

LEARNING ARRANGEMENTS AND SETTINGS FOR DISTANCE TEACHING/COACHING/LEARNING: BEST PRACTICE REPORT

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Distance Teaching/Coaching/Learning (DTCL) is attracting considerable attention. This methodology of teaching does not just provide the same contents in another way; DTCL is a change in paradigms. The teacher's role is being transformed from instructor to coach; the learners are no longer recipients of content, but become partners in a self-organised active learning process. DTCL turns away from unreflected and passively absorbed knowledge to an achievement of problem-oriented know-ledge. In addition, social skills such as teamwork, conflict management etc. are improved. To facilitate this, we have designed and developed a framework – WeLearn. WeLearn consists of a DTCL platform and is also a framework. Sample settings are contained that provide typical configurations for different learning models and embedded course material that has been developed especially for DTCL. This WeLearn framework is used in practice in several environments (at universities and schools and in adult further education), where different didactical models, various audiences, multiple requirements, skills, etc. are involved. To illustrate these, some case studies are presented in this paper. Our experience with DTCL shows that it leads to better learner motivation, a better understanding of the topics, better results and a gain in social competence.

1. Why Distance Teaching/Coaching/Learning

We start with a brief review of general arguments in favour of DTCL ([7],[15],[16]). The traditional teaching and learning model involves, in the worst case, frontal instruction where the teacher provides the contents to the students and the learners consume the teacher's knowledge. Holzkamp

([6]) calls this “defensive learning”. This means that knowledge is gained solely without reflection and is more or less passively absorbed by the students.

In the case of a collaborative teaching and learning philosophy or model, the teacher provides selected learning material and the students work actively on this content, find other sources, get some hands-on experience etc. Furthermore, instead of one-directional communication from the lecturer to the students, we find communication is multi-directional among the students and from and to the lecturer, who now actually acts as a coach ([17], [19]).

This teaching and learning model treats learning as an interactive process. An important factor is that the paradigms change. The lecturers act as organisers of suitable learning contexts and learning tools. They create the course environment and then become coaches in this environment. The learners are no longer only recipients, but act as active partners in a self-organised and cooperative learning process. This leads to problem-oriented knowledge and an increase in social skills such as team working, conflict and time management, etc.

But when students are faced with this new learning culture for the first time, we encounter the following phenomenon. “Usually one must expect resistance here, because the students have come to terms with the learning model in which their role is that of passive listeners. Now they suddenly have to take the learning process into their own hands, which contradicts their familiar learning experience and makes them feel completely insecure. [1]”

So when Distance Learning is introduced a supportive learning setting and environment have to be offered. Both have been identified as a prerequisite for successful activities within the broad field of DTCL.

2. The Learning and Teaching Arrangement

In the light of our experience ([9], [10], [11], [12]) with Distance Teaching/Coaching/Learning we have developed typical WeLearn arrangements.

These “learning/teaching arrangements” or “settings” include an *adaptable* teaching framework (WeLearn [3] platform from FIM – the Institute for Information Processing and Microprocessor Technology), dedicated objects such as virtual pigeon-holes, news boards, discussion forums,

facilities for chatting and virtual groups that bring subgroups of students closer together. In addition to these objects, various activities (teaching and motivating processes) are essential.

A setting is basically context-sensitive. It naturally depends on the target group, but the general aims of the teaching institution are crucial. The use of electronic learning material and the way it is made available to the pupils/students differs considerably depending on whether it is for pupils in a classroom (high school), for experienced students (at university), or for adults who attend an evening class for further education ([14], [20]).

3. The WeLearn Distance Teaching/Coaching/Learning Framework

WeLearn ([4], [5]) stands for Web Environment for Learning. It is not only a simple learning platform, but a framework that consists of three parts:

- the platform itself
- the settings and
- the course materials.

The platform

The WeLearn platform is a free and open learning environment that is dynamically adaptable to the expectations and needs of the course providers and learners, their skills, aims and requirements. WeLearn provides basic components (like discussions forums, chat forums, folders, news boards, etc.), which can be duplicated and arranged in any desired and convenient way. This construction-kit philosophy is the reason why WeLearn can also provide tailored settings and can be adapted to changing learning situations dynamically. In accordance to the GNU philosophy [18], the WeLearn framework is available free of charge, and moreover WeLearn can be easily modified or expanded by everyone.

