Online Tutoring – distributed interactive learning arena with synchronous video and audio

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Abstract: "Online tutoring" was a pilot project carried out at NTNU in the spring of 2005. Through the pilot project online tutoring was fronted as an alternative to traditional tutoring of assignments. Traditionally tutors have been available in the computer labs for questions at specific times, which mean that the students explicitly had to go to the computer labs in order for their questions to be answered. Through the pilot project both the students and the tutors are distributed. They used a video conferencing tool called Marratech to communicate. The research project also considered experiences and results of the pilot project according to theories of Moore (1999) and Mantovani's (1996) conceptual model of social context.

Online tutoring

"Online tutoring" was the name of a pilot project carried out at the Norwegian University of Science and Technology (NTNU) in the spring of 2005 in relation to two computer science courses (operating systems and programming), and part of the EU-project QUIS (Quality, Interoperability and Standards in e-learning). QUIS seeks experience of e-learning systems in order to develop requirements for the next generation e-learning system. "Online tutoring" sought to promote a new arena for tutoring, an alternative to traditional tutoring. Traditionally students go explicitly to the computer labs to be tutored on their assignments. This pilot project however provided the students with a system in which they could be tutored regardless of their geographical location. The pilot project was conducted in a technical environment and it provided a net-based service which was flexible and contained near real-time transfer of audio and video as well as application sharing and whiteboard. The research which forms the basis of this paper was conducted by two MSc students constituting parts of their thesis. The goal of the research project was to obtain the experiences the participants (students and tutors) had gained from the pilot; how online tutoring was recognized and employed by the students and tutors. The students were introduced to the interactive learning arena and its use before they assigned to join. The students were given the choice of either assigning to online tutoring or traditional tutoring. Each student and his/her group are entitled to 2*45 minutes of tutoring a week. As part of the preparation for the pilot project a tutoring lab was set up. This lab contained the facilities needed to take advantage of the possibilities within the interactive learning arena.

Online tutoring's largest strength was the flexibility it provided, which means that students can be tutored regardless of geographical location, as long as they have an internet connection. The survey shows that only the most technologically proficient and interested students chose to take advantage of this service. This means that the organisation of the service is of significance when it comes to the utilization of the service. The challenge is to increase the utilization, which can be achieved through certain measures such as an introductory workshop, cross-disciplinary tutor teams etc. Online tutoring can offer opportunities which traditional tutoring cannot provide; the use of private communication facilitates multiple simultaneous conversations without interference. The survey also shows that the use of private communication makes the students less nervous than asking questions in public. The students wish to hear the other students' questions thus it would be most appropriate to establish a netiquette; all communication to the tutor has to be public communication.

Marratech

Marratech (2007) is a desktop video conferencing tool developed at the University of Luleå, Sweden, and was chosen as the technical solution to facilitate online tutoring, as Marratech provides near real-time transfer of audio and video, and possibilities of a shared whiteboard and application sharing.

Participants
The Participants area gives you an overview of who is currently present

Video
If desired, video can be used within your environment, enabling you to meet others with high quality video

Whiteboard
The Whiteboard area is where all users can interact by sharing applications, MS Office documents, images and drawings.

Voice over IP
To talk to your group, simply press the microphone button. Low delay, crystal clear Voive over IP provided by Global IP Sound

