

A Novel Distance Learning Trial: The Integrated Networks Lecture

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Abstract *¾ This work addresses the Distance Learning and Teaching process within the concept known as dLectures. We will present a concept already validated by the practice, which has been developed and already implemented in the Institute of Communications Engineering at the University of Hannover. For the dLecture-based Integrated Networks lecture the development of the concept, as well as the technical infrastructure needed for the deployment will be presented. We also provide evaluation results of the lecture which validate its suitability and advantages in front of a presential lecture. Finally we present on-going research activities which would lead to novel multimedia supported eLearning approaches.*

Index Terms *¾ eLearning, dLectures, Distance Learning, ...*

GENERAL

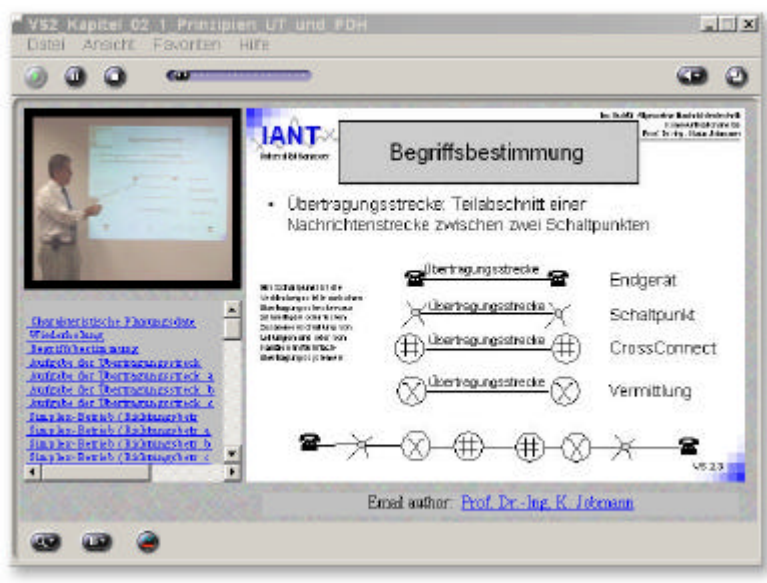
The Institute of Communications Engineering (IANT) [1] offers its support since 1998 in engineering lectures to the University of Magdeburg-Stendal. Major reason is the temporally lack of a Professor. Although many scientists applied for the position, no suitable candidate was found for the position, and therefore there was a lack in the engineering lecture offer. During this time a novel concept for distance learning has been developed with such a good acceptance, that since the year 2001 it has been established as an independent lecture. Major goals are, among others, provide the students with a flexible learning scheduling, and providing and encouraging the use of new learning media.

The first years were conducted in a synchrone modus. Through videoconference, the lecture was transmitted to Madgeburg. The students had the possibility to participate interactively in the lecture over a videoconference structure in Magdeburg. It was observed that the students rarely made use of the interactive capabilities in such a videoconference lecture. Additionally, many technical resources were necessary for the establishment and maintenance of the connection; an assistant had to take care and supervise all the infrastructure during the lecture in Hannover and Magdeburg.

For this reason, it has been developed a new asynchron distance learning concept since beginning of the year 2001. The lecture was recorded, and offered to the students as a normal video-stream in Internet. For this goal it was needed the support of a recording proprietary platform. The building-up process of the generated lecture is presented in Figure 1. This figure presents the professor in a small video picture. The explained slides are presented in a bigger separated picture. So the students could follow the lecture without problem. The proprietary recording platform used is the "PresenterOne" [2].

The proprietary platform "Lecturnity" [3] was also used in order to support additionally annotations and comments of the professor. This new world of lectures are known as dLectures.

FIGURE 1
EXAMPLE OF A D-LECTURE



CONCEPTION PHASE OF THE D-LECTURE

The above referred problem of the lack of interaction and the high costs due to the synchron distance learning made to change to the asynchrone recording system modus. A major argument was that there is no difference for the students between a passive "Live-Presential" lecture or a passive recorded lecture from the learning results point of view.

