Didactical Activities and Strategies in the Use of WWW-based Course-Support Environments: Design Guidelines for Instructors

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Abstract: New developments in educational technology at the University of Twente are providing instructors with a set of tools and templates for WWW-based course-support environments. Those templates can be used by the instructors to fill in learning activities and study material for all students, both local and at a distance. The task for the instructional designer is to create these general templates and make them suitable for different kinds of teaching situations. To guide the instructors in how to use those tools and templates, a series of design guidelines for the use of the WWW have emerged for each of the following didactical activities: face-to-face sessions, self-study activities, assignments, monitoring and feedback. Those guidelines are based on the experience of the Faculty of Educational Science and Technology at the University of Twente with the implementation of approximately 44 courses supported by WWW-based environments in the context of the TeleTOP Project (http://teletop.edte.utwente.nl/) as well as on instructional principles that predate WWW use. The paper concludes by noting the need for a course (re-)design model which combines the guidelines into an overall perspective.

A new role for instructional designers.

New developments in educational technology as well as new insights in the experiences of instructional design and information and communication technologies are stimulating new roles for instructional designers. Their major tasks are not to transmit the educational content, but to design activities; not to design hyperlinked learning materials, but to design and develop templates which can be used in multiple situations in which students are active and using WWW tools and environments to support and manage that activity. Their task is to design these tools and functionalities, so that instructors in turn can design their own activities and study material with those tools.

At the Faculty of Educational Science and Technology a WWW-based course-management system has been developed in which tools and functionalities are collected in a database which serves as a general base of templates (This system is called *TeleTOP*; see Collis & De Boer, 1998; see http://teletop.edte.utwente.nl). The instructor chooses the templates or functions he or she desires to support the course, and only has to type into various types of fill-in forms to organize the notes and other material that is to be put into the WWW environment. If a template is not available that meets the instructor's needs, the TeleTOP team creates it.

As the instructors are confronted with the task of choosing tools and functionalities for their courses, they express a need for educational and didactical guidance (Evaluatiewerkgroep TeleTOP en C@mpus+, 1999). In response to this growing need, the new-generation instructional designers of the TeleTOP team have created a set of design guidelines for instructors (Remmers, 1998). Those guidelines can be sorted around five general types of didactical activities which focus on a direct learning process: face-to-face sessions, self-study activities, assignments, monitoring and feedback (Collis, 1997). Communication is a major aspect within all the acitivities. For each didactical activity a variety of different types of (WWW-based) applications can be used. In Table 1 an overview of a sample of such applications is listed for each activity, as well as the numbers of the guidelines that are related to those activity-application combinations (the numbered guidelines are elaborated later in this paper).

Table 1: Didactical activities, their applications and the related guidelines

Didactical activities	Applications	Guidelines
Face-to-face sessions	1. Preparation of material	2
	2. Powerpoint presentation materials	2
	3. Discussions	2
	4. Small assignments	2
Self-study activities	5. Readings and textbooks	3, 5
	6. Quizzes	3, 5
	7. Simulations	3, 5
	8. Uses of asynchronous video	5, 6
Assignments	9. Small assignments	7
	10. Follow-up assignments	4, 7
	11. Asynchronous discussions	7
	12. Quizzes	7
	13. Students contribute to the study material	7, 8
	14. Case studies	7, 8
Monitoring and feedback	15. Individual feedback	12
	16. Group feedback	12
	17. Administration of submitted work of students	9, 11
	18. Peer evaluation	12
	19. Student digital portfolio	9
	20. Quizzes	9, 10

In the next sections the didactical activities are discussed in more detail. Every section discusses the following: (a) backgound information; (b) the manner by which TeleTOP supports the activity and what tools are available for the TeleTOP instructors; and (c) guidelines derived from practice and theory.

Face-to-face sessions and the WWW environment
Face-to-face contact between the instructor and the student as well as between students are still not-to-be neglected instructional activities even when the WWW is extensively used. "It is to the learner's advantage to occasionally come to a face-to-face setting interacting directly with the instructor and peers. Some learning experiences, plus the more-intangible aspects of developing as an intellectual (called in Dutch, *academisch vorming*), are more than the sum of reading books and completing assignments from the convenience of one's home" (Carleer & Collis, 1998). Moreover certain skills as, for example, applying statistical formulas are sometimes only learned by the active discourse between instructor and student, at least for some students.

