Project Work in Networked Distance Education

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Abstract: Project organized problem based learning is a successful concept for on-campus education at Aalborg University. Recently it has been the basis in networked distance education as well. This paper describes the experiences of Internet-mediated project work in a new Master of Industrial Information Technology education. For a pilot project, each student group prepared a report, evaluating the collaborative work process, and these process reports combined with the teachers observations, comprise the background material. The main conclusions are, that the project work was a strong learning motivator, enhancing peer collaboration, and that networked communication and face-to-face meetings was an efficient combination.

Keywords: Distance education, collaborative learning, problem based learning, group organized project work, Internet.

1. Introduction

Project organized problem based learning has been the foundation for the educational system at Aalborg University from its start 25 years ago. Since then, experience has proven this a very successful innovation in higher education [Kjærsdam and Enemark, 1994; Fink, 1999]. The duration of each student project is one semester, and the students spend half of their time working on the project in groups of typically 5-6 persons. In the engineering education a major part of the projects, especially in later semesters are part of research projects or industrial projects. This learning concept has many merits, e.g. increased motivation, excellent development of analytical skills, and experience in coping with complex real-life problems.

Consequently, it seems to be an obvious idea also to base our distance educations on the project study form. Traditionally, however, distance education has been characterized by one-way communication and self-study, whereas the project study form is based on collaboration and dialogue. Thus, a successful implementation of project work in distance education requires extensive utilisation of new information and communication technology.

A thorough literature search has only revealed a limited number of references on project-organized learning in networked distance education [Fowel and Levy, 1995; Milbury, 1998; Stamps, 1999; Whittington and Sclater, 1998]. The anthology [Danielsen, 1999] (in Danish) gives an excellent overview over learning theories in networked education, and [Bygholm et al, 1998; Brandon and Hollingshead, 1999] report and evaluate relevant cases.

In this paper the experiences of Internet-mediated project work in a new distance education is described. The project groups communicated by:

- Document exchange via web
- Asynchronous communication using e-mail and discussion fora
- Synchronous communication using chat fora
- Face-to-face meetings during seminars

For a pilot project, each group prepared a report, evaluating the collaborative work process, and these process reports combined with the teachers observations, comprise the background for this paper.

2. The Master of Information Technology Education

The Master of Information Technology Education in IT Engineering (MII) is a new supplementary education, established by the Institute of Electronic Systems at Aalborg University, Denmark. URL: *http://www.mi.itorg.auc.dk.*

The MII differs from the regular M.Sc. E.E. and B.Sc. E.E. educations in several ways, as the students:

- Already hold at least a bachelors degree or equivalent
- Are employed
- Have almost no spare time for studying
- Want to work innovatively with information technology in their professional life
- Have varying level of IT-skills (from IT professional to IT novice)
- Constitute an inhomogeneous group of people, regarding:
    - Age (25 – 56 years)
    - Former education (B.Sc. in Electronics Engineering, Mechanical Engineering, Building Construction, Architects, School teachers and others)
    - Residence (from most parts of Denmark)
    - Professional career

The MII is an Open University education, which implies a payment of study fees (app. £ 2000 per year) and it takes three years of studying on a part-time basis (approximately 20 hours per week) to acquire the Master of IT title.

Content

The MII education leads to one of 5 professional specializations, sharing a common first year education. The contents of this year are primarily basic theories and skills in: Data Networking, Object Oriented System Development, the Client-Server paradigm, Databases, Human Computer Interaction and Web-tools.

The second and third year the students are studying IT concerning their own profession, attending courses of particular interest and making projects about the chosen subject of special study. The MII offers specializations in:

- IT in the Building Process
- IT in Industrial Manufacture
- IT in Control Engineering
- IT in Distributed Real Time Systems
- IT Network Maintenance

The pedagogical model in practical studying

It has been the aim to transfer the successful Aalborg model to a modern supplementary IT education and adapt the main points of the model to networked distance learning at the MII education.

The major difference, compared to pure distance education, is the study seminars. They serve the purpose to support the courses and the project work, in introducing and boosting the courses, and in scheduling time for project work and reflections. The study seminars also contribute to establish an identity as a student and social relationships between the students.

3. Pilot Project

It has proven a good idea to start problem-based educations with project work by letting the students make a short pilot project in administratively selected groups. This seems also to be the case in distance education [Bygholm et al, 1997], so it was chosen to begin the MII-study with a pilot project, titled:

Make a Web site for your group, to present your projects and the group members

The objective was to get experience with project and group work in distance education, and to test relevant communication tools.