Chat
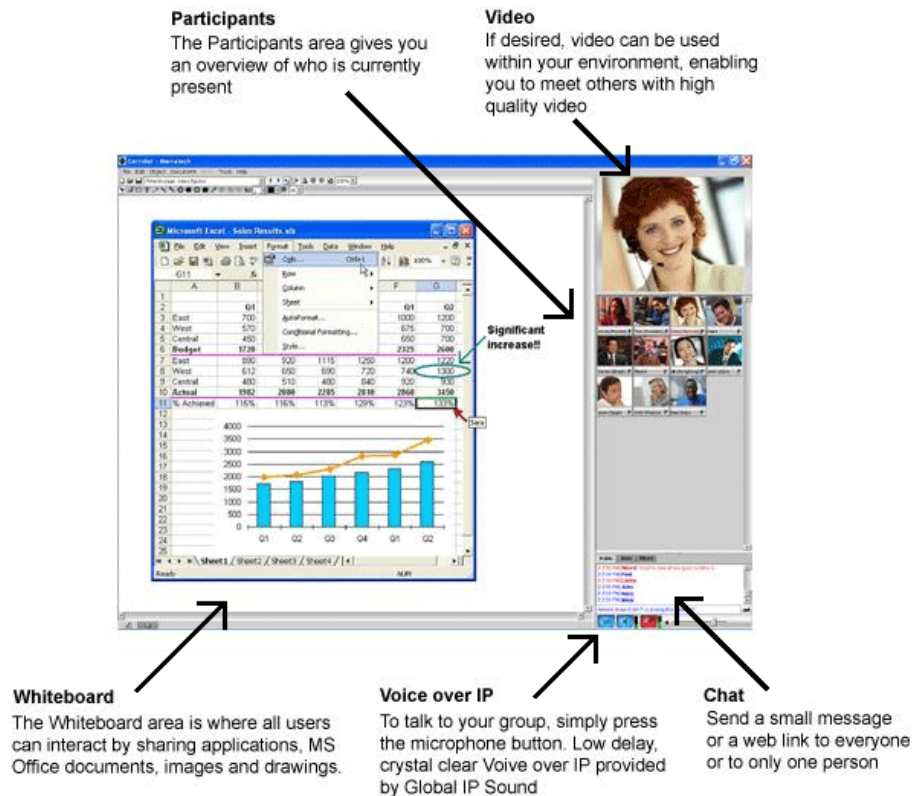Send a small message or a web link to everyone or to only one person

Figure 1: A typical user interface from Marratech (illustration taken from Marratech homepages)

Method for data collection

The research method applied was action research, and the methods used were questionnaires and interviews. Prior to the students assigning to the pilot project they were asked to fill out a survey (Survey1), which covered the students' expectations to, and perceptions of online tutoring. This survey was answered by 70 students in the beginning of spring semester 2005. Towards the end of the pilot project the students filled out a second survey (Survey2), in which the students' experiences were registered. Survey2 was answered by 22 students in the end of the spring semester 2005. An explanation of the low number of students answering survey2 is probably because most students were busy with their final exam preparations. Six depth interviews with two students and four tutors were also conducted at the end of the semester. In addition reports from the tutors were part of the data collection.

Method for data handling

Survey1 was analyzed quantitatively with statistical analysis, except for the commentary fields. Survey2 was also analyzed quantitatively, while the information gathered from the interviews and the reports were analyzed qualitatively.

Analysis of the results

Communication

Communication in the interactive learning arena could either be verbal or textual (chat) and the students can choose whether they would like to communicate privately or publicly. Communicating privately means that a student can communicate directly to his/her tutor without other students intercepting the conversation. Communicating publicly means that everyone who has joined the session is able to hear or see what is communicated. Choosing public or private communication ought to be based on whether the information is relevant to the other students present. One student (informant) has communicated that he prefers using global communication, with the exception of practical questions with which he does not want to bother the other participants. Survey2 indicates that the students wish to hear the questions and answers the other students give. The research shows that a large percentage of the students chose to communicate through chat rather than voice, and this is related to nervousness discussed in the next subchapter.

Another student said he was very influenced by the choice of communication medium the other students chose. If they used chat, he also preferred using chat rather than oral communication. The tutors conveyed that tutoring students through textual mediums was cumbersome. Responding to questions textually was more time-consuming than responding orally, and according to the tutor another student had asked him another question before he had time to answer the first question. The number of people logged into the video conferencing system affects the choice of private or public communication. The study shows that if many people are logged onto the system, the students prefer using private communication, but if few people are logged on they choose public communication.