During the contact session: For students who live at a long distance from the educational institution, the amount of face-to-face sessions must be kept to a minimum because of time and money issues. Therefore, the face-to-face sessions should be used to address only the most important subject matter or activities (see Guideline 1 and Figure 1). The evaluation study of TeleTOP concluded that part-time students, students who carry out a profession elsewhere and study part-time, and students with a part-time job particularly wish to have *elaborations* of the study material in the face-to-face sessions, not to have the time filled up with listening to *organisational aspects* of the course, which they can read in the WWW-based course environment (Evaluatiewerkgroep TeleTOP en C@mpus+, 1999). Thus, Guideline 1:

1. Use face-to-face sessions:
   - to provide the context of the course and the subject matter
   - to show relations between topics in the learning material
   - to explain difficult and essential issues
   - to show (good) examples of applications or assignments
   - to make the students enthusiastic and inspire them
   - to let the students interact and have discussions with one another
   - to reflect upon submitted work
   - to invite expert guest speakers on the subject matter
   Do not use the face-to-face sessions:
   - to provide organisational aspects of the course
   - to repeat what students can read

Figure 1 reflects Guideline 1, showing how a face-to-face session was used in the course "Tele-Learning", not as a lecture, but for a variety of activities, capitalising on the presence of a guest visitor from another institution whose work relates to the study material for the week.
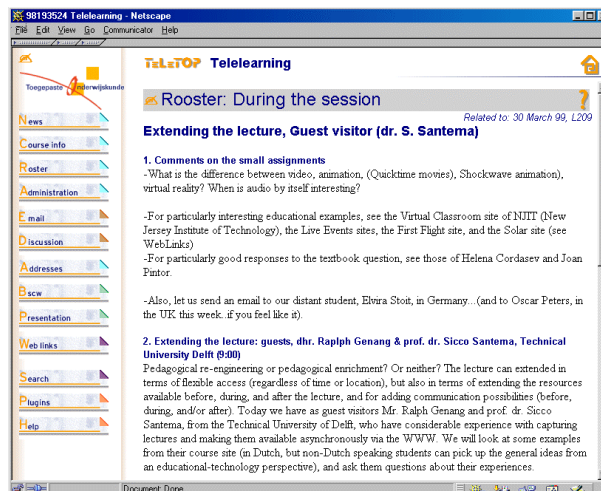

Figure 1: Example of the topics discussed during a face-to-face session in the context of a course which is given partly at a distance, Telelearning course, 1999.

Also, it is necessary to prepare a contact session so that students who were not able to be physically present (especially part-time working students) can also participate, either at the same time but at a distance or at a later time. This typically has three aspects: (a) any content material to be elaborated in the contact session by the instructor is prepared in note form in advance and made available on the WWW environment for students who will

not be present; (b) an interactive activity (a discussion, a short analysis task, a problem to work out, etc.) is devised that can involve the students attending the contact session at the same time (and perhaps some of them in different locations) so that the students are actively engaged in some sort of articulation and collaborative learning; (c) support materials to guide this interactive work, plus to be used by the students to report on their work, are created and put in the WWW course environment (see Guideline 2).

2.	Prepare the face-to-face session so that students not physically present can also participate (synchronously or asynchronously), by providing the content material to be elaborated, an interactive activity, and support materials to guide this inter-activity.

Students' preparation before the session: For the students to carry out an assignment during a face-to-face session, to have discussions, and to reflect on assignments it is necessary for them to have a basic understandnig of the subject matter before they come to the session. For this reason the TeleTOP team has designed a specific kind of matrix-like structure called a *roster*, containing self-study activities to be carried out before the session (see Guideline 3 and Figure 2) that are integrated (via being in the same row) with notes and activities for the face-to-face sessions.

3.	To provide students with the necessary basic understanding of the subject matter, give them self-study activities before the session, integrated in the WWW environment.

Figure 2: Example of the roster of a WWW-based course-support environment in which the students have to study certain literature before the class session; Principles of Learning and Instructional Design CC3, 1999

Follow-up after the session: After the session a follow-up activity to structure students' reflections on the contact session and how it integrates with their self-study materials and their other course activities can be planned. The instructions for this activity and the reporting form for the students to use are entered into the WWW environment before the contact session. A cut-off time should be indicated for the submission of the follow-up activities from the students, and after this time, the instructor should look at their submitted comments and post a feedback response in the WWW environment or by email (for example, a different comment may be appropriate to the part-time students than to the local students). See Guideline 4.