The WeLearn framework contains facilities for presenting and organising learning material and an easy method of course administration; it supports communication and interaction, and self-assessment possibilities are included. Typical sample configurations exist for different learning models. So every teacher can implement his or her individual learning model or adapt existing settings to his/her learning environment, aims, audience and requirements [8]. In order to

differentiate learning models, the appearance of the WeLearn platform adapts itself to individual configurations.

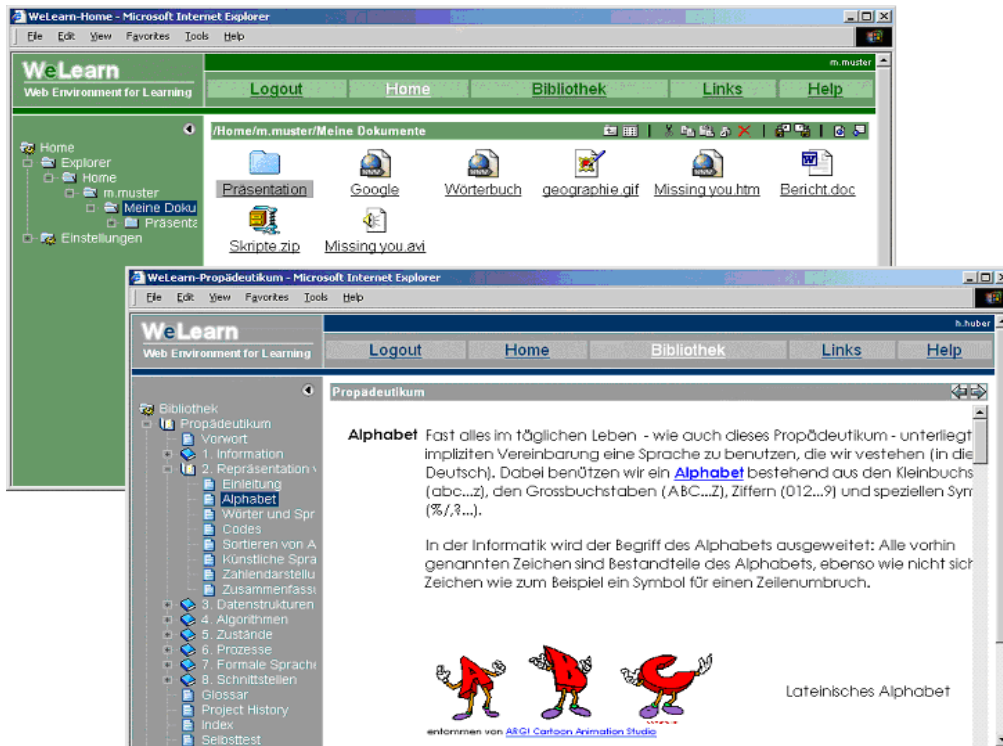


Figure 1: Different Appearances of the WeLearn Platform

In addition, several off-the-shelf courses can be embedded in the WeLearn platform individually. Teaching material (slides, text, exercises,...) is embedded in an XML meta-description, which follows the CPS (Content Packet Specification [8]), now a world-wide standard. A detailed description of the technical design, the various functionalities, the settings and the course material can be found in [3].

4. Case Studies

This section focuses on the experience we have acquired, and also describes frankly the lessons we have learnt. It is organised as a sequence of “best practice” reports, and contains statistical material derived from questionnaires, interviews with teachers, tutors and students, and lastly from marking examination papers in comparison to those groups of students who went through the course(s) as usual.

4.1 Teacher training

A summer course on Principles of CS was held for teachers who teach CS at high schools. In order to avoid putting these teachers under excessive pressure, the electronic learning material was introduced step by step and used to enhance traditional handouts. The course lasted for 1 week. In the morning teaching was done in a conventional way, but during the afternoon the teachers had to recapitulate what had been taught previously. As a way of mirroring the classroom procedure, they had to group themselves into smaller units, each of which had to invent examination questions for other groups, and also had to inspect and discuss the answers given. A dedicated setting was specified in the WeLearn framework, which was installed on a PC used as server. The latter was physically available in the classroom, running on a small LAN.

4.2 Teaching Propaedeutics in Computer Science at JKU Linz

During the winter semester of 2001/02 a beginner's course on "Propaedeutics in CS" was held. This course is compulsory for all CS students in their first semester. The number of students who have to attend this course is usually between 150 and 180. We gave a questionnaire to all the students in the lecture theatre and invited them to join the pilot study. 157 questionnaires were returned and 28 students agreed to join the study. Five of these had no access to on-line facilities, so finally there were 23 participants (all statistical results are taken from [13]; more details can be found there).