Compared to traditional tutoring, one of the interactive learning arena's strengths is the fact that all the students who have logged on to the system are able to hear all the communication to and from the tutor provided the use of global communication. This would not always be possible in traditional tutoring. If we take a look at private communication, the interactive learning arena facilitates numerous concurrent conversations without interrupting each other. On the basis of this information it is necessary to establish etiquette for communication channels; appeal for the use of global and oral communication. Survey2 shows the majority of the students are satisfied with the technical implementation of online tutoring.

Anxiousness

Nervousness is a factor influencing the students' choice of public or private communication, but also whether they choose to use written or oral communication channels. The choice of asking a questions in writing or orally is more significant to the students' nervousness than communicating publicly or privately. This indicates that students are more comfortable expressing themselves to an audience in writing rather than using their voices. From the survey it is evident that the students, who evaluate their theoretical proficiency in computer science to be high, are more comfortable addressing an audience than those students who evaluate their competence to be low. This indicates a pedagogical social problem, the students who do not consider themselves proficient in computer science, who are most in need of guidance and help, are the students who are most reluctant to ask questions. This is not an unfamiliar problem within pedagogic.

Learning outcome in a distributed environment

The results from survey1 show that 32,9 % of the students feel traditional tutoring provides the best learning outcome, while 15,9 % prefer online tutoring. From survey2 42 % of the students feel that online tutoring gives the best learning outcome. This means that the students, who were most positive to online tutoring, were actually those who made use of the service. Experiences with the interactive learning arena and online tutoring show that half of the respondents feel the learning outcome is as good as traditional tutoring. The same amount feel online tutoring is a valuable supplement to traditional tutoring. At the same time, many of these students have communicated that the learning outcome has not been in accordance with the expectations.

With the term learning outcome, the researchers expected feedback regarding the pedagogical aspect of online tutoring, but comments were made on the organization of online tutoring. The main reason why the learning outcome was not as expected, can be related to the students' visions concerning the availability of online tutoring. The students expected the service to be more available than traditional tutoring. Both online tutoring and traditional tutoring have resource problems when many students want the attention of the tutor at the same time. The hypothesis is that online tutoring utilizes the tutors better than traditional tutoring, because public communication in the interactive learning arena is broadcast to all the students who are logged into the system. Students may have the same questions thus you obtain a rationalization gain by using this system.

Organization of online tutoring

Participation challenges

The pilot project was not utilized to the extent expected and one reason, suggested by the tutors, could be a high threshold, by means of administrative overhead associated with joining online tutoring; having to obtain a web camera, headset, user profile for the system, installation of the software and then learn how to use the software. This may have resulted in students choosing traditional tutoring instead of online tutoring. The challenge is to make online tutoring as applicable and available as traditional tutoring.

The pilot project was based on geographical distributed students and teachers and the idea of making the interactive learning arena available on NTNU's computers was against the intention of the pilot project. The system was thus not installed on NTNU's computers. Survey1 shows that the majority of the respondents want to employ online tutoring at home. However, we can not rule out the fact that having the system available at the university could have increased the participation, because that would give the students the opportunity to test out the software before deciding to enter the pilot project. Survey2 indicates that 1/3 of the respondents have communicated that they would have used the system more if it was available at the university. These findings demonstrate that making the interactive learning arena available on school premises might have increased the students' attendance in online tutoring. The students would have liked to have the service available at all times, but that is not possible. One desired time span which was suggested by the students was between 4-6 pm.

Means to improve organization of online tutoring

Means In order to increase the turnout are listed below. Student follow-up is one of them in which it could be advantageous if the tutors explicitly contacted the students to ask if they needed assistance or help. This would involve the students more giving them a greater sense of follow-up. A different introduction to online tutoring is also mentioned as a measure, in which the students were invited to a workshop learning to use of the interactive learning arena rather than a mere presentation of the software. This would activate the students and apply learning by doing to create interest around online tutoring. A workshop could be held at a computer lab with all the necessary equipment (web camera and headset) available. Students are given the opportunity to test out the software in a dynamic environment. After the workshop it would be possible to assign to different tutoring groups making informed choices when choosing whether to join online tutoring or traditional tutoring. These are means to reduce the threshold to join online tutoring.

