

Instructional Design for

Tele-learning

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ABSTRACT

IN ANY COURSE IN INSTRUCTIONAL DESIGN, the design principles should not only be covered in the course content, but also demonstrated by the structure of the course itself. Telematics applications of various sorts can bring new dimensions into the instructional design of the course to better illustrate the subject matter. In this article we describe the design of a WWW-based course-support environment for a course in instructional design, give an overview of how the environment was used as part of the course experience, and summarize the student evaluation of the course. We call such an augmented learning process a “tele-learning” situation because telematics applications are involved. We conclude that such a course-support environment can extend the teaching and learning process, if well designed, by bringing added opportunities for communication and coaching, and by increasing student self-responsibility. We do not see such a tool as replacing the instructor, but enhancing instruction. The design of the environment should reflect this. Although the article describes a particular course on instructional design, we argue that the conclusions can be valid for a variety of disciplines and instructional approaches. (*Keywords: Instructional design, WWW, communication, coaching, self-responsible learning*)

INTRODUCTION

THE RESULT OF SOLVING A DESIGN PROBLEM is an artifact, a sketch or plan of an object to be made. Once it is made, it will be used to fulfill a human need, such as the sketch of a house, a bridge, a painting, or a piece of music. Once these objects are realized, they fulfill the need for shelter, for easy transport, and for pleasure. In these cases it can easily be imagined what the result of the design problem is like. However, it is more difficult to describe the result of solving an instructional-design problem.

Originally, the result was a communication between an expert and a novice. The purpose of the communication was learning or the acquisition of knowledge, skills, and attitudes. Now, the reality could and can be represented on paper or in other information carriers, and the learners can operate on a mediated reality. Media has changed the nature of instructional communication. The designers and developers of instruction came to store relevant information and problem-solving procedures in a medium and anticipated a communication.

Soon after the invention of the digital computer, its potential impact on education was recognized, and in the 1960s, high expectations were expressed for its use in learning. Early tryouts showed that there were many questions relating to the production of courseware and the way that students would interact with it. The high expectations in the 60s rose to new heights when, at the end of the 1970s, the microcomputer became available. Nearly all universities and many schools installed computer classrooms. The computer could now support the learner because of its speed of processing information. It offered improved interaction with the represented reality and gave immediate feedback to questions and answers. The designers and developers of computer-assisted instruction anticipated an increase in communication with the student as well as an increase in student errors and learning problems. Although many units of effective and efficient computer-assisted instruction were made, the predominant conclusion has been, for many learning situations, that the teacher remains central (Collis, Knezek, Lai, Pelgrum, Plomp, & Sakamoto, 1997). Sooner

or later, a teacher is required to motivate the students, to coach the students in the use of problem-solving methods, to explain the descriptions and interpretations of the subject matter, and to model the learning and practicing of skills.

Parallel to the evolution of media for learning purposes, there has been an evolution in person-to-person modeling and coaching in special learning environments (classrooms) where it is possible to communicate with groups of learners. Gradually the approach of teaching a class by one person became the tradition. The practice of a single figure lecturing to a group of students has certain strengths and weaknesses. While it may be expedient and cost effective, communication with a group of students means a decrease in communication with individual students. Addressing groups tends to reduce the capacity to recognize individual intellectual and motivational problems, to personally explain to a student a difficult part of the subject matter, to provide clear tasks, and to coach the students' problem-solving activity. The often-repeated criticism of the whole-class approach has done little yet to change the system and increase personal contacts and coaching between the teacher and individual students.

It now is clear that computer-assisted instruction will not take over the traditional classroom and that the communication of an individual teacher with an individual learner is often indispensable for learning. We believe that the integration of computer technology with data communication, called telematics in Europe, creates new possibilities to support and amplify the communication between a teacher and the students and among the students themselves. Furthermore it increases the opportunities for the instructor to coach students on an individual basis and provides them with the possibility of becoming more self-reliant in their approach to studying, while still retaining the benefits of the familiar face-to-face class setting and textbook. WWW-based environments in particular can combine the strengths of computer-based learning with those of instructor-guided learning and can help to overcome the mass-production aspects of the large course in higher education.