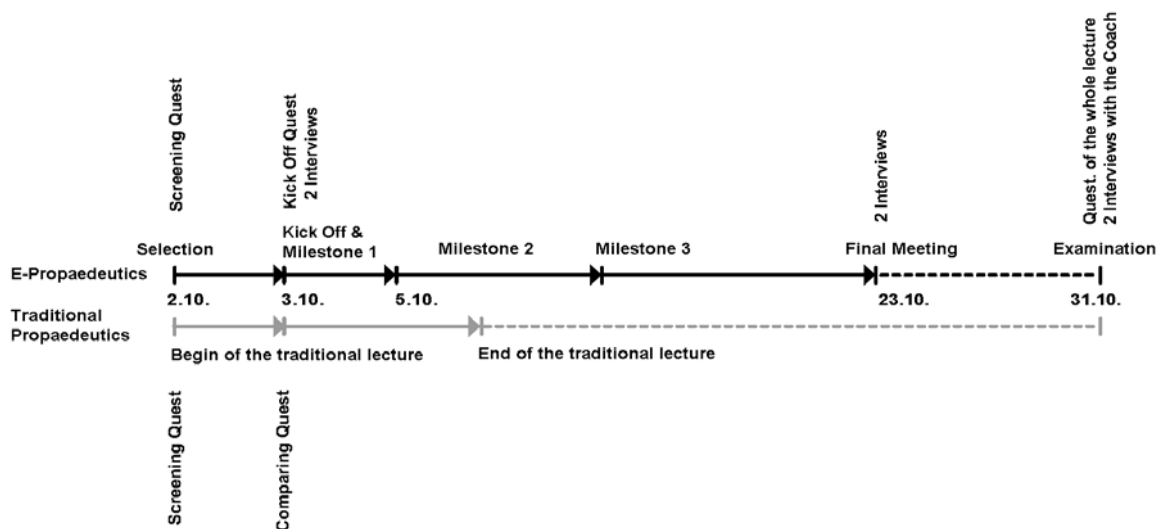


Figure 2: Time schedule of the course "Propaedeutics in Computer Science WS 2001/02"

Propaedeutics in Computer Science started on the 2nd of October and from the 3rd of October onwards the lecture was split into two learning models:

The Traditional learning model: with one-week of frontal instruction in the lecture theatre and a final examination three weeks later.

The collaborative web-based learning model (DTCL model): 23 students participated in this learning model, which was mainly web-based, but also included a "come together" Kick-Off Meeting held in a classroom, several Milestones and a final meeting. After four weeks the same examination had to be sat.

Both models were executed in parallel. They started and ended in the same period of time. The traditional learning model is the common model for lectures at the university and therefore not described here. But the DTCL model is worth presenting in more detail.

Within the DTCL model for Propaedeutics in Computer Science we followed a hybrid teaching model mainly based on two elements:

- the web-based environment: a special setting for Propaedeutics in WeLearn and
- a didactical setting for face-to-face meetings in a classroom

The WeLearn Setting for Propaedeutics

For the web-based lectures on Propaedeutics specific electronic learning material was developed and embedded in the WeLearn environment as a library. In addition to useful Links (URLs) and Help sections, several forums were set up in advance for the E-Propaedeutics.

The learning material consisted of varying presentations of the content and included a Study Guide. The Study Guide served as an introduction to how to organise self-directed learning. The content itself was composed of an HTML version with embedded applets to give the students the possibility of hands-on experience. Additionally all the slides shown during the conventional lecture-theatre presentation with embedded illustrations and the full text of the handouts (in German and English) were made available. These different materials are intended to support different types of learners and to give the students the chance to approach the content from more than one angle. It is worth mentioning that the HTML version was developed by students for students.

Last but not least, each chapter ended with self-assessment exercises (questions and answers, quizzes, text fill-in exercises, crossword puzzles, etc.). This enabled the students to assess what

knowledge they had gained and which topics should be repeated. This self-assessment is also a very good tool when students have different backgrounds. To give an example: A student is already familiar with time complexity, but not sure whether (s)he knows the topic in sufficient detail. Then (s)he can start with self-assessment and check whether (s)he needs to have a closer look at this topic, or s(he) could skip the chapter in question.