Another suggestion is holding the first lectures online as well as in the auditorium. In this way, the students can choose whether to attend the lecture either in the auditorium or distributed through the interactive learning arena. The system opens for the distributed students asking questions which the students in the auditorium can hear as well as the other way around. In order to facilitate for asynchronous correspondence, one could implement a forum. This system could take questions and discussion as a supplement to the synchronous sessions provided by the system. The questions posted on this forum could be answered by tutors and other students. The full benefit of online tutoring could be achieved when it is applied to several subjects held the same semester. This will increase the utility value and interest for online tutoring for the students. In order to increase the availability of the service without introducing increased cost of tutors, there is a need for improved utilization of the tutors. One mean is to introduce inter-disciplinary tutor teams which can tutor in several subjects. If we combine the tutoring hours of all the subjects involved to one service, the capacity of each tutor would be utilized better without increasing the use of resources.

The pilot project of the spring 2005 was the first test of online tutoring as an alternative learning arena, and the experiences from the pilot project created benefits for future pilots on online tutoring. The spring semester of 2006 means have been taken in order to take into account the findings of the 2005-pilot. The means taken include increased availability of the service by offering 12 hours a week for all students belonging to a net learning group, a forum facilitating asynchronous communication, an introductory workshop to increase participation as well as

learning how the software works. In addition lectures will be broadcasted within the interactive learning arena facilitating distributed students.

Online tutoring vs. theory

When considering the online tutoring pilot project according to theory, it is interesting to look at Moore (1999) and Mantovani (1996). Geoffrey A. Moore's book "Crossing the Chasm" (1999) is concerned with Moore's description of how new technology is adopted in the market by establishing several categories of user groups and characteristics for the user group (innovators, early adopters, early majority, late majority, laggards). There exist chasms (gaps) between the user groups, and "each of these gaps represents an opportunity for marketing to loose momentum" (Moore (1999) in Aarsland (2002), pp.141-142).

Moore underlines that the principal challenge is crossing the chasm between the user group early adopters to early majority. Strategies must be worked out in order for the technology or the concept to cross the gap. Once the technology has reached the main market, the development will go on its own, in which new students obtain information and interest from other students who already use the tool. Through the pilot project it has been established that curiosity has been the major motivation for the students to take part of the pilot project. The students, who were most positive to online tutoring in the first place, were the students who have actually used the system. If we compare this information with Moore's theories the students belong to the group of innovators and early adopters. Online tutoring is still in the early phase of Moore's graph, meaning that efforts have to be made in order for the technology and concept to pass the chasm.
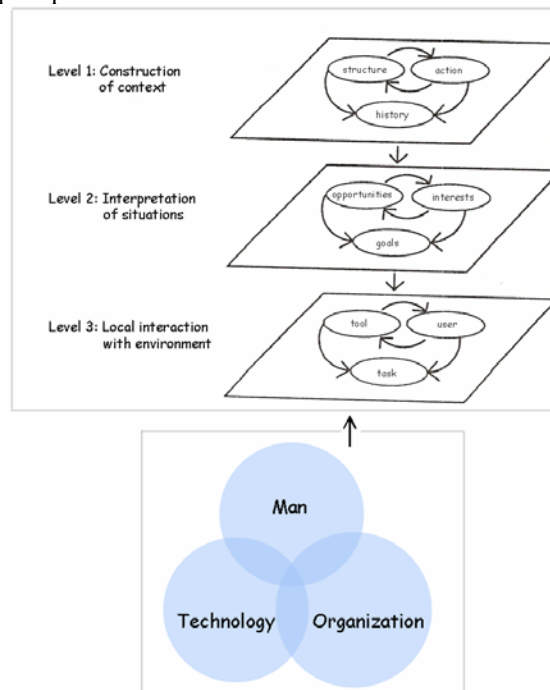

Figure 2: Illustration of the hypothesis: MTO forms a foundation for Mantovani's model (Vennes 2005).