4.	To structure students' reflection on the contact session and to relate it to the study-materials, provide students with a follow-up activity and a WWW-based template through which they submit their work relating to this activity, and indicate a cut-off time for this submission.

Self-study activities
The profile of the ideal professional practitioner requires that students should possess a solid knowledge base with regard to the profession (Verhagen et al. 1999). In general, self-study could be used for rehearsal of knowledge and for reflection on this knowledge. Reflection is oriented towards realising learning tasks: to process and to refine insight and understanding (De Jong, 1995).
Self-study activities are mostly used in TeleTOP as a preparation for face-to-face sessions and assignments and for the replacement of face-to-face sessions if necessary. For self-study activities, as well as for assignments, it is very important that they are not a stand-alone and independent activity. They should be implemented in the course WWW environment with for example an explanation of the relevant issues of the self-study activity, the active involvement of the learner, feedback from the instructor and repetition (Westera, 1999, see Guideline 5); otherwise students will not feel much value in the activity.

5.	For self-study activities to be more effective, provide students with the relevant issues to interpret in terms of the study materials, provide WWW-based templates for the students that structure their active involvement, feedback and repetition.

The following applications could be used in TeleTOP for self-study activities: study guides, quizzes, simulations, and asynchronous audio and video. Quizzes will be discussed later in this paper.

Asynchronous audio and video: For students who were not participating in the contact session as it occured, the instructor has the possibility to capture via digitised audio and/or video anything needed to make the notes more effective for those students who will study the materials later. In this way the communication event is captured and can be re-used (Peters & Collis, 1999). Other reasons for using asynchronous video are described in more detail in Peters and Collis (1999) and are summarized in Guideline 6.

6.	Use asynchronous audio and video:
	• to capture presentations or lectures
	• to give access and depth to real events
	• to support the learning process in situations involving procedures or social situations
	• to develop a library of cases or units of learning material
	• to capture and share one's own video materials

Self-study activities are primarily oriented around the acquiring, rehearsal, and reflective consideration of knowledge, whereas assignments are more focussed on the application of the students' knowledge base and insights into practice (see the next sextion).

Assignments
It is generally accepted that if you "put students to work" they learn more (De Jong, 1995; Collis, 1998). For this, the term action learning is used. Meyers and Jones (1993) identify four major elements associated with action learning which students use to create new mental structures: speaking, listening, reading, and writing and reflecting. Those elements refer to cognitive activities which enable students to clearly investigate, consolidate, and acquire new knowledge. For example, when conducting a discussion, the process of telling clears the thoughts of students, whereas listeners have the possbility to reflect on alternatives to one's own perspectives (Peters, 1998)
Within TeleTOP there are several ways to put the students to action: small assignments (before, during, after or in-between contact sessions), working on case studies, making contributions to the course study material, developing their own research questions and discussions, and contributing materials that can be used as model answers or help resources. For assignments to be effective some of the issues mentioned in Guideline 5 are also important for the implementation of assignments. These are summarized in Guideline 7.

7.	To help make assignments be more effective, provide students with relevant issues relating to the topics to be studied, use WWW-based templates that help structure and manage the active involvement of the students and that integrate feedback with the assignments; when possible, use student submissions as a basis for study and reflection in the course itself.

Small assignments: One of the major orientations of the TeleTOP method is to reduce the number of lectures and increase the number of "in-between assignments", relatively small assignments to which feedback is quickly given. The process for handling this is supported within the Roster of the course-support environment (see Figure 2). The trick is to make the management of this process as automatic as possible, while still maintaining instructor contact when useful. This becomes the major task of the instructor: to think of these assignments, and of how they can be carried out efficiently and effectively (i.e., both instructor and student getting regular insights into how the learning process is going on).
In TeleTOP the instructors have the possibility to let the students submit their work on (small) assignments in the WWW environment during a face-to-face session, but also before or after a session. Before the session, to help the students become familiar with the subject matter. After the session, to let the students reflect on the presentation of the instructor, on the answers to the assignments, or on ideas that emerged during the face-to-face session, etc. However, assignments need to be assessed or else students tend not to do them and the learning potential is not realized. "Although students appreciated the follow-up assignments, they often did not have time to carry them out if they were not given points but only offered on a voluntary basis" (Dijkstra, Collis & Eseryel, 1999).