Parallel to the library, a global discussion forum and four group forums were set up. In the group forums only the individual group members had reading and writing rights. So each group had its own forum where the group members could discuss, ask questions and help each other. When questions arose that could not be answered within the groups, or whenever they wanted to ask the coach or wanted to address (members of) other groups, the global discussion forum was used.

The didactical settings for face-to-face meetings

The Kick-Off Meeting

The Kick-Off Meeting is a very important element in a hybrid teaching and learning model. The Kick-Off Meeting should provide an introduction to the learning model, with the coach giving a survey of the aims, the time schedule and the major milestones. The Kick-Off Meeting is the starting point, at which it is crucial to motivate the participants and to give the chance both to get used to the organisation (working environment) and also especially to meet their colleagues face to face. The Kick-Off Meeting was held in this way. The coach informed the students about necessary details and motivated them. The latter formed 4 learning groups. The very first task was to find a nick-name for each group and to post it together with the names of the members into a WeLearn forum, in order to get mutually acquainted and to get more familiar with using the WeLearn platform. The four groups also had to discuss what computer science means to them, and present their result afterwards to the audience. The coach collected the various results and mapped them onto the actual CS curriculum.

At the end of the Kick-Off Meeting the coach summarized the various contributions by going over the main aspects of the collaborative web-based learning model once again and reviewing the milestones and the aims of the pilot study. A very important fact, which has to be mentioned, is that these 23 students were “banned” from the lecture theatre – they were instructed not to attend the traditional lectures anymore.

This Kick-Off Meeting was a great success. During the evaluation the students had to mark it and they were asked what they liked or disliked about it. The students emphasized that they appreciated the informal atmosphere, the way the coach developed links between their ideas and the CS curriculum, and particularly the formation of learning groups. Some timing problems were reported. These were due to the lack of a lecture theatre at an appropriate time, which meant that for some students the meetings clashed with another lecture. But this is an organizational problem unrelated to DCTL in general.

Overall most participants marked the Kick-Off Meeting as very good or good, as shown in Fig. 3.

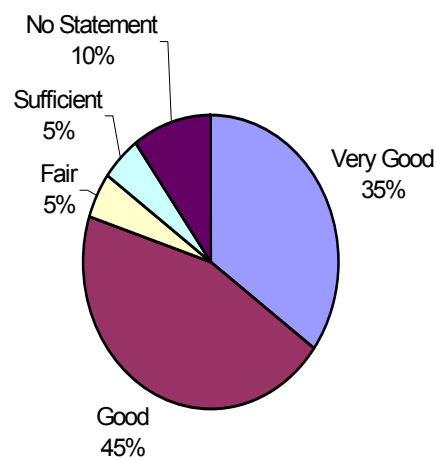


Figure 3: Evaluation of the Kick-Off Meeting

The Milestones

The students had to fulfil several milestones. The first milestone was to form groups, find a group name and post the data of the group members and the group name into the discussion forum in the WeLearn platform. The second milestone was for each student to get familiar with the platform and post a short presentation with their main personal data into the discussion forum, so that the students got to know each other a bit more. The last milestone involved more work and required interaction between the students and the learning groups. The task of the groups was to find questions about the content of Propaedeutics, to answer together the questions from the other groups, and to present the answers given. In other words, they played the role of a teacher for a while. In order to do so they have to understand the content, choose appropriate questions, and finally assess the answers.

The Final Meeting

The final meeting serves to come together once again, to conclude and summarise the project, to answer any outstanding questions and most of all to give and get feedback. The coach handled the final meeting on E-Propaedeutics with these aims; the students themselves participated intensively in this meeting and their feedback was more positive than the average for such situations. The time clash was again mentioned as negative, but there was enthusiasm about the coaching concept and the commitment of the coaches got good marks. The idea and the implementation of the new learning concepts were noted as very good.

The Examination

The students from the lecture theatre and the E-Propaedeutics students had to sit the same examination at the same time in the same room. The examination contained certain key questions, which the students had to answer to pass the exam, plus various additional questions designed to find out whether the students had concentrated exclusively on the compulsory subjects or had studied the broad range of Propaedeutics.

