ONLINE INTERACTIVE LEARNING ARENA OVER THE INTERNET

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ABSTRACT

The article describes the experiences and results from the pilot project called "Online interactive learning arena" at the Norwegian University of Science and Technology. The pilot project used an internet-based video conferencing system in a course with about 80 students. The system was used for online lectures, online tutoring and online group work, with focus on the integration of different media types (e.g. audio, video, text, shared whiteboard) and the interactivity possibilities between the lecture room and the distributed students (via e.g. shared applications, audio- and text communication). We experienced new communication possibilities compared to traditional learning environments, but also that nervousness in public communication via the video conferencing system was less than in traditional lectures. Another experience was that one should use the possibilities and added value of the technology as a starting point for the organization of the use, and not put technology in the same frames as traditional education. The pilot project was one of several experiments conducted in the QUIS project.

KEY WORDS
Video conference system, e-learning, online tutoring.

1. Introduction

"Online interactive learning arena" was a pilot project that was carried out during the spring semester 2006 in the course "Operating systems" at the Department of Computer and Information Science at the Norwegian University of Science and Technology (NTNU) [1, 2, 3]. In all, about 80 students followed the course. Some students were physically on campus attending the lecture, while some students attended the lectures via the internet. There were one teacher and five tutors.

The definition of an "online interactive learning arena" in this study is a learning arena run through an internet-based video conferencing system. The learning arena covered three areas; online lectures, online tutoring and online group work. In addition, there was a course website. The learning arena was based on a commercial video conference system [4] run over the Internet.

It has also been a goal to gather as much experience and information as possible about this kind of teaching and learning, in addition to offer the students access to several alternative learning possibilities. What are the positive and negative experiences? What improvements are experienced? We have tried to illuminate these questions.

2. Virtual auditorium

The online learning arena made use of the video conference system to broadcast lectures in real time over the Internet. The students could actively participate in the online lectures. With a computer, a web-camera and a microphone, they could follow the online lecture in addition to ask questions during the lectures. And, by sharing applications, the teacher could also allow the students to control the activity on his/her computer. Thus, the students may, for example, write and draw on the electronic blackboard belonging to the video system. If the assignment is, for instance, to construct a machine part, this could be done by the teacher and the students, together in the video conferencing system. Then the teacher can draw a construction draft and the students can add their corrections, or vice versa.

Figure 1: Screen shot of video conferencing system [4]

Online tutoring

Online tutoring means that a teacher or assistant teacher tutor over the Internet, and it offers the same possibilities as an online lecture. For instance, in a programming course, student / teacher can upload the code and thus work with it together. After finishing, it is possible to run the program together, make new updates etc.

Group work
The students may work together via virtual group rooms. The group rooms offer the same possibilities as mentioned above, and they are accessible 24 hours throughout the week.

3. Setting up equipment in auditoriums

In the video conference system, it is possible to enable desktop sharing, so that the other participants of the meeting can access your desktop. This function was actively used during the lectures. The lecturer shared an Internet-based hypermedia system (covering the entire course curriculum), which allowed online students to see exactly what the students present in the auditorium saw. In addition, there was a camera pointed towards the lecturer, and two cameras pointed towards the students who wanted to be physically present in the auditorium. The reason for the lecturer-camera was that the students following the lectures online also should be able to see the lecturer; i.e. to see the body language of the lecturer. The cameras directed towards the students were placed so that students following the lecture over the Internet could see the interaction between the students and the lecturer in the auditorium. We have experienced that this is a strong want from online students. Especially when there are questions from students, online students want to see the interaction / dialog between student and lecturer. So, there were at all times three pictures from the auditorium available to the online students. The people present in the auditorium follow the conversation via a canvas and speakers. The online students can choose if they want to participate with names, video and audio, or just by showing their names on the canvas/screen.

Equipment
Most of the communication between participants is via web camera, speaker and microphone. Each of the cameras we used could be programmed for six different areas/zones in advance, i.e. where the pictures come from at all times. This makes it easy for the operator operating the cameras without causing any inconvenience for the users of the system.
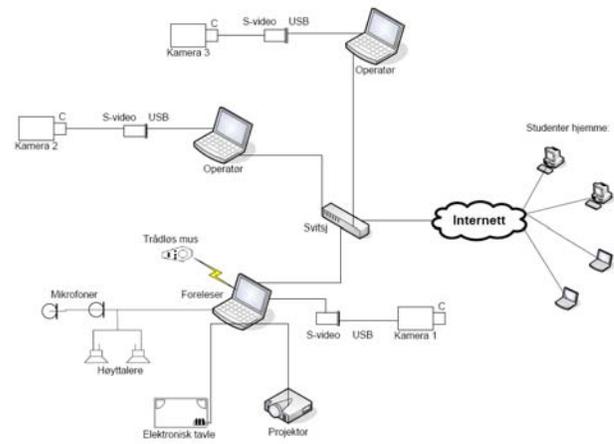

