SYNCHRONOUS SESSIONS WITH COLLABORATIVE WORK FOR DISTANCE LEARNING IN MULTICULTURAL CONTEXT

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Abstract
In distance learning, synchronous situations including collaborative work in a multicultural context are innovative and complex situations of distance learning that will probably become more and more frequent in the future because of internationalisation of education. We present an experiment of those pedagogical situations realized in the framework of the GENIUS European project. This experiment involved students and teachers from engineering departments of universities from four countries.

INTRODUCTION

The GENIUS project1 (Generic e-learning ENvironment and paradigms for the new pan-european Information and commUnication technologieS curricula) follows the European project CareerSpace2 which was centred on the competencies to be acquired by future ICT (Information and Communication Technologies) professionals. The goal of GENIUS is to provide an educational program in the field of ICT and to design and experiment innovative pedagogical situations within specific distance training software. Nine European universities participated in this project and four industrial partners3: eight modules were developed and experimented by the universities (Operating systems, Project Management, Computer Networks, Programming, etc.). At INSA of Lyon, the project focused on training engineering students, in initial education in the Computer Engineering department, on computer networks. A module on computer network has been realized in cooperation with three other universities: Aristotle University of Thessaloniki, University Carlos III of Madrid and University of Reading.

Paquette (2001) has defined 6 models of "distributed education": "High-tech" Classrooms are classrooms using sophisticated multimedia and network equipment where students and teachers are in a single location; Distributed Classrooms or Virtual classrooms are classrooms where...

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2 CareerSpace Project: http://www.career-space.com/
3 University of Reading (UK), University of York (UK) Trinity College (Ireland), Aristotle University of Thessaloniki (Greece), University Carlos III Madrid (Spain), INESC Porto (Portugal), University of Ulm (Germany), INSA Lyon (France), University of Linkoping (Sweden), IBM, Intel, British Telecom/Support IT, Phillips, e-Skills (UK) and ICEL Ltd (Belgium)
students and teachers are in at least two distant locations; *Hypermedia self-training* on the web on or cd-rom; *Asynchronous "on line" training* are organized by a teacher and include student group work; *Communities of Practice* concentrate on professional tasks and are not led by a teacher; *Performance Support Systems* provide training at place of work.

The system designed for the computer network module of GENIUS relates to the "distributed classroom" model. In effect, students and teachers are located in several distant locations, in our case, different countries. This type of model can be supported either by a real-time videoconferencing system, or by a desktop multi-point videoconferencing software. This is the case in GENIUS, where all the tools supporting the distributed classroom are computer-based.

Our approach was to focus on a specific pedagogical situation characterized by synchronous sessions and an important amount of collaborative work between students. Our goals were to define typical content of this kind of session and to set up an experiment with students from different universities. This approach is innovative for several reasons: it concerns mainly students in initial education (distance learning is usually used in continuing education); the sessions are synchronous sessions; they include collaborative work; they take place in a multicultural context, students from different countries being in the same virtual class.

In this paper, we present the general results of the work realized on the computer network module, and we focus on the pedagogical aspects of distance learning situations. We first describe the module on computer networks, then we detail the experiment of this module with students, and especially the second session. Finally we present the results of the experiment and recommendations.

**MODULE ON COMPUTER NETWORKS**

**Pedagogy**

Our goal was to test innovative pedagogical situations. Distance training through computers is itself an innovative situation because it is not widespread in universities. But we wanted to have a pedagogical situation, which was innovative even compared with traditional teaching, which means situations that cannot be obtained in traditional settings. Several innovative aspects were considered: Synchronous sessions, Distant collaborative work, and Multicultural context.

In a synchronous situation the actors (learners, teachers) communicate at the same time. Synchronous tools are for example telephone, videoconferencing, chat, whiteboard, application sharing, etc. Asynchronous tools are for example mail, discussion forums, workspace for documents, etc. It is generally admitted that Synchronous and Asynchronous situations are closely interrelated and must be both present for successful distance training. We may say that synchronous situations bring to learners more human contacts while asynchronous situations bring them more time to reflect on the knowledge domain. In the computer network module, we focused essentially on synchronous situations, because we did not have enough resources to consider both aspects. The support of these synchronous situations is not always provided by LMS (Learning Management Systems). So specific tools are currently being developed to address those specific features, like the one described in (VILLARDIER & al. 2003).