How does one design a WWW-based course-support environment to reflect this instructional philosophy? Are there instructional-design principles to follow? We address these questions with an example, a course about instructional design taught by the Faculty of Educational Science and Technology at the University of Twente in The Netherlands. The example we describe is just one of over 30 courses in our faculty (department) that are taking advantage of WWW-based course-support environments to enrich teaching and learning for students in the regular institutional setting, as well as students sometimes or even primarily at a distance from that setting. The instructional-design course provides the opportunity to practice what it preaches and demonstrates how instructional-design principles can be illustrated through the use of a course-support environment. We first describe the instructional design course and then comment on the generalizability of the instructional-design approaches in that course to other courses, both in our faculty and beyond.

A DESCRIPTION OF THE COURSE “INSTRUCTIONAL DESIGN THEORIES”

INSTRUCTIONAL DESIGN THEORIES is a 120-hour senior course in the Faculty of Educational Science and Technology at the University of Twente. Students in the course include graduate students from outside The Netherlands enrolled in the faculty's Masters Programme in Educational and Training Systems Design, as well as regular students completing their first degree in educational science and technology in the faculty. Thus, the students in the course represent diversity in terms of background relating to knowledge of the theoretical principles of instructional design and English. The language used in the course is English. The textbook accompanying the course contains a scholarly analysis of the theoretical foundations of instructional design and of key research approaches (Tennyson, Schott, Seel & Dijkstra, 1997). Emphasis is given to the meaning of the theories

for solving various instructional-design problems is given (Dijkstra, Seel, Schott & Tennyson, 1997). Because the students have different levels of prior knowledge coming into the course, their learning needs are quite different.

DESIGN OF THE WWW-BASED COURSE-SUPPORT ENVIRONMENT

The course design took into account different learning requirements and identified some key principles for all students: a) supporting and amplifying the communication between the teacher and the students and among the students themselves, b) increasing the opportunities for the instructor to coach students on an individual basis, and c) providing the students with the possibility of becoming more self-reliant in their approach to studying. With this as a basis, the following requisites were established for a WWW environment to support the course:

1. The site should provide access to prerequisite knowledge for those who need it.
2. Examples of how instructional-design theories and models are applied in practice should be available.
3. The information presented in the textbook should be extended by showing different perspectives in the topics discussed.
4. The meaning of critical terms should be clarified.
5. The students should be supported in searching for additional resources and examples illustrating the course concepts via the WWW.
6. The students should be motivated and supported in discussing and sharing information.

Using the features available through the “TeleTOP” database-generated course-support system development at the faculty (see <http://teletop.ede.utwente.nl>) a course-support environment was created with the following basic components:

1. a news/update area, for general communication from the instructor to the students;
2. a matrix-like roster which contains the weekly organization of the course, links to extra study materials, links to discussions, capacity for students to enter assignments and new materials into the course site, and instructor and students' feedback;
3. a communication area, supporting direct e-mail among all participants in the course;
4. a section with general information and background about the course;
5. a shared-workspace area where groups of students can work and discuss course topics;
6. a glossary, with communication options added so that students can suggest new entries or ask for clarification about terms; and
7. a resources area containing links to external resources relevant to the course, some to serve as prerequisite material, some for illustration of concepts and theories, and others to serve as enrichment and examples of professional interactions relating to instructional design.

Figure 1 shows the navigation frame and the roster of the course.

A CLOSER LOOK AT THE ROSTER

The roster works as a course organizer. For each session, it shows the date and place of the session and links to self-study activities that should take place before the session, links to notes to accompany the face-to-face session, links to materials created by the students for presentation during the face-to-face sessions, and provides follow-up activities after the session. The session notes are prepared by the instructor to help the students deal with each of the chapters and topics in the course. The notes also allow the instructor to update the material, add links to views of other specialists, provide links for further exploration, and to illustrate concepts with examples and real-life applications.