Figure 2: Equipment [2]

The camera pointed at the lecturer was programmed for six different areas/zones. The two cameras directed towards the students, were also programmed for six areas/zones each. Here, one could choose towards which areas in the auditorium to point the camera, according to which area/zone the conversation between lecturer and students took place. All three cameras could be controlled by the same remote control. The setup didn't require an auditorium specially designed for video transfer, the only requirement was access to the Internet. The cameras were easy to set up. With some preparation and practice, this could be done during the break before lectures.
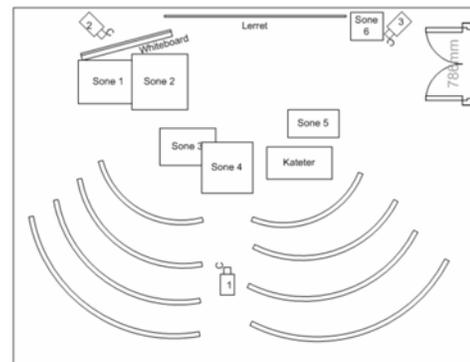

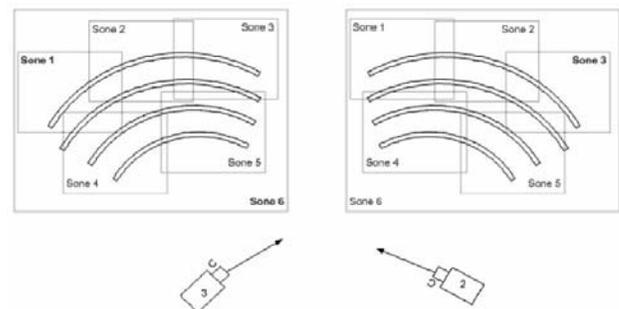Figure 3: Map showing camera placements in lecture room [2]

Figure 4: Map showing the zones in the lecture room [2]

We also used two powerful desktop microphones, which could capture sound from the entire auditorium. One was directed towards the lecturer, the other one towards the auditorium.

Chat function
One possibility is to have a public written conversation where all participants that are logged in can see what you're writing, and what others write to you. Additionally, it is possible to start a private conversation with one or several participants. The latter function involves having a private conversation which is only seen by the participants invited. This could include text, as well as video and audio.

Whiteboard (on-screen sharing of applications)
One of the widely used functions is the sharing of applications. It offers an opportunity to point and mark in a lecture where the lecturer, for example, makes use of PowerPoint presentations. Each page on the whiteboard that you want to keep can easily be saved as a file.

In addition, there is a function called "Allow control", a function that is used if you want others to take control of the application.

Using an ordinary board, whiteboard
In a meeting- or a lecture context, people often want to use an ordinary board. In this connection, an electronic board can be very useful. The electronic board that was used registered everything that was written onto an ordinary whiteboard. This is done by the use of two censors that are attached on the two upper corners of the board, and special pens that function like a computer mouse. The setup was quite easy. The only requirement was access to an ordinary whiteboard. The registered data is transferred to a computer. There, you can in turn store this data, share it with others via e-mail, print it, or discuss it in a meeting with others in the video conference system, like in the virtual auditorium. There, the electronic board was used as a shared application. It is also possible to control the computer from the board.

Recording the lectures
In addition to broadcasting the lectures live on the Internet, we also made use of the recording function in the video conference system. This gave the students, who for some reason couldn't follow the lecture live, the opportunity to download the recordings from the Internet and watch them later on. When the students gradually became aware of this possibility, we noticed that there were many students that weren't present. However, it should be added that the lectures began at 8 a.m.