Although the problem of the lack of interactivity is not avoided, we achieve that the students are more involved in the process. In front of the synchrone lecture event, we only need additionally 30 minutes for the recording of the same lecture on a recording platform for the technical preparation of the video and audio technical elements, also for converting and preparation of the recorded lecture in the Internet. Because these are very easy procedures, we can leave such tasks to our supporting staff, mainly students, and therefore we keep our research staff on researching tasks. Another implication is the reduction of the lecture duration, thus the professor needs also less time than in a live event. Concretely, we notice that in a real 90 minutes time lecture, a reduction in about 30 minutes is achieved, resulting in a recorded lecture of about 60 minutes. The major reason for this time reduction is the lack of questions from the students and organization activities (e.g. to give the slides of the lecture to the students). From this perspectives, the effective lecture duration is kept without significant modifications.

The lecture being conducted at the IANT traditionally has a higher interactivity between the professor and the students. A reason of this behaviour is due to the fact that the contents of the lecture (i.e communications theory), is oriented to results and facts. The active work in the presential lecture is mainly due to the dialog between the professor and the students, as a result of the practical exercises and small tests conducted.

Inventing the Interaction in the Distance Learning

To promote the interaction in the Distance Learning, a set of actions had been conducted, but opposite to the desired results, they did not succeed. We observed many times, and also in other projects which keep the same goal, that any action taken in order to promote the interaction succeed. At least, this provide us with some useful direction guidelines from the experience which can be seen as guidelines for future actions. We do not conclude that in other fields of education (i.e. not only in our Integrated Networks lecture), or in other groups our proposed actions do not succeed. Next we will present the set of actions conducted.

The first action in trying to set-up a dialog with the students around a concrete thematic was conducted with a Chat. The professor offered fixed time schedules for such a Chat in order to give the opportunity to the students to make any questions. The content thematic was around the actual lecture content (i.e. so doing we avoid that the students not only work on the lecture just before the main test, but some more time before). The students even met together to assist to this Chat sessions, but we observed that just some few took action actively during the session. That is just we had in a presential lecture, and many times has been observed. Some few students make their questions, and the rest of the students just hear at was has been

said. Compared to a presently event lecture, even the actively involved students was lower. It seems that the students inhibit themselves from taking active participation in making their questions. As a major result, the quality of the discussion was very low and rudimentary. In analogy to a presently lecture event, there was not the possibility to discuss any theme with a high degree of quality. Discussions were trivial, and the learning value limited. This leads to a passive use of the Chat session, and after some time, the students reduced the attendance. Even after some weeks any of the students was using the Chat session.

Our experience show that we could not achieve a valuable discussion through a Chat session. In such an approach, there is a lack of verbal contact and information, even in the questions that the students made, and also the questions suffered from the lack of a high precision needed. All this process needs more time than the one available during the synchrone dialog. The results of this approach were even noticed in the test phase. The technical aspects were not stable in the beginning (1999). The transmission suffered from high delays and connections breaks continously.

Another action was the introduction of Multiple-Choice-Tests. Through a suitable web-based software we produce some tests. The students had to assist to the class in a scheduled period of time, in order to solve and pass the questionnaire. The results obtained with this approach were good, and this encouraged the students in order to continue with the action. The students solved the questionnaire periodically. This method was introduced and conducted during some semesters in different periods of time. A major inconvenience is the high amount of time needed in order to produce such a high quality questions. For this reason a Multiple-Choice-Test allows the test of scientific knowledge in its minor approach (yes/no; Response A, B, or C). Due to this approach, a scientific knowledge based on procedures could not be tested. Always was unsolved the problem of the interactivity of the students during the learning process.