A Collaborative situation exists where learners are working together through ICT tools. One class of learners can be split into several parallel subgroups, each subgroup working on a specific task. Specific tools such as whiteboard, application sharing, shared web browsing, etc. can be used. One situation can be, for example, that a group of distant learners communicate with a chat
tool and a whiteboard. For example the European project NetPro is developing a specific collaborative environment for project-based learning (PONTA & al. 2003), and (CHAN 2002) has studied web-based support of projects, using discussion forums and email communication with a commercial tool (WebCT). Three different aspects are usually distinguished in collaborative situations: communication (dialogue), coordination (roles and task attribution) and production (the task itself).

A Multicultural situation exists when a heterogeneous population from the point of view of language and/or country of origin is being trained. The learners and the teachers can have different countries of origin, different cultures in their country of origin, different languages (mother tongues and non verbal languages), different work habits, different pedagogical approaches and different learner/teacher/author relationships. This type of situation implies new problems at the levels of organisation, teachers and ICT tools, as for example: choice of a working language, holidays, work hours, shared knowledge, cultural background, common analogies, multimedia illustrations, layout of screen, use of colours, etc. The study of multicultural factors in educational technology is quite new, as for example in (TEDRE & al. 2002) and (KÄHKÖNEN 2002).

An important amount of work has been done on collaborative situations, but synchronous situations are less studied compared to asynchronous situations. The addition of the Multicultural factor is even more rare. The combination of these three types of situations (Synchronous, Collaborative and Multicultural) induces a high complexity in the pedagogical situation and so it has rarely been studied.

Design of the content of the module
The objective of the computer network module was mainly experimental, so we concentrated more on pedagogy and on experiment than on the content itself: we didn't develop completely new course, but instead, each partner worked on already existing courses. Each session was designed and led by one country, and was dedicated to a specific topic corresponding to the speciality of the teacher (teachers were from university and were also researchers). The content of the course relates mainly to the research themes of the teachers, so most of the sessions of this module can be seen as a set of seminars on highly technical topics: Routing in computer networks, Network administration, Grid computing, Web services. The main difficulty for the design of the content was not the design of the lecture but was the design of innovative learning activities, that is, activities which are convenient for distant training and for collaborative work. With regards to this matter, the field of computer networks is especially interesting because computer networks deals itself with distance. Although the domain provides plenty of examples of distance situations in professional situations, we found that it was not obvious to transpose them to a pedagogical situation.

Learning Management System (LMS)
The LMS used during this experiment is a commercial software provided by one partner of the project4. This software works in a synchronous mode and reproduces a virtual classroom (one teacher and a group of students) and enables also group work (several group of students working in parallel). The features offered by this tool are:

- White board,
- Synchronized web browsing,
- Application sharing,

- Chat, Audio, Raising Hand (asking for the floor by clicking on the hand icon),
- Feed-back from students to the teacher (yes/no, faster/slower,...),
- Questions and Answers,
- Picture or video of teacher and students,
- Recording of sessions,
- Break-out groups: groups controlled by the teacher (time duration, students),
- Meetings: groups without control by the teacher.

In this experiment, the video was not used because it didn't seemed essential and in order to avoid problems of network bandwidth. All the other features were used, especially the group work features. The description of the module with the detailed schedule of the sessions was stored on a specific web site, located in France\(^5\).

**EXPERIMENT**

The experiment involved students coming from four universities in France, Spain, Greece and England. For scheduling reasons, we had to schedule long sessions (4 hours sessions). Our idea was then to put into those session both lectures and group work, and to test if this would work. We also wanted to promote interaction between students and teachers during the lectures, and interaction between students\(^6\). Lastly, we have provided the possibility for students to work from home.

**Scheduling**

The schedule of the sessions (Figure 1) was totally constrained by the schedule of the French students: as their schedule is already very full, this course was set up to replace existing sessions of practical work.