4. Tutoring-lab

In connection with this project, a tutoring-lab was constructed. This lab was specially designed for online tutoring and the possibilities that the video conference system offers. The lab contains 3 pan / tilt / zoom cameras, whereas one camera is placed at the front, one at the back, and one in the ceiling above the desk. It is possible to switch between these cameras when needed. All the cameras are controlled by the same remote control. Each camera has its function;
• The camera in the ceiling is meant for showing details. For example, one can display an item and put it on the whiteboard for discussion, i.e. a page in a book, etc. The camera's zoom function makes it possible to clearly see details such as text.
• The camera at the back is used if the tutor is to be visible when illustrating something on the electronic board.
• The camera at the front is to be used as default to show the participants present in the room. The lab also contains a canvas and an electronic board. In addition, it contains two projectors, either for projection on a canvas/screen, or on the electronic board. Furthermore, the lab contains a powerful desktop microphone. This room can be used by tutors for tutoring, so that they can make use of all the opportunities in the video conference system. All the equipment was of same quality as in the auditorium.
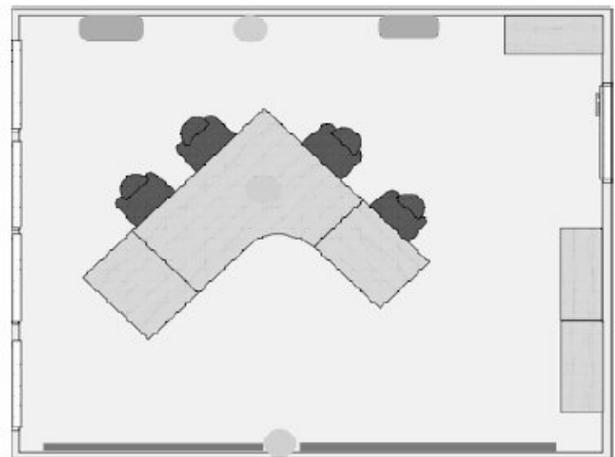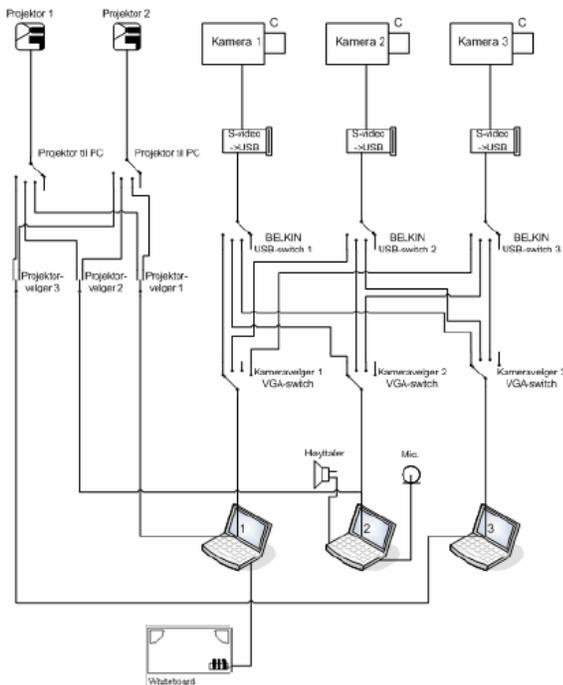

Figure 5: The tutoring lab [2, 3]

Figure 6: The tutoring lab [2,3]

The use of the tutoring lab was based on the department's traditional tutor organization. There would be tutors present in the lab and in the online video conference system at specific times of the week.

5. Results and discussion

In the pilot project we carried out several surveys aimed at the students. Due to practical conditions, the most extensive surveys were about the use of the tutoring lab. However, many of the results from these are probably also applicable to the auditorium part.

From the answers we got in the survey we carried out before starting, it seems that the students felt that their knowledge of computer science was quite good. From the 16 answers we got, there were barely 40 % who said that they wished to continue following the lectures over the Internet, and that 30 % of these also would consider the possibility of watching the recordings of the lectures later on, both right after the lecture, and when preparing for exams.

In all, barely 80 students followed the course. In order to keep track of how many who downloaded the lectures, we created a counter. It showed steady usage throughout the semester, on average a little over 80. Gradually, there was a slight increase. Some students have probably logged on several times.

Motivation
Both mobility and curiosity have been important factors among those students who chose to use online tutoring. A majority of the students say that the mobility, i.e. the possibility of having tutoring anywhere, is the main strength of the project.

Learning achievement
50 % of the students say that the learning achievement from this project is as good as from traditional tutoring. 25 % of the students say that online tutoring is not as good as traditional tutoring, but it is a valuable supplement to traditional tutoring.

This learning approach did not meet the expectations of 40 % of the students. None of the students answered that this learning approach was better than expected. The criticism towards the lack of learning achievement was not aimed at the functionality of the system, but the organizing of the system. Only 20 % of the students said that being able to see their tutor affected the learning achievement.

Communication
75 % of the students who answered made use of the possibility of asking the tutor questions. The others didn't feel the need to ask the tutor, and they had not been communicating with the online tutor. Only one student said that he/she didn't find the questions others ask the tutors useful at all. 60 % of the students had tried to communicate with other students online, and 40 % of the students had also made use of the tutoring room for group work out of school hours. One student says that it would never match being in the same room. Another student feels that the video conference system would function better as a medium for co-operation, rather than learning.

Usability
70 % of the students got a demonstration before they started using the video conference system. One student read the manual for the video conference system, and 25 % did not receive any kind of training. All of these felt that they received sufficient training. 60 % of the students said that the system was easy to learn, while 25 % had to spend more time and energy in order to understand the system. Only one person felt that the system was difficult to learn. 70 % of the students said that the user interface was good, while 25 % said that it needed improvements. So, in general, the students think that the video conference system was ok to use. One student thinks the video conference system also could need an interface that offers offline communication, like an ordinary forum.

