaged. However, today’s online learning tools can provide rich, interactive environments where students are actively participating. Students can respond to questions in a chat room, have “digital dialogues” on bulletin boards, and receive instant feedback on quizzes.

The traditional model of instruction has a teacher creating the curriculum and delivering it, but that model does not necessarily work off online instruction. Good online courses are often developed using ISD, that is based on the tenets of instructional design. With ISD, a development team rather than an individual creates online courses. Traditionally, professors have developed their courses on their own with little regard to the demands of

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other people's schedules and they have not needed technical support or utilized instructional designers [2].

Additionally, ISD focuses on the student and what they will know and do at the end of instruction. "The fundamental principle of the ISD approach is that all aspects of learning and instruction should be defined behaviorally so that what the students is expected to learn can be measured and teaching can concentrate on the student's observable performance" [3]. Basically, ISD poses three questions: First, what do I expect a student to be able to do? Second, in what way should the student demonstrate learning? Third, what student performance is acceptable as evidence of learning?

Designing an online course requires:

- Understanding the role of motivation in learning
- Assessing and using students' prior learning
- Creating an inventory of students' learning styles
- Understanding learning processes and how to best-fit learning styles
- Planning for collaborative/cooperative and problem-based learning
- Assessing course and student outcomes
- Knowing how to use instructional technology tools

While these requirements are often needed for more traditional course development, they are *essential* for online course development. Without an understanding of the learner, the technology, and interactions between the two, online courses can be static and do not fully utilize the Web's potential.

With variations on each phase or task, both programs generally adhered to the process model shown in Figure 1.

### The Development of Two Programs: SWPM and EMIT

The first program involved transitioning a traditionally delivered class to an e-learning format. Software Project Management (SWPM) is a well-established traditional non-credit program that has been successfully delivered for more than 10 years.

The organizational structure of the class was in place, as well as the bulk of the content details. One evening each week, students living in the Austin area physically attended class on campus. During the class, the instruction was Web

cast to those outside the area and simultaneously videotaped.

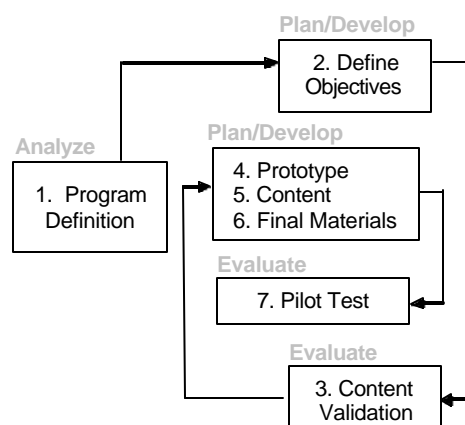


FIGURE 1  
CLEE PROGRAM DEVELOPMENT PROCESS

The second program, the Executive Management IT (EMIT) program, was a completely new program and was intended for online delivery from the beginning. Unlike SWPM, there was no course structure from which to work.

From the onset, EMIT was a collaborative effort that used experienced practitioners from various specializations in the IT arena as subject matter experts (SME). The development process was managed by a CLEE program manager. An instructional design consultant serving in an advisory role was added to the team after the project was underway, but the SMEs carried primary responsibility for designing and developing course content.

We will briefly explore the differences in the way each step in the development process unfolded for each program.

**1. Analyze: Initial Program Definition.** SWPM stayed true to the scope and content of the certificate program that was developed by its advisory board in 1993 and refined in 1998.

In this first step, SWPM had the advantage of existing content, ready to use. EMIT had to work and research appropriate content, but was not hampered by preconceived notions about what it should be.

**2. Plan/Develop: Defining Objectives.** With SWPM, objectives for each lesson existed from prior deliveries, but they had been written by the practitioner instructors. They were refined by instructional designers and assembled into an integrated, outlined whole.

With EMIT, it was only after the advisory team was well into the process of defining content, that an instructional designer joined the project, refocusing the effort on defining instructional objectives to drive development.

Both programs had to work hard at defining objectives. One of the greatest challenges with instructors/SMEs, who are responsible for content development, is getting them to understand that objectives, not topics, should drive course content.

**3. Evaluate: Content Validation.** Because SWPM had been offered and continually improved for almost 10 years, the content was deemed to be sound. Two focus groups were conducted to validate plans for EMIT.

**4. Plan/Develop: Prototype Development.** Tapes of SWPM lectures were digitized to become video segments in the online topic presentation. Reading lists and individual exercises were developed, along with instructions for team deliverables based on a case study.