<table>
<thead>
<tr>
<th>Session 1 Routing</th>
<th>Session 2 Administration</th>
<th>Session 3 Administration</th>
<th>Session 4 Grid computing</th>
<th>Session 5 Web services</th>
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</table>

1 week

*Figure 1. Schedule of sessions*

**Students**

Students were from various university departments:
- France: initial education, Computer engineering department
- Greece: initial education, Telecommunication division
- Spain: initial education, Telecommunication department
- England: continuing education, Master of Science

The students had generally a very good experience in using ICT tools. The English students were a little older than the others and some of them had industrial experience, which was not the case with other students. Students were recruited on a volunteer basis in France, Greece and Spain. In

\(^5\) Web site : matice.insa-lyon.fr/genius/

\(^6\) This was done by providing informations on students and teachers (name, e-mail, photos) on the web site and by recommending teachers to use specific tools of the LMS (feed-back, questions and answers).
England, the whole class was enrolled in the experiment. The table 1 shows the participation of students.

**Content of sessions**
Four of the sessions comprised a mixture of lectures and group work, the other session (the third in the series), inserted because of problems with timetabling, consisted solely of group work (Table 1). Two of the sessions were split between two different lecturers (Table 1).
The lectures used a wide range of techniques, including presentation of slides, whiteboard (almost always), feedback (yes/no, faster/slower,...), question and answer, demonstration of software, application sharing and response to questions sent by text chat. Materials available on the website included reading lists, notes, slides and animations.
For the group work, students were divided into transnational groups and worked together using the ‘Break out group’ function of the LMS or (in the group work only session) the ‘Meeting’ function. For most of the lecture sessions, the associated group work involved mini-projects or assignments, to be completed within the timetabled session. Sometimes all the students reconvened at the end of the session to answer questions or demonstrate solutions related to the group work. For GRID computing there was a longer project, requiring work well beyond the timetabled session.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Session 4</th>
<th>Session 5</th>
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<tbody>
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<td>France: 1</td>
<td>England: 1</td>
<td>Spain: 2</td>
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<td>Spain: 5</td>
<td>Spain: 4</td>
<td>Spain: 0</td>
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<tr>
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<td>France: 0</td>
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<tr>
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<td>France: 0</td>
<td>Greece: 0</td>
<td>Greece: 0</td>
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</tbody>
</table>

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<thead>
<tr>
<th>Participation of actors</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Session 4</th>
<th>Session 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(..): number of students located out of university</td>
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<td>Spain: 6</td>
<td>Spain: 5</td>
<td>Spain: 4</td>
<td>Spain: 0</td>
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<tr>
<td>Total of person</td>
<td>22</td>
<td>23</td>
<td>17</td>
<td>28</td>
<td>30</td>
</tr>
<tr>
<td>Type of content of session</td>
<td>Lecture</td>
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<td>X</td>
<td>-</td>
<td>X</td>
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<tr>
<td></td>
<td>Individual exercises</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td></td>
<td>Group work during session</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Group work after session</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
</tbody>
</table>

*Table 1: Participation of actors in sessions and type of content of sessions.*

*The total number of person is not the sum of all the actors because some physical persons have several roles.*
DESCRIPTION OF SESSION 2
We now describe, as an example, the distance situation and the content of the second session of the experiment.

Distant synchronous situation
The figure below (Figure 2) shows a global view of the actors involved in session 2. Four distant universities are involved: students and teachers are from three universities (Lyon, Thessaloniki and Madrid) and the LMS common server is operated by one university (Reading). Each university has also a local LMS server, used as a test server. The teacher is in Lyon, he is the communication controller (labelled "CC").

Detailed schedule of session 2
The content of the second session was, as in session 1, a combination of lecture and group work, but with more time for group work. The figure 3 shows the detailed content of the lecture, with the expected time schedule.
During the group work, the students were divided into transnational group work and worked together using the "Break out group" function of the tool.
RESULTS

Evaluation of experiment
For each session, we have collected the following elements:
- Questionnaires completed by each student, sent by e-mail after each session, containing qualitative and quantitative questions on lecture and on group work,
- Recording of sessions (provided by the LMS),
- Text of chat during the sessions,
- Observations.
In addition, the French students wrote a report on their experience, and an evaluator realised interviews with sample of students, teachers and coordinator. The answers to the questionnaires were analysed and synthesized by this independent evaluator (not belonging to any participating university)\(^8\). We present in this paper the first results of this experiment, based mainly on the qualitative answers of the students to the questionnaires.