Instructional Theory 2	Before the session	During the session	After the session
25 March 98 L:213	Preparation for session 1	Session 1 notes (Introduction)	Preparation of Group 1
2 April 98 L:213	Preparation for session 2	Session 2 notes (Ch. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11)	Preparation of Group 2
23 April 98 L:213	Preparation for session 3	Session 3 notes (Ch. 12, 13, 14, 15, 16, 17, 18, 19, 20)	Preparation of Group 3
7 May 98 L:213	Preparation for session 4	Session 4 notes (Ch. 16, 17, 19, 20, 21)	Preparation of Group 4
20 May 98 L:213 MC	Preparation for session 5	Session 5 notes (Ch. 21, 22)	Preparation of Group 5
28 May 98 L:213 MC	Preparation for session 6	Session 6 notes (Ch. 10, 11)	Preparation of Group 6
4 June 98 L:213	Preparation for session 7	Session 7 notes (Ch. 12, 13, 14)	Preparation of Group 7
11 June 98 L:213	Preparation for session 8	Session 8 notes (Ch. 14, 15, 16, 17, 18, 19, 20)	Preparation of Group 8
25 June 98 L:213	Hour to be prepared for the exam.	Examination	

Figure 1. Navigation frame and roster of the course-support site for the Instructional Design Theories course

There were three types of follow-up assignments: discussion questions, assignments relating to the creation of reports, and self-tests. For the discussion assignments, students took part in discussions relating to instruction-design issues available via the Internet. This served to increase their sense of the application of the concepts in the study materials and also helps them articulate and defend their own ideas. Using the shared workspace, they also held discussions among themselves, reflected on the discussions, and then commenting on the ideas of other students in their group. The instructor occasionally intervened to support and motivate, but the main focus was for students to communicate with others in the field, as well as their classmates.

For the report-type assignments, students needed to search the Internet to find additional resources to support their ideas. Their reports were posted on the course site for peer-review. Again, the instructor coached and commented on an individual basis as needed. The TeleTOP course environments allow for easy entry of comments and files, as well as feedback and follow-up to materials. All the instructor and students need to do is to type in their responses or upload previously created files. The entries are immediately entered into the course database and integrated into the course WWW environment. Self-testing was done with Java-enabled test items that provide immediate feedback after the student submits an answer. The students were free to make as much use of these resources as they wished.

THE GLOSSARY

An important part of the course site was the glossary section. Figure 2 shows the entry to the glossary. In the glossary, all terms in the course are defined and external links provided to lead to more-detailed information about each term and concept. In addition, a communication form was provided so that students could immediately enter a suggestion for an addition to the glossary or ask for clarification. The instructor would then respond by e-mail or with a new entry in the glossary or with further comments during the next face-to-face session.

STUDENT EVALUATION OF THE COURSE

At the conclusion of the course, the students responded to a questionnaire embedded directly in the course environment. The questionnaire contained 22 multiple-choice questions and 12 open questions. Among the main results of the evaluation are the following points:

- In general, the students enjoyed the site and especially appreciated the well-organized extra resources. "*The site motivated me to search for more information.*" "*The site is great; good support.*"