The Tutorial Concept of the dLecture

After all this actions we obtained some important experiences, but our major goal was so distant as before. In an intensive discussion process we summarized all our experiences and our desired goals. The results obtained with the Chat action provided that in the writing process a deep discussion with a high degree of quality seems that can not be achieved. A possible solution that we saw was to change our methodology to an asynchron method. So doing, the students and the professor had more time in order to formulate and solve the questions. This procedure of question-solution could be conducted in the basis of Emails or the establishment of a Forum of discussion. A long discussion on a Email basis is suitable to be closed very fast, so a Forum was seem as a better solution for this problem.

In order to avoid that many students are passive during any discussion, we decided to build-up some learning groups. In the practice this approach seems to be successfully accepted. There were groups which dicussed very actively with each other, other did not. From this we experienced also that when solving a question the students do not desire to wait a long period of time. So we concluded that the Forums where the students had to wait for a solution some days, they do not visit the forum anymore. The solution of a question has to be solven within 24 hours, in order to keep the Forum alive. Here we changed our supporting concept. Because the professor is the most time involved in research tasks additionally to the teaching ones, and there were a lot of questions made in the forum, some research scientists of the department were responsible for this tasks. When the research scientist has not the capability to solve the questions, he would reformulate the question to the professor. A "Two-Level Support" is builded in such a method.

The last evolution process to be achieved was that all involved groups work towards a more complex global discussion process, working in armony and enthusiams with each other. To achieve this goal we produce new thematics and contents taken from the main lecture, as well as exercises, and then offered to the forum. The group had to solve the questions and exercises with support of the forum. The students had a period of time of about 2 to 3 weeks, depending on the difficulty of the tasks. It seems that, even in small exercises, at least 2 weeks time were needed in order to give an answer, due mainly to the asynchrony of the communication resources availability to the students. The research staff pointed the solutions of the students. They give points for the results, and they support also their punctuation. Therefore, the students become a very good feedback about their capabilites. At the end of the lecture, the solutions of the exercises were added to the note of the final test in order to improve the final note given to the students. The students could achive a bette note of one point. A requirement was that the final test should be passed. Therefore, any student could not achieve a better note than 1,0.

Even all the groups become the same exercises, they can not look at the answers of the other groups of the forum. Therefore they provide independently solutions. Our experience demonstrate that the group keeps its note and marks, although they can exchange its marks through easily (e.g. by Email).

Additional Actions

In order to allow an uniform and homogeneous participation in the work of the group, the students become a global number of points for the presented results of the exercise, and they have to share all points among themselves. As an example, if a group achieves 70% of the maximal points, and the group consist of five students, the whole group become $5 \cdot 70 = 350$ points. If all the students of the group have performed the same work amount in the resolution of the work, they share the whole points achieved in an uniform manner. Therefore each student would become 70 points. (i.e. 70%). In case one of the students of the group does not performs his part of the work in the exercise, the group has the decision of giving 0 points to that student, and share the total number of points among the rest. In this situation, each of the four restant students would become $350/4 = 87,5$ points. We should point out that since we introduced this novel system, such a situation has not appeared. That is because each student of the group works as much as the rest in order to become his portion of the total points.

The Internet offered lecture offers also presential phases. The most important presential phase is the presentation event of the lecture, i.e. the first lecture event. This helps the students, as well as the professor to personally know each other. Additionally this event helps also to avoid an “unpersonalized” soul of a Distance Learning lecture. During the presential lecture event, the professor presents the concept of the Distance Learning based lecture, and how the role of the learning platform, as well as its major functionalities. In the middle of the semester, a new presential event is offered as well. The students have in this case the possibility of performing its questions and doubts which are too complex to be discussed in the Forum. This provides also a valuable feedback to the professor and research staff about the lecture. The students also provide valuable comments, e.g. small effects detected in the learning platform, or questions such as how the exercises are evaluated. This presential event gives the students the feeling that they are not alone with the Internet-based lecture. The last presential lecture event is offered in the last lecture event of the semester. The students have here again the posibility to formulate directly their questions and doubts. They focus mainly on the final test. We shloud point out that this final test has a high percentage of participation. On the other hand, during this last presential event we give the students a questionnaire which collects all impression of the Distance Learning-based lecture, as well as opinions, and of course an evaluation. This is a very valuable material, since this avoids to be a “blended learning” process. A major reason is that only a small portion of the lecture consits of this presential events.