Availability
Most students prefer to make use of online tutoring at home, and the majority of students prefers between 2 and 5 lessons á 45 minutes of online tutoring per week. The time between 4 and 6 p.m. is popular for tutoring. 30 % of the students would have used the video conference system

more if the software was available also in the computer labs.

Technology
75 % of the students said that the technology worked fine. Two students did encounter difficulties; one of them had audio problems in Linux.

Nervousness
Students often hesitate/are afraid to ask questions during an ordinary lecture. This is also the case when using a video conference system, but not to the same extent as during an ordinary lecture. The reason for this might be that the video conference system offers the opportunity to write the questions, instead of asking orally, since many probably feel more comfortable using this form of communication.

Students feel more secure when asking questions during an ordinary lecture if they are sitting with people they know. This effect is also present in the video conference system; when others are online, i.e. people that the student knows. However, the effect here is much weaker than in a traditional lecture. In general, the students find it easier to ask questions to the lecturer in an ordinary lecture if they know the lecturer well. This effect was less present in online tutoring.

The students are divided when it comes to whether they want few or many students to be online simultaneously. Some prefer that a small number of students are logged on in order to get more attention from the tutor, while others find it uncomfortable to get that much attention.

In the questionnaire, the students could answer whether or not they preferred few or many students to be online. However, many of these students answered that they missed a third alternative; an alternative in which they could indicate something in between few and many.

6. Conclusions

The main strength of having an online interactive learning arena is the mobility it offers both the lecturer and the students. The students can access lectures and tutoring independent of geographical location, as long as they have Internet access. This also very much applies to the lecturer, it is easy to move the lecture outside the auditorium. The biggest challenge is the technological demands we face in communication with and between the participants. Technology must be learned before used and the students must have access to necessary equipment.

Experience from the pilot project shows that technology doesn't always work the way it should. Package loss during transfer may give bad audio / video quality. However, it hasn't been a practical problem, especially not for audio, since audio is always a priority in the video conferencing system. We have experienced that, at certain times, from 10 a.m. and for a few hours, there might be some package loss between Scandinavia and Southern Europe.

Only the most motivated students have made use of online tutoring. It is clear that the organizing affects the participation. The main challenge is to increase participation. We have suggested several efforts when it comes to better organizing. One of these is improved training of online tutors through workshops.

Online tutoring may offer possibilities that are not possible in a traditional lesson. The use of private communication makes it possible to have several conversations in the same room simultaneously without disturbing each other. The survey also shows that using private communication makes the students less nervous when it comes to using the system to ask a tutor technical questions. The survey also shows that the students also want to see questions from other students. Therefore, we believe that it could be useful to develop and to offer the users training in a special etiquette for how to apply online tutoring, so that the users as a group can benefit as much as possible from online tutoring. That is, for example, to use global communication with the tutors, and speech if written communication is inappropriate. The implementation of online tutoring offers possibilities for both private and public, as well as oral and written communication, and this has proven to be advantageous. Nervousness, however, is a factor that has led to unfortunate choosing of communication forms, and it is therefore important to create etiquette for usage of the various media.

According to Moore's principles, the students who participate in the pilot project are categorized as innovators and early developers [5]. The great obstacle is move on to early majority where technology is accepted by a majority of the potential user group. When technology reaches this stadium, the development will become autonomous, where new students get information and gain interest in the concept from students that already make use of the system. Later on, the development has become somehow autonomous; there have been many requests for accessing the technology and other projects are in progress.

The aim of the pilot project was to fulfill Mantovani's conceptual model of context, and one hypothesis is that the condition for evaluating the pilot project through Mantovani's model is the man, technology, organization (MTO) perspective [6]. "When a technology-related artefact is introduced in an already-existing technological environment, it is often not enough to apply the artefact directly without changing the organizing around the artefact, in order to make the most of the possibilities that the artefact offers" [3]. In the online tutoring project, the organizing was insufficient and thus it is not expected that

the artefact spread within the structure, and is therefore not part of the students' social context.

Through the pilot project, we have seen that the organization of online interactive learning arena has been of great significance. An online learning environment requires different organization than traditional tutoring. The students criticized that the new learning approach (online tutoring) was not available at the appropriate times of the day. When one starts using technology one should use the possibilities and added value of the technology as a starting point for the organization of the use, and not put technology in the same frames as traditional education.

If we want online interactive learning arena to become customary, the possibilities must be established in the mental models of the student, the lecturer, as well as "the institution". Then, online interactive learning arena can eventually become a natural part of NTNU's teaching and learning portfolio.

Acknowledgements

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