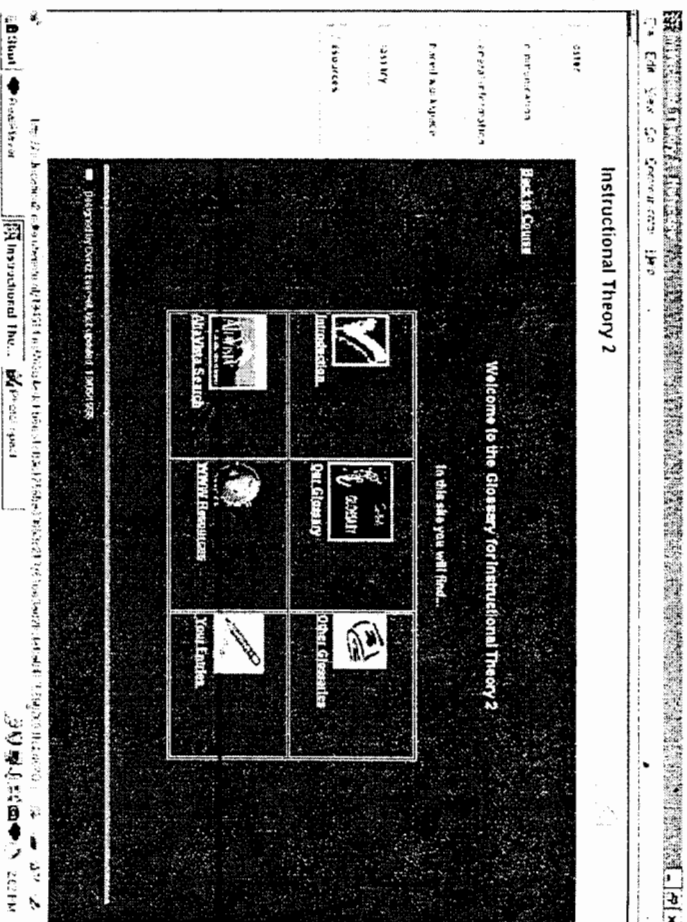


Figure 2. Glossary area of the course-supported site

- The students immediately contributed to the site by adding their own PowerPoint presentation materials to support their class presentations. "*It is especially good that the students can participate in the site.*" "*The database allowing students' entries is a good idea.*"
- The students indicated they planned to continue using the resources for other courses. "*Often there are words that are hard to place and so specialized that they cannot be found in dictionaries. The glossary is a good help.*" "*Linking the terms in the glossary to WWW resources is a very innovative idea for us.*"
- Although they appreciated the follow-up assignments, they often did not have time to carry them out, particularly when they were not given points for the additional work. "*The*

assignments should be part of the assessment, otherwise they take too much time."

- Students need an initial demonstration of the site: on how to use its features such as the shared workspace and the facilities for uploading and downloading files and giving comments. Students do not read the user manuals provided. *"Working in the shared workspace requires special skills from the students in terms of organization and navigation."*
- Students appreciated being able to read the contributions of other students in the shared workspace. *"A strength of the site is that you can work together as a group and not have to work at the same time or be in the same place. You can access the work of your own group members and that of others. This gives you more learning opportunities and examples when doing your assignments."*
- Students made particular use of the site when studying for the examination.
- Students appreciated a convenient way to communicate among themselves and with the instructor. *"It is very convenient to communicate among the learners and with the instructor via e-mail in the 'Communication Centre.'"*

The students did make constructive critical comments about the design of the site and the manner of integrating it into the course (i.e., its fit with the instructional design of the course). Specifically, while they appreciated the rich resources, they felt that they lacked the necessary time to exploit them without credit being given in the marking scheme of the course. A case in point was the discussions. In order to get a critical mass of discussion activity, students were given points for their contributions.

They commented that learning from each other has limitations: *"Learning from the presentations of others is not always good, because they can tell wrong things or they cannot explain well. When the instructor explains, it is interesting, but there is often not enough time because of student presentations."*

Other comments included the use of a shared workspace and system problems. *"When you add documents to the shared workspace without a proper structure it becomes very messy. It is important that all students give good names to the documents they upload."* And, when the occasional technical problem occurred, students found it frustrating.

DISCUSSION

THE SITE was used as a support for the course. Students could decide for themselves what extra materials they wish to select and study. The goal was to support their responsibility for learning. But students sometimes need a push or a reward to motivate them. In the next cycle of the course, points will be part of the design to acknowledge participation in the discussions. The most important function of the course site was to stimulate a more-active learning process among the students, by providing valuable exercises and letting them participate in building the course site and by finding or creating resources and sharing them with others. The purpose of the course site is more than putting instructional content in a form ready for study. If our aim as instructors is to coach students to think critically and to reason about concepts and issues, as well as having the ability and motivation for learning independently, then the instructional design of the course-support site should reflect these aims. For example, using the site to search for additional, and relevant, information and examples, and presenting them within the site so that the other students could reflect on each others' choices is a valuable activity for our aims. In the case of students all working in a language (English) which is not their mother tongue, the asynchronous nature of the course site allowed them the time to construct their responses without the difficulties of speaking spontaneously.

EXTENDING OUR EXPERIENCES TO OTHER TYPES OF COURSES

ALTHOUGH THIS CASE STUDY has focused on a particular course, it is our experience from working with the instructors in 30 courses during the past year that our main conclusions are relevant to a large variety of courses. These courses employed a wide range of instructional approaches. Several were based substantially on group projects; several focused on statistics and thus placed emphasis on accurate answers; several focused on individual skill development; and several employed a wide range of instructional approaches to courses that are predominately theoretical in nature. With all of these courses, the following guidelines have been appropriate, although the way of realizing them varies considerably from course to course:

- A WWW-based course-support environment should extend the boundaries of the traditional teaching that occurs in the classroom.
- It should support and challenge students' thinking.
- It should include a resource center for the investigation of a variety of information, with an emphasis on the students evaluating this additional information in terms of its meaningfulness to the course.
- It should support discussion, exchange of ideas, and peer evaluation. These activities should be part of the graded activities in the course.
- It should allow the students to organize and restructure information as well as create and contribute their own resources.
- It should present a convenient way for students to participate in collaborate work and to communicate ideas and questions in ways that cannot take place in the classroom due to restricted time and the difficulty of making reflective comments in a classroom setting.