The last additional action is the qualification of the tutors for the support of the students. Commonly the tutors (i.e. research staff of the institute), does not have neither experience on learningn or teaching on a Distance Learning based lecture. This fact brings the tutors in a novel terrain where they sometimes feel lost and get discouraged. For this reason the tutors become at the beginning of the semester a theoretical and practical introduction of about two hours about the Internet lecture. Additionally they are provided with about 50 pages of a supporting tutorial on the thema “Functions and Obligations of a Teletutor” and an “Specific Tutoring for Tele-learning Situations”. This learning material conforms the Tele-Tutor course of the FH-Furtwangen [4], on which one of our researcher staff had succeed. The last learning phase for the tutors consits of a practical phase. While the tutors support the students, they would be also supported by the Tutor trainer. The tutors find this help action very imporant and positive in order to teach in this novel Distance Learning situation. After two months the tutors have full confidence with this new situation and they work totally independently and involved.

TECHNICAL ASPECTS

Many eLearning projects fell because they do not take into consideration many technical aspects. The configuration of the learning process most of the times concentrates on the technological possibilities, but not in the learning process itself. Many times there is the lack of a concrete learning objective and how this objective should be achieved. The technology breaks itself. Although we criticize the technology in our afiramation, we do not have to forget that one of the major basis of the eLearning is of course the technology, and it has to be taken into consideration accordingly. For our purposes, we find that major requirements of the technology are:

- a) Relialabilily,
- b) easy and intiutive use
- c) and minimal operative costs.

When this basic aspects are not given, the technologycal services would not be used. This leads e.g. to a low quality forum which would break the communication process using this medium, as well as a worse perception of the learning platform, even leading to the cancellation of the lecture. In next sections we will discuss about technical aspects such as “Audio and Video technicl aspects”, as well as the chosen learning platform which we decide to use in the implementation of our novel Distance Learning lecture.

Audio and Video Technical Aspects

Up to middle of year 2002 it was set up a lab_table, which was composed of the technological needed elements. We can observe this lab_table in Figure 2. The technical elements were: a PC with monitor (1,8 GHz with a Capture Card), one videocamera (Sony EVI 100), one wireless microphone (Sehnheiser Mikroport), and a Beamer. On the PC was installed a software package consisting of: Windows 2000 OS, Power Point programm and a proprietary tool in order to record the lecture (i.e. the Real Presenter). This lab_table could be installed in each teaching rooms of our institute thanks to its high grade of mobility in order to record any lecture at any place. The most expensive element of the system was the Beamer; the rest of the elements sume at about 5000 Euro.

FIGURE 2
LAB_TABLE FOR LECTURE RECORDING



The reliability of the builded lab_table was tested. The whole system installation does not needs more knowledge than the normal computer basics.

Since the last sommer we decided to install our technical system in a fixed room. The camera is installed on a wall, and the picture is profected on a fixed projection wall. The major motivation for this change was to perform the recording of the different parts of the lecture under similar conditions. This provides a clearly better quality of the dLecture i.e. each recording has the same light behaviour and the same picture frames. Additionally, the projection wall has touch sensitive capabilities and allows annotations over the Power Point presentations with the proprietary tool “Lecturnity”.

Learning Platform

The first information about the dLecture were offered through a Web site. The students had the possibility to work on a protected environment thanks to an assigned passwod. This Web site was installed over a Linux server and associated to a small learning plaform. So each student became a personal password and could work in a protected environment, as well as downloading general information about the dLecture, as well as the use of a Chat, a Forum, and a collection of Multiple-Choice-Tests. After some time, this little server was overloaded. The downloading of content was unsuccessful in some cases, the administration of passwords was more complicated, and the administration of the OS was more complicated with the addition of new services. And more important was the loose of a general overview on the dLecture contents due to the lack of an archive system.