Experience of actors in E-Learning
The experience of students before the course was mainly self-training with websites and cd-rom. Only one of them had attended videoconferencing lectures. So most of students had no experience at all of synchronous distant learning. But they had experience of synchronous communication tools: the chat tool familiar to most of the students, point to point videoconferencing on Internet\(^9\) familiar to some of the students. The LMS used was new to all the students. Each country trained its own students in the use of this software.

\(^8\) The analysis of questionnaires included both a numerical analysis and a collation of comments to open questions.
\(^9\) Chat software: ICQ, IP videoconferencing: Netmeeting
**Type of sessions**

**Synchronous sessions**

Synchronous sessions were difficult to organize because they required very precise scheduling: general schedule of day and time and a precise schedule of the content of the session describing the time for the lecture and the time for the group work. The advantage is that they recreated the impression of being in a class, at the same time as other students. Students could communicate with one another, especially during group work.

**Long sessions with lecture and group work**

Having long sessions (4 hours) was very difficult in the first session for some students who had concentration problems. The class was a good length for 5 students and too long for 9 students. This session contained mostly lecture and only one break.

In session 2, the length of the sessions was a good length for 8 students and too long for 5 students. This can be explained by the fact that in session 2, students were better familiarized with the LMS, that more breaks were scheduled and that the session included more group work than in session 1. In session 2, the amount of group work was of a good length for 4 students, too short for 8 students and too long for 1 student.

![Figure 4. Application sharing during the lecture part of session 2](image)

**Lecture including demonstration of tools**

The lecture of session 2 on Network Administration included the demonstration of a specific software, a network supervisor. This software was shown to the students by the mean of the application sharing feature (Figure 4). So all the students could follow in real time the actions of the teacher on the software (activation of menus, entry of text, ...), the cursor being visible, and the response of the software.
This demonstration and the application sharing feature was very much appreciated by students, although the low speed of displaying of this application sharing was quoted by some students.

**Interactivity during lecture**
The interactivity between the teachers and the students was provided either at the initiative of the students or at the initiative of the teachers. Teachers asked verbal questions or written questions prepared in advance or not (using the tool Question and Answers of the LMS), and asked for feedback (using the tool Feedback of the LMS). The interactivity was provided unequally according to the teachers. Students reported that the interactivity offered by most lecturers helped them to keep their concentration.

Students interacted with the teacher mostly by writing questions in the chat window and rarely by using the Raising Hand tool. The students interacted between themselves using the chat tool.

**Multicultural context**
Those distant sessions involved teachers and students from many more than four nationalities. This situation is probably typical of some European universities where there is an important exchange of students and teachers.

The language used by all the teachers, English, was not a problem except for understanding some accents. However, this result may not be generalized to the whole class, as the French, Spanish and Greek volunteer students were a sample of their class, having probably a better level in English than the rest of the students.

The students also spontaneously tried to use other languages, in the chat tool (Spanish, French, German, Greek), the problem being of course that only a few people could understand.

Most of the students were very enthusiastic about the transnational group work: being able to communicate with students from other countries, working with people having different backgrounds and way of thinking. A minority did not take much part in the group work. Sometimes this was thought by the others to be a sign of non-cooperation, but it could also be the result of technical difficulties (like loss of sound), hesitation in using English or lower levels of prior knowledge of the subject of the session.

**Collaborative work**
Most of students were enthusiastic about the group work, and especially by the fact that the group comprised students from different universities (transnational groups). A lot of different tools were used by the students during the group work: white board, application sharing, shared navigation, text chat,....

A number of problems occurred, as for example, the fact that all the students did not have the same level in using the group work features of the LMS. In effect, the training of students on how to use group work features was done differently in each country, and was probably too weak for the group work, which is much more complex than for attending a lecture.

They also found that the communication during group work at distance was slower than in classic presence situation.

Many of the students were accustomed to 'directed work' sessions, in which a lecturer or assistant is available to respond to questions and solve difficulties. They therefore found it difficult to undertake group work when there was no way of requesting help from the lecturer. In effect, the students were dispatched in several different parallel workspaces and they could only see what was happening in their workspace, the LMS doesn't provide the possibility for students to "call"

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10 Several students of the English university were in fact students coming from other countries (Spain, Greece, Germany, ...). One teacher in Spain was from Germany.
the teacher. In the last session (on Web services) the lecturer joined each workspace in turn to respond to any questions and this was very much appreciated by students.