Learning approach

One of the views about problem-based learning in groups making a project, is that reflection loops have a predominant place. This understanding of learning processes is based on Kolb's (1984) learning cycle, and Schön's (1987) ideas about reflection in the learning process, combined by John Cowan (1998) to a learning concept based on several small reflection loops - Kolb cycles (as paraphrased by Cowan: - experience - reflection - generalisation - test -) and planned reflection three times in a learning process, see Fig. 1: before (*for*) or in the very beginning of the learning process where it is considered what the process shall be to fulfil the learning needs, *in* the middle of the process, where it is considered how the process so far has fulfilled the scopes and aims, whether they are still relevant and what changes in plans if any are necessary, and finally after (*on*) the learning process, in order to decide what has been accomplished and what is still missing, bearing in mind improvement of future learning processes.
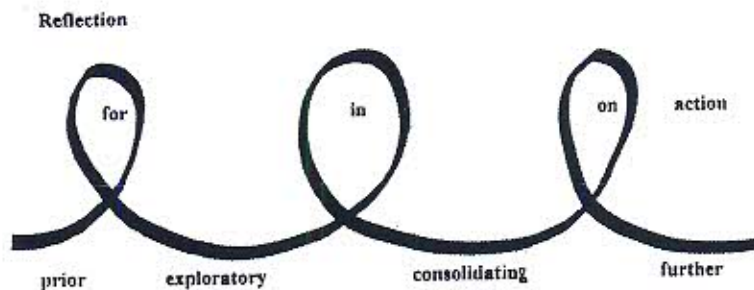

Figure 1: The Cowan diagram. [Cowan, 1998].

One of the main purposes using this approach with three reflection loops is to teach the participants to improve the quality, depth and relevance of what has been learned.

Form

The pilot project was started at a seminar (2½ day) and run for 2 month, with a seminar in the middle and an evaluation seminar at the end.

A crucial course: "The virtual workplace" about both communication tools (IT) for the virtual work and for face-to-face collaboration were held at the seminars. At each seminar there was time for actual project work, and according to the learning approach this was guided by reflections. At the starting seminar the groups reflected about the content and purpose of their Web site, resulting in a written problem formulation for the pilot project. In the middle of the project period they reflected upon their virtual workplace and the project work done so far, in order to improve communication and to modify their plans to be sure to finish their project in time. For evaluation purpose at the final seminar each group had made 3 documentation products: A Web-site, a project report documenting and evaluating the Web site (specification, design, implementation, conclusion and documentation) and finally a process report reflecting about how they could improve their group work in the next project.

The process report was used for the final reflection on the learning process, during the evaluation of the projects, and it appeared to be a powerful tool, not only for making good advices for the next project, but also for documenting the experiences with project work in distance education, used in this paper.

4. Technology and Collaboration Methods

In the MII education the latest information and communication technology is the subject as well as the tool.

LUVIT® is an integrated distributed WWW-based learning environment, originally developed at Lund University, Sweden. It has facilities for development and delivery of on-line courses, and provision for statistical information of student activity. Although it is not intended for project work, it was chosen for the MII-education, as the course facilities appeared to be adequate for group organized distance collaboration in project work as well. A project work is handled as a course, where the students are the information providers.

Document handling

The project documents are organized in a tree structure in LUVIT, reflecting the final report contents, see Fig. 2, [Borch et. al. 1999].
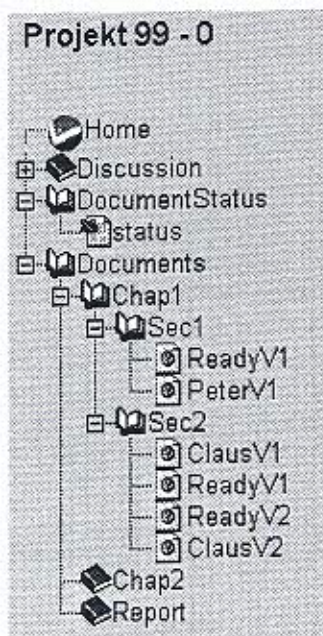

Figure 2. LUVIT navigation tree: documents for group 0.

Figure 3. Section of spreadsheet status document, Project with pull down menu of possible selections opened.

The documents are typically Word documents, and the reviewing facilities, 'track changes' and 'comments' are utilized. To organize the document handling, a status document, implemented as a spreadsheet, is used. The status document, Fig. 3, contains the status of each document, including version control, and the related responsibilities of each group member. The status document is downloaded, modified and uploaded to LUVIT, recording every action on a document.

Asynchronous communication

LUVIT has a discussion forum organized in threads. Besides, ordinary e-mail is used for communication between group members and supervisor.