Critical to all of this is a user interface that makes contribution to the course site simple for both the instructor and students. Thus, other major requirements in terms of the instrumentation of the course site are:

- The course site should allow students and the instructor to enter comments, and upload and download files, without having to know any technical aspects of the process.
- Access to the course site should be through the usual WWW browser, requiring no separate software for either instructor or students.
- All course-support resources should be integrated within a single WWW environment.
- Students should be cobuilders of the course resources and, therefore, need to be able to see and give comments on the entries of their peers into the course site. The course environment will then grow during the process of the course, based on student entries and, thus, must be flexible technically to handle growth and still maintain the underlying database relationship.

CONCLUSION: TOWARD AN INSTRUCTIONAL DESIGN FOR COURSE-SUPPORT ENVIRONMENTS

THE VALUE of a WWW-based course-support environment depends entirely on how the environment is designed and how it is integrated into the rest of the teaching-learning process. But because of the newness of the WWW, instructional design models for this are not yet well-known. In their taxonomy of instructional design models, Gustafson and Branch (1997, p. 30) identify three general classes of models (classroom orientation, product orientation, and system orientation). What they label as the classroom orientation reflects the typical process of course design in traditional higher-education settings: Using little or no explicit design methodology, the

individual instructor is at one time the designer, developer, and deliverer of the course. The instructor is also the content expert and the person responsible for student organization, student support, and student evaluation. Despite the potential weaknesses of the idiosyncratic course-development method, it is by far the predominate way that courses are designed and delivered in most schools and universities. And its weaknesses can also be its strengths. As content expert fully responsible for the course, the instructor can mentor, stimulate, scaffold, and personally interact with students so that the course is much more than a systemic way to meet predefined objectives but also can be a framework for an apprenticeship-type mentoring relationship between instructor and learner (Sjard, 1998).

In contrast, the product-orientation and system-orientation instructional-design models assume that professional development teams will use an explicit design methodology, and sophisticated analysis, design, and development tools. Unlike the instructor-rooted classroom-orientation models, the product-orientation and system-orientation instructional-design models implicitly or explicitly assume that it is unlikely that members of the development team will actually have a role in the product's ultimate implementation or use.

Each of these three classes of instructional-design models has its strengths and limitations. A combination of the models, in a way that optimizes the strengths and reduces the effects of the limitations, seems desirable. Such a model could retain the skills and insights of the personal instructor and at the same time make use of the time involvement, specialization skills, sophisticated tools, and task division possible in the professional development team (Collis & De Boer, 1998). This is the situation now at the University of Twente. With the TeleTOP tools and course-re-design approach, we have the benefits of product and system models. But with our orientation toward the central skill and responsibility of the instructor to motivate, coach, and communicate, we retain Sjard's combination of objectives-oriented and participation-oriented course experiences. We hope that the guidelines suggested in this article can contribute to an instructional-design model for courses making use of WWW-based support environments.

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Deniz Eseryel, at the time of writing this article, was a student in the Masters Programme in Educational and Training Systems Design and completed her thesis based on her participation in the design and development of the Instructional Design Theories course. She will soon be beginning Ph.D. work in the area, with Professors Dijkstra and Collis.

Instructional and Social Dimensions of Class Web Pages

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ABSTRACT

THE REPORTED WORK is part of an ongoing qualitative study of faculty uses of the Internet at our institution. The goal of the present work is to categorize the functions of course Web sites from both researcher and faculty perspectives. Using a qualitative content analysis approach, we first analyzed the functions of 25 publicly accessible course Web sites. We then interviewed a subset of the sites' authors. We found that all sites performed course management functions which were valued by instructors; that a small subset also demonstrated easily implemented, successful, and pedagogically interesting uses of the Web; and that pages in our sample conveyed implicit and explicit social information to students about the class and instructor through four primary channels. We describe these findings and discuss their implications for teaching practice and for further evaluation research. (*Keywords: Internet, higher education, faculty development, qualitative evaluation*)