The students have made a number of very thoughtful and constructive suggestions on how to improve the group work:
- Avoid wasted time at the start of group sessions by allocating people to groups in advance
- Ensure more equal prior knowledge amongst group members, or devise group tasks so that each can contribute his or her own expertise
- Hold a group introductory session before the course, so that group members feel they know one-another and can ‘get down to work’ straightaway
- Provide training in using the group work features of the LMS before the sessions, so that students feel comfortable with using it (this could be combined with the previous suggestion)
- Keep the groups the same for several sessions, to build on the group spirit
- Appoint a student who acts as a chairperson: knows what to do, controls communication and encourages contributions from each of the students
- Allow more time for group tasks
- Ensure that students receive credit for the outcomes of the group work.

**Student location during the sessions**

In France, the choice of the location (in the classroom or at home) was left to the students from the third session, because at that time they were considered to be sufficiently trained in the use of the LMS. Some of the French students were enthusiastic at this idea. As shown on table 1, 3 students participated from home in the third session, and 4 in the fourth session. Those students had a high-speed connection to the Internet because they had a room on the campus. The advantages quoted by the students were: they felt more comfortable on the computer because it is a personal computer with all the programs and preferences on it, they were in a quiet environment (no noise from other students), they heard the sound via speakers instead of headphones. The disadvantage quoted by one student was that it was harder to concentrate because they was less feeling of being "part of a class", because there were no other students around.

**RECOMMENDATIONS**

From the experience gained during this European project, we can propose a list of sensitive points to be carefully taken into account when designing distant learning situations of a synchronous type including collaborative work. We formulated them as "problems" which may occur.
- Collaborative work
  - Insufficient training of students on the features of the LMS related to group work
  - Length of group work too short
  - Tasks too complicated for group work in too short a time
  - Lack of prerequisite knowledge on the part of other students
  - Different background of students
  - Description of the task for group work too poor
  - Lack of explanation by the teacher concerning the task (before the group work)
  - Lack of presence on the part of the teacher in the groups (during the group work)
- Features of LMS not supporting group work adequately (like impossibility for the students to "call" the teacher for help)
- Access problems during the practical work because of network security
- Network congestion
- Lack of headset for the students (problem if several students are in the same room)
- Student feeling isolated (lack of feedback of other students)

- Multicultural context
  - Difficulties with understanding the chosen language
  - Difficulties with understanding the accents of teachers or other students
  - Different background of students

- Synchronous sessions
  - Scheduling common international sessions
  - Rescheduling sessions because of last minute changes (like teacher availability)
  - Scheduling sessions in an already full schedule
  - Too long sessions (and especially too long lectures)
  - Unbalanced sessions (proportion of lecture and group work, breaks,...)

- Methodological
  - Analysis of data time consuming
  - Tasks related to evaluation of experiment underestimated
  - Operational objectives and Research objectives not compatible

CONCLUSION

We designed and experimented innovative pedagogical situations characterised by synchronous sessions including lecture and collaborative work in the framework of engineering education and in the multicultural context of four European countries.

The experiment showed that the students have a strong motivation for working in transnational groups in synchronous sessions. Although those students were highly IT skilled, and also used to traditional group work, there was an important need for a deeper training to the features of the LMS related to group work. This experiment showed also the limits of the LMS for group work, as for example the lack of a feature for "calling" the teacher from a work group.

A large amount of data was collected in this experiment. The first results were presented in this paper. Some perspectives for further work are: to go deeper in the analysis of the data; to examine the models of pedagogical situations involving synchronous, collaborative and multicultural sessions; to study the LMS features required for supporting the models.

Complex situations of distance learning implying synchronous activities, collaborative learning and multicultural context will probably be generalized in the next few years, especially in the context of higher education and in the scientific and technical domains. Indeed, the

11 for example operational objectives could be to have one session per week, but this doesn't give time to analyse the data for research and for improving a session from the analysis of previous sessions.
internationalisation of distance learning, the requirement of on-line collaboration and the needs of synchronous communication between learners and teachers are leading to these new pedagogical situations.

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