In the framework of the Learning Lab Lower Saxony [5] project, we have the possibility to test different learning platforms. Hitherto we have implemented and tested three different learning platforms. Each of the learning platforms has its advantages. For us, the most important is that the learning platform should provide and assist a easy and clear “learning space” i.e. learning plan, forum, and general information management functions., where the students are provided with a fast and easy access to the information. Fo r this purpose, the learning platform should provide the possibility to manage forums for a specific group of users. Keeping the learning results in mind, we found that the different learning platforms did not have

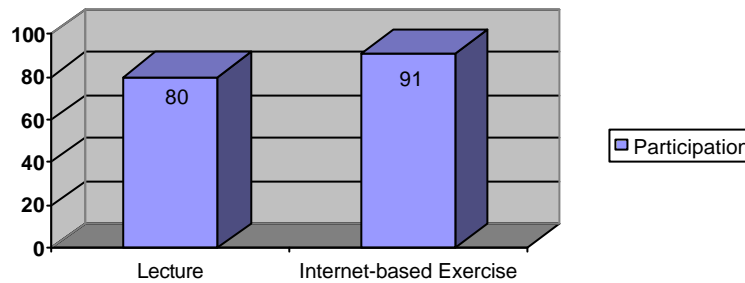
big differences among each other. For this reason we decide to avoid a closed final product. Open source projects show that a learning platform is not necessary expensive.

EVALUATION RESULTS

The presented dLecture concept is being offered since the 2002 summer course. We can conclude after two semesters that this novel Distance Learning Internet-based lecture is suitable to be evaluated. The evaluation results obtained show the positive feedback received from the students, additionally to the evaluation process conducted, which results will be next presented.

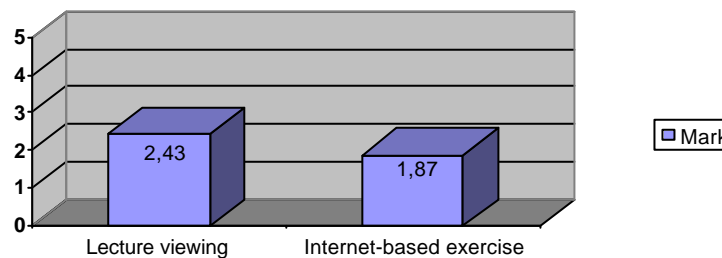
Firstly we measured the amount of students (%) who participated in the offered lecture. It was a major surprise that the students despite of viewing the recorded lecture only 80% of the total, they have participated in the 91% of the exercises offered through Internet. We present this results in the Table 1. This results are opposite to other results obtained with different concepts, and opposite to our other experience result, where at about 90% of the students had viewed the recorded lecture, and the interactive offer (Chat + Multiple-Choice) was not used so oft.

TABLE 1
PARTICIPATION IN THE OFFERED LEARNING EVENT



Another major point of the evaluation was to know how the students would mark the received support during the lecture for their success. The Table 2 shows that the students mark better the Internet-based exercise than the recorded lecture. This is also a surprising evaluation result, since the students feel more supported through the Internet-based exercise, therefore they feel more supported in a presential lecture than in a recorded one (i.e. mark-scale: 1 is the best mark, 5 the worst mark).

TABLE 2
EVALUATION OF THE LECTURE SUPPORT FOR THE SUCCESS



From the results it can be deduced that the students give more importance to the support received than to the lecture itself. Personal interviews with the students resulted in that they feel more comfortable with more support. We can summarize that the envisioned concept of integrating interactivity in an Internet-based lecture achieves good results, and encourages us to keep this research avenue. A deeper comparison of the lecture test results show that the students achieved even better marks in the Internet-based lecture than in the presential one. Moreover, this improvement in the marks are achieved by abroad students. This effect is due to the additional advantage provided by a recorded lecture: the students of other countries have the possibility to view the lecture once again, and therefore they repeat sequences where there are many words whose meaning they do not know.