A prototype of a single EMIT session representing one week of the course was developed. Built in the target delivery platform, it provided a concrete example for content developers to reference.

With both programs, text-based templates were developed to provide structure for the upcoming content development task. The main goal of the templates was to encourage consistency.

**5. Plan/Develop: Content Planning.** For SWPM, the content had to be tightened, rather than developed. What was originally 48 lessons had to be condensed into 34 lessons, in order to refine the content and to correlate it with the just-published text book for the class [4].

For EMIT, we assembled four teams of paid SMEs, one for each of the four modules. Each team was charged with compiling content for their assigned module based on the objectives provided. Based on the SWPM instructional designer, it was decided that the teams would be given their objectives. We found that practitioner instructors had difficulty in creating objectives.

Both the SWPM Instructional team and the EMIT SMEs were asked to:

- Plan a logical sequence of sessions and lessons of each module
- Recommend group activities, individual activities, discussion topics, test items, and interactive multimedia activities or assets
- Identify web-based articles and appropriate textbooks to be used for reading assignments
- Assure that all materials and activities support the objectives
- Provide case scenarios, examples, models, templates, or other assets required to illustrate concepts or carry out recommended activities

**6. Plan/Develop: Final Materials Development.** SWPM lesson plans were prepared in the format of an approved template, then translated into actual online components. Each lesson plan, and each completed lesson was reviewed by a team member; suggestions and corrections were returned to the author.

The initial EMIT documents, from the content planning team, were highly diverse in terms of format, approach, and level of detail. A single SME was given the task of finalizing the course materials, focusing on completing the module and making the various components consistent. The resulting documents were highly diverse in terms of format, approach, and level of detail.

TABLE I  
COMPARING THE TWO PROGRAMS

	SWPM	EMIT
Type of Team	'Instructional Team'	'Development Team'
Availability of Content	Existing content, based on a known body of knowledge.	No pre-existing content or structure, no standard body of knowledge
Team Makeup	The instructional team (all subject matter experts, or SME) had a long history of working together, and with the content which they had, for the most part, developed themselves	Multiple (up to 16 at one point) subject matter experts serving as content developers had no history of working together – most had little or no experience instructional development
Project Management	Project management was done by an instructional team member, who was also a certified Project Management Professional (PMP)	Project management principles were not strictly followed
Team Task	The task of the SWPM team was to reduce content	The task of the EMIT team was to build content
Instructional Design	Instructional design and the use of instructional technology was provided when needed in a consulting mode	Instructional designer a member of the development team serving in an advisory role
Existence of Material	Archive of media collected from previous traditional offerings of course	No existing archive of media – all media would designed and developed for online delivery
Experience with online delivery	Key member of the instructional team had experience with developing courses for online delivery	Only one member of the development team was familiar with online course development, and none of the subject matter experts had experience with online courses.

**Type of Team.** The benefit of having an instructional team is that the developers are intimately familiar with the content and have experience in knowing what the student is expected to learn and how it can be measured. The disadvantage is that they may be wearing blinders when considering translation of material to the online “constructivist” model where students have to “pull” information on their own instead of having it “pushed” by the teacher. The SWPM conversion, having the “teacher” or experiential model combined with the systematic design of instruction (ISD model), provided more insight than the EMIT new development, which relied on ISD alone.

**Availability of Content.** The SWPM conversion relied on software management skills defined by the original advisory board. These skills are based on widely accepted bodies of knowledge in the software and project management industries: the Project Management Institute (PMI), the American Society for Quality (ASQ), the Institute for Electrical and Electronics Engineers (IEEE) and Carnegie-Mellon's Software Engineering Institute's Capability Maturity Model (SEI's CMM). While EMIT had a large IT industry to research, it did not have advisory board guidance that culled the information into a manageable set of skills for the IT manager.

**Team Makeup.** Team dynamics played an important role in the development of each program. SWPM had worked together for years and recently collaborated on a text book. EMIT, on the other hand, dealt with 16 developers, all new to the program and to each other. The Program Manager and Instructional Designer were relatively new to the organization as well.

**Project Management.** One of the most important lessons learned is that all program development benefits from following basic project management principles.

**Team Task.** In both cases – reducing content (SWPM) and building content (EMIT) – we found that the core development team has to have the right combination of expertise. There are several domains of expertise that come into play including knowledge of subject matter, online delivery techniques, instructional design, and managing development projects. The core development has to have all those bases covered, and the expertise needs to match the development role.