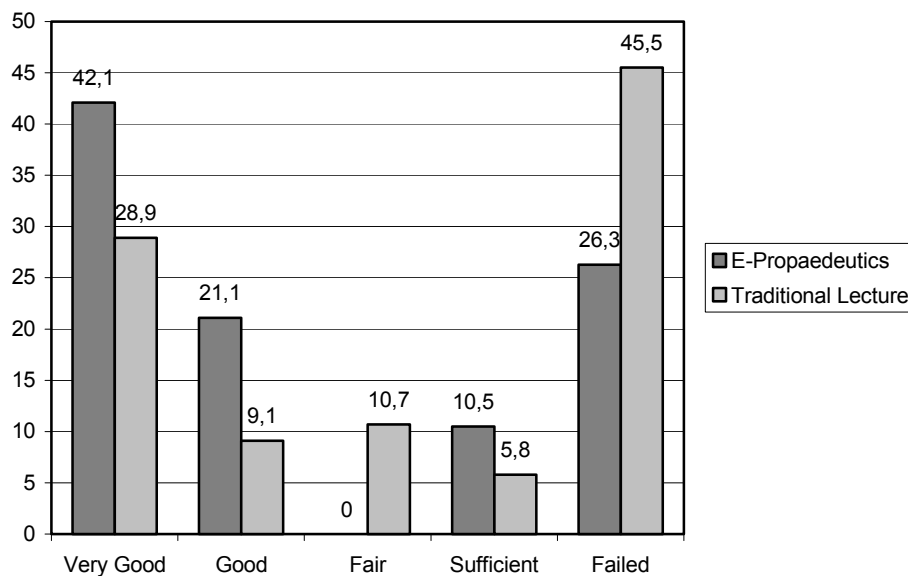


Figure 4: Results of the exams of both learning models

The mean mark obtained in the E-Propaedeutics group is 2.58, and the mean in the traditional lecture group is 3.3 (1 = very good,... 4 = just sufficient, 5 = failed). So there is a difference between these two groups, but because of the standard deviations of 1.74 and 1.75 the difference is not statistically significant. But, when one groups the marks very good and good to express that these are students with a good knowledge of the topic and you group the other marks, a statistical

difference can be proven by comparing the two learning models with a χ^2 test. The result of this test statistically proves that the E-Propaedeutics students are marked very good or good significantly more often than the students in the traditional lecture setting. This and the feedback from the students lead to the conclusion that the Distance Learning students are working more actively and in a broader range on the various topics.

4.3 Teaching Operating System Principles at JKU Linz

This course is part of the CS curriculum at Johannes Kepler University at Linz. In the past this course was held in the traditional way – the lecture was delivered only in the lecture theatre. In the summer semester of 2002 “Operating System Principles” is provided as a hybrid teaching model. This means that there are meetings in the lecture theatre, and DTCL is provided via WeLearn parallel to these. The didactical concept of this course is similar to but not identical with “Propaedeutics in CS”, and the settings in the WeLearn environment are therefore different. In this course context we have also provided a three-level coaching concept that includes the students, tutors and the coach.

4.4 Teaching Virtual Communication at the Universities of Zurich, Munich and Graz

A course on “Virtual Communication“ was organised at the University of Zurich and the Universities of Munich and Graz cooperated on this course. Students at all three universities worked together in groups on specific topics. The WeLearn platform was the key technology that makes distributed teamwork and collaborative working possible.

4.5 Teaching Principles of Computer Science to pupils aged 14 – 16 at two different high schools

WeLearn was also tested in the school context. In such a setting the teacher is present in the classroom most of the time. The WeLearn framework is basically used as a source of teaching material and to set homework that must be uploaded into special folders by the pupils. Each pupil has “write” access to a dedicated folder and “read” access to a general folder, which can be regarded as a conventional “news board”. The latter is owned by the teacher who has reading and writing rights there. In addition a folder for uploading and downloading is available – here everyone has reading and writing rights. Parallel to this folder a dedicated forum is open to all pupils and the teacher too.

4.6 Teaching Computer Science as an extramural course for postgraduates at a polytechnic

This course addresses adults aged between 25 and 40, who are employees of various firms and want to upgrade their current knowledge and skills specifically in CS with an emphasis on network administration and JAVA programming. The postgraduate course lasts for 3 semesters; as part of this course students and instructors meet regularly at weekends. At the polytechnic in question (Fachhochschule Vorarlberg, Austria) the setting of WeLearn is different and there is a strong emphasis on DTCL, particularly as concerns basic theoretical knowledge and the foundations of CS.

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