FUTURE RESEARCH WORK

Technological

The introduced Internet-based lecture is a solution for the Distance Learning events, which should be implemented with support of presentation slides. The technology is optimized through allowing the introduction of annotations and Powerpoint presentation in the overall lecture event, and therefore this effect limits this approach to a few group of this lecture events. Intensive work in the board (e.g. mathematic formula) could not be allowed without this additionally support. Moreover, the resolution of the SmartBoard is too low when describing long formula. In order to solve this problem new and novel solutions are being developed. Examples are the e-kreide project of the Freien University of Berlin [6], or a projects whose goal is to allow take pictures of the board work in the framework of a ELAN project [7] in the University of Hannover.

On this field the IANT developed from the experience a novel multimedia Teaching and Learning system, which allows any synchronised and asynchronised learning scenario. The project known as the "Interactive Virtual Learning Space (IVLS)" would be implemented in the framework of a L3S project, and this will be soon operative. Major goals are among others, the possibility to define fixed learning scenarios by using multimedia controlling, without the configuration of individual components. A minimal and easy controlling board should also provide a more easy way to offer eLearning-based events.

Methodical Aspects

An additional goal of the IVLS project is to provide valuable information on how about a synchron video-based learning event could be introduced. We suppose that the teacher should not introduce himself longer than the introduction conducted within a presential lecture event. A major reason for this suposition is that the non-verbal signals of the teacher are limited during recording due to technologically limitations, and therefore the students feel discouraged.

Regarding the dLectures, we are thinking of developing another novel learning concepts. The basis of such a learning scenario is a project tasks, which the students should conduct with own work and capabilities in an special field. In our example could be the thema of the projects the UMTS-technology. The students would work independently in the obtention of results, and could view the lectures needed for this at their own. For this objective the lecture should be recorded and available in a media server (e.g. dSpace), in order to allow a better and methodical search of a concrete theme. Another goal could be the obtention of a virtual community conformed of students which could be used even after the official studies. This would bring a more near contact between the industry and the universities.

SUMMARY

A major conclusion of the evaluation process is that the Internet-based dLectures does not have any additional inconvenience in front of the classical lectures. Moreover, the students from other countries achieve a better mark in an Internet-based lecture than in a presential lecture event. Major reason for this effects is that the students have the possibility of reviewing the recorded sequences in order e.g. to allow translation of unknown words.

Additionally to the transmission of learning content, multimedia knowledge is also transmitted to the students. This multimedia capabilities allow also to divide the work within different groups, and also introduce this new multimedia tools. We argue that the learning of the new multimedia knowledge is very important during the studium phase. The transformaton of industrial companies to scientific companies will introduce important changes in the world of the work. Concretely the reduction of the time while adquisiring knowledge [8] and the establishment of the information technology (IT) [9] will support novel media competences, where eLearning would play an important role in the continuous education. Through this novel learning scenarios the students will adquire all this needed knowledge.

The introduced supporting concept would be also introduced in the presential lecture events. An additional effect is that the participation of the students is also increased. Also the tutoring staff support this decision, since they are able to control this learning process more precisely. The Internet-based lecture is not seen as unpersonalized, since minor presential events are also introduced in order to allow the participants to meet each other. Also the division of the students in different groups leads to a more personal contact within them than in a presential event.

Regarding the time consumption of the concept, we should remark that the teaching staff save some time, and the tutor staff spend as much time as in a normal presential lecture. All participants also remark the advantage of viewing the recorded lecture at their more preferred time. The increasing of the personal and financial resources is limited to the preparation and support of the technical infrastructure.

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