As mentioned earlier Mantovani's conceptual model of social context has three levels, and if we compare online tutoring with Mantovani's model, level three is the local interaction with artifacts, and the artifact in the pilot project is online tutoring. Level two in Mantovani's model is the interpretation of situations. The situation is tutoring of students on their assignments in relation to their studies. Level one, the construction of social context is the learning institution NTNU, or the individual students. The social context in Mantovani's model can thus be either a human's mental model or it can be an organization's social context. The hypothesis reads that Man, Technology and Organization (MTO) forms a foundation for considering online tutoring to Mantovani's model, as can be seen in figure 2. Humans (man) are individuals who perform tasks based on their motivation, skills and knowledge. Technology means the facilities and tools utilized to perform a piece of work. Organization is the body that works systematically to realize one or more objectives. All the elements of MTO are mutually influenced; Man influences

the technology as well as the organization. Technology on the other hand influences man using the technology and the organization. Organization influences man and the technology. Online tutoring is a technology-related artifact which was introduced in a technical environment. Online tutoring was introduced without making changes to the organization i.e. increased availability of the service. The new possibilities a new tool would introduce, were not included in the organization of online tutoring.

As mentioned earlier the organization of online tutoring was at fault in the pilot project, which meant that the MTO foundation was not fulfilled. It is thus not possible to consider Mantovani's model. Only when Mantovani's model is obtained, the students can include online tutoring in their mental model (social context) through the artifact online tutoring. When entering the level of construction of social context they may see the benefit of online tutoring and the artifact becomes transparent. When the MTO foundation is not present, it is thus not expected that online tutoring as a concept becomes part of the social context, nor can it be expected of NTNU, as an organization, to make online tutoring part of its portfolio of student tutoring.

Conclusions

NTNU is a university whose focus is set on technology and the use of technology. Traditional tutoring has existed in its current form for decades. Later years focus has been set to the use of ICT within learning, but the traditional learning methods still exist. Online tutoring is an opportunity for NTNU to utilize technology to form a new learning arena. Through this pilot project it has been evident that the organization of online tutoring is of great significance. The students would like to have an expanded service with regards to availability, and inter-disciplinary tutor teams are means to meet this objective. The implementation of online tutoring facilitates both private and public communication as well as oral and textual communication channels, which has proven useful. Anxiousness is however a factor which has led to inopportune use of communication channels, which necessitates the establishment of etiquette for the use of the various mediums of communication.

The main challenge is the student participation, but the attendance needs to be seen in light of low participation on traditional tutoring as well. Through the use of Moore's principles it has been established that online tutoring is in an early phase as students form the user groups of innovators and early adopters. The challenge is crossing the chasm to early majority in which the technology is accepted by a large part of the potential user base. The measures which have been mentioned are means to enter this stage of the development curve, and the development will go on its own when new students obtain information and interest for the concept through existing users. Students will then include online tutoring in their mental models and online tutoring will be part of NTNU's portfolio of tutoring.

Online tutoring was introduced without making big changes to the organization of the tutoring, except for the fact that the tutors were distributed. When considering online tutoring to the hypothesis of MTO forming as a foundation for evaluating Mantovani's conceptual model of social context, the organization-part is lacking and as long as it does not work on the lowest level it is difficult for the concept to propagate up the structures of Mantovani's model. When a technology-related artifact is introduced in an existing technological culture, there is a need to see new possibility in the organization to better utilize the potential which the new artifact provides. This pilot project was the first experience NTNU has had with this type of tutoring over the internet, and as the experiences become multiple so does NTNU's handling of these types of tutoring and the possibilities it creates.

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