Students' contributions to study material:Another major orientation of TeleTOP is that students can contribute study resources to the course-support environment. This can occur in many ways: for example, through adding to a FAQ (frequently asked questions) collection, adding to a database of examples, supplying model answers, adding links to external resources, adding definitions to a course glossary, and constructing and sharing one's own video & WWW resources (Collis, 1998). The most important function of the students contributing to the course study material is to stimulate a more-active learning process among the students, by providing valuable exercises and letting them participate in building the course environment by finding or creating resources and sharing them with others (Dijkstra, Collis & Eseryel, 1999). For example, "Students appreciated being able to read the contributions of other students in the shared workspace" Dijkstra, Collis & Eseryel (1999).

Working together on case studies: If correctly applied, case studies are suitable for developing skills for problem-solving, for critical thinking, and for creativity (Romiszowski, 1995). For part-time students who carry out a profession as well follow a study, exercises with case studies can be done by placing the case study in the contexts

of their work. The TeleTOP system allows different assignments to be described for different groups of students; the students only see the descriptions for the groups to which they belong.

For both the students' contributions to study material and for the case studies, TeleTOP offers the tools *workspace* and *presentation*. At the workspace students can work together on certain assignments and only the group members can enter the group workspace. They can work for example in an on-going way on their case-study exercises or their self-developed study material (see Figure 3). To make the workspace not too complicated, overly fulled with files and comments, the students can present their final work in the section *presentation.* This function could present in a well-organised overview the final products of the groups for all students to access (see Guideline 8).

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8.	To let the students actively learn or develop skills for problem-solving, critical thinking and creativity, use students' contributions to study material and case study exercises as resources in the course WWW environment: • Let the students work together in a shared workspace and present their final products in a separate part of the course environment. • For part-time students use the context of their work experiences for their case studies.
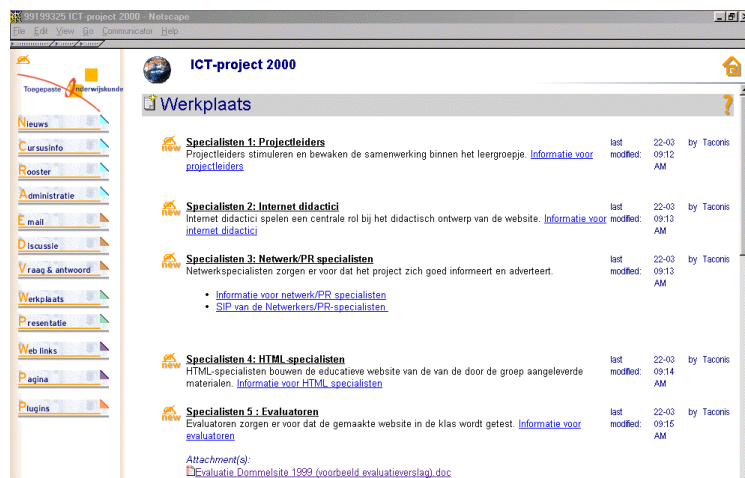
Figure 3: *Students working together in the Workspace (in Dutch: Werkplaats), ICT-project 2000 course, 1999.*

Monitoring and feedback

One of the reasons for monitoring which Dodman and Coxhead (1994) have put forward is: monitoring students and groups of students to see which parts the students do not master and which they do not master very well. In classical situations monitoring takes place on the basis of the experience and knowledge of the expert, the instructor (Winnips, 1998). In telelearning situations the instructor may not always be present physically, which could result in limited feedback on the progress of the individual students or on a group of students. By applying monitoring strategies, this progress can be made clear and actions can be undertaken if problems should occur.

TeleTOP offers the instructors a number of tools which could make the monitoring of students and group of students easier (see Guideline 9). *Quizzes* (with multiple-choice questions, short answers, true-false, etc.) and *clear overviews of the submitted work* of students are all being used by the instructors of the faculty of Educational Science and Technology. In the beginning of August 1999 the faculty initiated a *digital portfolio* project (see Guideline 9):

9.	To monitor the work and progress of the students, use WWW-based *quizzes*, *overviews* via the WWW-site *of the submitted work of students,* and *digital portfolios* accesible via the WWW-site.

Quizzes: When using quizzes in his or her course, the instructor can get a glance at the understanding of the students relating to the topics which are covered in the quizzes (see Guideline 10 and Figure 4). The answers to the questions in the quiz are sent to the instructor and if a student answered (several) incorrect answers, the instructor could take action and give appropriate feedback to the student. Students can also submit quiz questions themselves, as small assignments during the course.