**Instructional Design.** New development (EMIT) had the advantage of an instructional designer as team member. She was not present at the beginning, however, and the team was forced to take what was perceived to be a step backwards in order to define objectives for driving development.

**Existence of Material.** The challenge with having existing material (SWPM) is that a “tried and true” syllabus and curriculum may not translate well from onsite classroom to online delivery. However, having video clips of instructors explaining difficult concepts and answering frequently asked questions, was a boon.

**Experience with Online Delivery.** It is difficult for anyone, even an SME to grasp the differences in online delivery without having experienced them.

## LESSONS LEARNED WHEN DEVELOPING FOR ONLINE DELIVERY

### What We Did Right During Development

**Required that objectives drive content development.** SWPM reviewed the objectives of each existing session and mapped them into the online sessions. The focus of EMIT had to be shifted from topics to objectives, but once done, development improved.

**Included an instructional designer early on.** The instructional designer assists in writing course objectives and monitoring their implementation throughout the process. Instructional objectives should drive the entire content development process.

**Created prototypes and templates.** Text-base templates, outlining the contents of each online session provided a standard structure for each lesson to follow.

**Held a pilot course for a limited number of students.** This allowed us to revise and refine the course in order to improve the content and identify technical problems.

**Provided pre-course support.** Orientation materials and technical requirements were designed to help students become familiar with the online environment and work out any connectivity issues.

**Provided a hands-on training session for the instructors.** Prior to taking SWPM into online development, all of the instructors were invited to attend a session that explored issues related to online design and delivery.

### What We Would Do Differently During Development

**Spend more time in schedule estimation and tracking.** Underestimating project tasks is not unusual, but we were ill-prepared for some of the technical and communication challenges that resulted from a diverse development team. One hurdle we had to overcome was a number of subject matter experts who were accustomed to live, lecture-driven instruction and who were therefore unfamiliar with interactive teaching methods. Building interactive content is much more complex than placing PowerPoint slides online.

**Utilize and strictly adhere to project management processes and principles.** The programs differed in this respect. SWPM benefited from the strong project management skills of its team members.

**Publish a life cycle process and stick with it.** The whole life cycle of the project must be apparent (e.g., phases, flowchart, roles and responsibilities, schedule, milestones, deliverables, completion/approval criteria, etc.) to all participants.

**Use parallel development judiciously.** If the project requires more than one content expert/developer, it is better to manage the development of the pieces of the course in sequence rather than simultaneously. At least develop one piece completely before starting a parallel development process.

**Be aware of the current limitations of existing courseware.** Given that these programs were testing the limits of online delivery, there were times that technical restrictions were frustrating.

**Engage the technical team as development group members.** This would facilitate early design of a formal process for problem reporting, tracking, and resolution of issues with courseware applications.

**Enlist someone unfamiliar with the material to read the required readings and to log their time.** We were too

optimistic in our estimates of the time required from students.

**Gauge the appropriateness of the length of the video clips.** We had a tendency to make the video clips too long. This meant the student had to wait an uncomfortably long time for the videos to buffer and load, creating some frustration. Very short clips are not recommended either, as it hardly seemed worth the wait for the clips to buffer and load. Clips between 12 and 20 minutes in length were the most popular with participants in the prototype deliveries.

**Work with only one or two subject matter experts serving as content developers.** Rather than taking a large team approach as EMIT did with 16 inexperienced instructors working simultaneously, we would leverage their expertise for solely for content reviews.

**Educate the content developers.** We would make sure the content developers understood the differences of how online instruction differs from traditional practice.

**Assign individual team member roles and responsibilities** as an initial step, and insure that individuals with the right skills and experience for the required tasks are on the team.

**Inspect the work products via a formal peer review process,** paying particular attention to the student assignments.

**Plan practice assignments and assessments** before creating information/content presentations.

**Hold development team meetings frequently and regularly** to review progress and to assist each other with solving common problems.

## LESSONS LEARNED DURING DELIVERY OF ONLINE PROGRAMS

**Instructors and Mentors.** Students in online courses benefit from the individual/team attention that can be given by a facilitator or “mentor” who takes an interest in deliverables and gives direct feedback. The mentor also deals with problems and issues with the technology; student self-pacing and study habits; conference calls versus online chat sessions; how to cope with missing body language clues, etc.

**Allow students more time to complete an online lesson.** Student effort per lesson was generally underestimated. We originally aimed for six hours per week (per student per lesson) but the minimum discovered in prototype delivery was closer to eight hours.