10.	Use WWW-based quizzes to monitor the understanding of the students of the subject matter. Let the answers be sent to you via the WWW-site. Consider the strategy of having students contribute quiz questions via the WWW-site as an assignment, which are then used by all the students for self-study.

Figure 4: *Questions created by the instructor in the course Instructional Theory 1, 1999*

Overview of submitted work: As the instructor has chosen that the students will submit assignments through the roster, the instructor is able to get an overview of each item of submitted work of each student and can give the student immediate feedback or remedial help and perhaps a mark or some number of points (see Guideline 11 and Figure 5). If the instructor decides to give the students points for the assignments, the overview will also show the total amount of points per student at each moment in time. The instructor should keep track of the student's submissions, and send a message to students who did not submit to find out if they are having particular problems (this message can be pre-structured, so the time and effort needed to send it can be small).

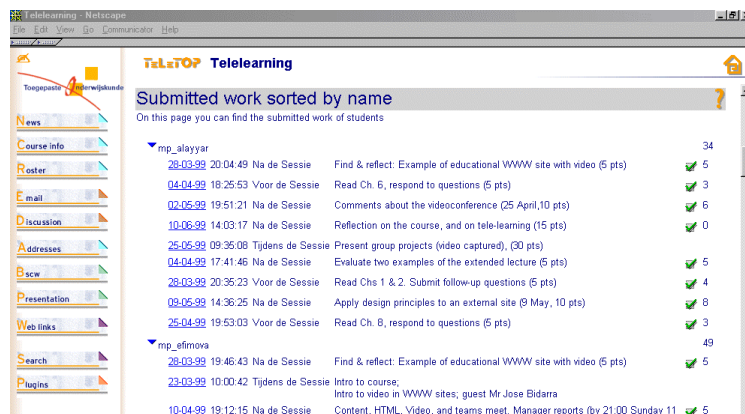|	
11.	To monitor the comprehension of the students as to how to apply their recently acquired knowledge into practice, use an overview of the submitted work of students in which direct links are available to the work of the student, the submitted date, the feedback to the students, the points given; all ordered by student

Figure 5: *Overview of the submitted work of the students and of the given feedback (checkmarks) and points, Telelearning course, 1999.*

Feedback: When feedback is needed, as a consequence of monitoring or as a reflection on the work of students, the instructor has the possibility to (a) provide individual feedback via the course environment (this feedback can only be seen by the instructor and the particular student), (b) provide public feedback (feedback that is meant for one student, but can be read by all students), (c) provide feedback to a group of students, (d) give one key-answer to all students, and/or (e) let students give feedback to themselves and each other (self- and peer evaluation). See Guideline 12.

12.	Give the students via the WWW-site:
	• personal feedback when they all have to carry out the same assignment.
	• public feedback when you want them to learn from each other's answers or maybe use each other's answers for a new assignment.
	• group feedback when the numbers of students of the course is large and could not be handled with personal feedback with regard to time constraints
	• one answer key to all students when many students make the same mistakes in their answers.
	• peer feedback when you want to guide the students in learning how to evaluate and give feedback

Digital portfolios: As a current development for the Faculty of Educational Science and Technology, the students' overall progress within all their courses is being monitored by the use of students' digital portfolios. Individual assessment will still take place by the instructors of the particulair courses, but overall monitoring and support will be done by faculty members serving as mentors. This type of support is designed to stimulate the professional growth of the student by examining his or her added products and documentary evidence relating to his or her work.

How to re-design your course for the use of a WWW-based course support environment?
The above-mentioned guidelines and applications are a handle for the instructors when they are (re-)designing their courses to make them suitable for WWW-based course support or tele-learning purposes. Although the instructional principles underlying the guidelines may not be new in themselves, what is new are increased possibilities for putting these principles into practice through the support of WWW-based tools and environments. Also, WWW tools and environments are being used by many instructors (i.e., in technical faculties) who are not familiar with instructional design theories. The guidelines are written in a pracical way to steer the use of the WWW for good pedagogical practice.
The set of guidelines can be elaborated with new experiences of instructors and students, as well as with new developments in educational concepts. On a regular basis, new guidelines are being designed and added to the set of guidelines that we now have. However, there is also a need to put the guidelines in a broader perspective in such a manner that instructors will know when to choose certain applications in certain didactical situations (especially important for novices). This could result in an instructional (re)design model for WWW-based course-support environments.

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