**Conference Calls and Chat Sessions.** Some clients, offering the SWPM online course in-house, prefer that students participate in a conference call instead of an online chat session. Although the international scheduling of the call can become a challenge, many find this to be a “warmer,” more interactive, method of communicating.

**Threaded discussions** received mixed usage. With SWPM, where instructors post questions, some students respond effectively, but not all seem able to keep up. Students are enticed to participate through an incentive bonus points

award system, helpful to those who missed conference calls due to work schedules. It’s interesting to note that threaded discussions were used extensively for team collaboration in the EMIT pilot.

**Media Assets.** Almost all students in both programs report that a variety of media assets in online session helps to hold their attention.

While SWPM makes extensive use of video clips, both programs rely on web links, embedded graphics, quick links and icons to embellish plain text in the Topic Presentation.

**Web Research for Online Students.** If the lesson sends students out to the web for research, the how and why should be clear -- otherwise, the student can spend longer finding an article than reading one.

**Students who are professionals** in certificate programs have a vastly different set of needs than traditional college students.

## WHAT’S NEXT

Over the past two years, we have been promoting the concept of altering instruction for improved learning and positioning technology as an enabler for change. More importantly, our goal is to alter instruction to be more “learner-centered” [4]. This is a goal of the College of Engineering and we engaged in a college-wide multi-faceted approach to accomplishing this objective.

A growing interest in course modularity and granularity of learning objects supports this course improvement effort. Modules can be reusable and customizable learning events, whether for academic or lifelong learning use. The University of Texas at Austin is part of a National Science Foundation Engineering Research Center investigating the design of effective learning environments, and their work has heavily influenced our strategy [5].

We are focused on facilitating additional e-learning activity within the College of Engineering, and intend to:

- Work closely with faculty to modify their design of instruction to maximize learner-centeredness; utilize technology; and create modules that not only enhance campus-based teaching and learning, but also lifelong learning.
- Provide ample opportunities for assessment of student progress.
- Measure the investments made in creating e-learning programs.
- Develop continuing education programs that are originally designed for e-learning; available for use in either the academic curriculum or for the lifelong learner; are easily repurposed for other programs (reuse); customized for specific needs; and are marketable as individual learning events, modules, or as a complete curriculum.

It is critical that development of e-learning programs becomes more efficient and development time be reduced.

Faculty involved in the academic curriculum will generally not be interested in devoting the time required to create e-learning as we have described it here. Our experiences with these two programs helped to develop a standard production template for further e-learning course development that will provide ease of use, quality assurance, and measurements for the benefits in enhanced learning that outweigh the time and effort invested.

## SUMMARY

In this case study, a traditionally taught program was retrofitted for concurrent online delivery. This model worked, but also created complications. When a second fully online program was begun, instruction was designed from the beginning for online delivery. In both cases, the instruction was designed for interaction, collaboration, and the elimination of traditional lectures.

We learned that developing courses for e-learning, whether from an existing, traditionally delivered course or from a brand new one, takes more time than originally planned. Adhering to project management techniques are key to successful course development, especially to launch a course on schedule. Early establishment of individual team roles and responsibilities is also critical, as is having subject matter experts well engaged in the instructional design process.

The following sequence, if strictly adhered to, is one that serves program development well:

- Write course goals and objectives.
- Determine structure of course – major sections and their sequence.
- Develop mastery assessment activities.
- Develop instructional strategies, including a plan for providing opportunities for practice, developmental assessment, and feedback.

Only after these tasks have been completed should the content details be developed, including reading assignments, content presentations, and other resources.

Of particular importance, the development and implementation of a test plan, even before content is created, is emphasized. Involving students as well as subject matter experts was also considered, and students will be included in the design process for our next iterations of e-learning. A strong technical infrastructure that includes staff with skills in the use of technology as well as the design of instruction is a requirement for success. Finally, “starting with the end in sight” is important.

There are several unresolved questions from our experience in developing these two programs for e-learning. We have observed that new communication issues arise when students accept that there will be no face-to-face contact with other participants or with instructors. While this simulates the practical work environment of many students today, adult students are still “programmed” to desire live, face-face instruction and learning. Another

question we are examining is the continued reluctance of many faculty and practitioner instructors to engage in e-learning and online learning despite the increased demand from traditional as well as professional students to use e-learning tools. Because of our experiences with these two programs, we suspect this may be due to a forced change in the instructional model because of e-learning, and the attendant time and resources needed to create e-learning. Finally, continued assessment of the effectiveness of these efforts must be undertaken, not only because of the significant investment in creating e-learning, but also because of the potential for improved teaching and learning.

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