Synchronous communication
LUVIT also provides a chat forum. Typically, chat meetings have been conducted once a week per group, the group supervisor participating if convenient and desired by the group. The duration of a chat meeting is typically 1 hour, but the efficiency is low due to context mix-up and typing delay. Using MS Netmeeting, the sound facility and immediate file transfer possibility is an improvement.

Face-to-face meetings
These meetings, held at the seminars, were utilized for fundamental discussions and decisions in the project work such as status, planning and reflection.

In some cases, e.g. when the computer technology failed, the telephone or fax was used.

5. Experiences with the Pilot Project

Experience with problem oriented group work in distance learning will be presented as: distance group work experiences, project work experiences, technology experiences, and seminar experiences.

Distance group work experiences
The students are faced with many kinds of problems, social as well as professional, to get the group work done properly. It was a special challenge to give the project precedence, because it is much easier to use time for well planned discipline oriented courses where progress is easy to measure and where hints are available. At the same time, group work copes with unclear task/subtask definitions and the students are mutually dependent. In the virtual group room the students communicate through chat, telephone (synchronous), e-mail and fax (asynchronous). Experiences from virtual group room work can be handed over by comments from the groups:

Problems: "Chats are very time consuming (2 hours or more) and difficult to structure. Often group members 'speak all at ones' about different subjects and even about matters that do not belong to the subject under discussion"

Best practice: Before every chat meeting one of the group members was responsible for making a detailed agenda for distribution to the other group members via e-mail. The agenda also pointed out a chairman and a reporter. Every topic had its own unique topic-number. It was the chairman and only the chairman that changed from one topic to the next. The chairman was responsible for closing and saving the discussion.

Benefits: It was agreed that regular chats so far are necessary and could be used with success in group work. It was time consuming but gave the students the feeling of group solidarity.

It seems that chat was not suitable for difficult and complex problems. These kinds of problems were treated in a superficial way. Chat was best for communication in firm frames and requires high discipline from the participants.

Project work experiences
The Project work dealt with description of well defined tasks/subtasks, task planning and time planning. The groups as self running entities really had problems with defining common plans, so that every student was confident with the plan and knew all about tasks/subtasks and when they were supposed to be solved.

Problems: "In retrospect, it is easy to see that the time plan was not used seriously enough. The time plan was not under debate on every chat. Suddenly subtasks were behind schedule and the time lack did not result in a revision of the time plan. There should be much more attention to the relation between the time plan and state of the project."

Best practice: An analysis in the beginning of the project period should give an overview of the whole project compared to an estimated need of time. It was followed with detailed subtask definitions and a detailed time plan. The time plan was always a topic in the agenda.

Benefits: Most of the students were very enthusiastic and enjoyed working on solutions of the problem together.

Project work in the virtual space, though, was very individual. As stated in a report: "The project phase can be hard and lonely for the individual student, where doubt and uncertainty for the project solution and the other members of the group are strong factors".

Technology experiences
Virtual group work is dependent on: communication, exchange of documents, version control of documents and track keeping of the time planning.

Communication was mainly done via chats. In LUVIT the students can create as many chats and forums as they wanted, but this was one of the pitfalls because it was very difficult to have an overview of more than a few.

Exchange of documents and version control (Fig.2) *and time planning* (Fig.3): When used on the local area net at Aalborg University it worked nicely and as expected, but the experience when used on the Internet revealed lack of robustness. Especially the spreadsheet status and version control system did not work well within LUVIT when used on the Internet, but the ideas are sound and well defined and the option really should be available for the students.

Best practice and benefits: The students found other ways to keep track of their documents using Web-drives, Frontpage or common drives at Aalborg University. E-mail was used intensively.

Seminar experiences
The seminars were very popular. The students really felt that the project progressed even if only few hours were free from courses. Especially for the complex and difficult part of the project, where important decisions should be made, face-to-face group work was needed. Also it was observed that the project managing had a very high priority and that the sessions were used as milestones for the project state.
Students comment: "It is important that chats are followed up with meetings at the seminars".

6. Conclusion
For the MII-students, who are not accustomed to project work in learning or to distance learning, a small-scale design-oriented pilot project was an excellent introduction to project work in networked education.
The main conclusions, based on experiences from the pilot project, are:

- *Project work is a unique learning motivator*
  This is particularly important for distance learners, studying at home after a long days work.
- *Project work enhance peer collaboration*
  Studying at home alone may be hard and lonely, and one often gets stuck in even minor problems. Collaboration may be the answer and the way to get forward.
- *Face-to-interface meetings must be combined with face-to-face meeting*
  It is commonly felt, that a good networked collaboration requires a prior personal acquaintance. Besides, the students experienced, that certain parts of the project work, in particular planning and reflection, was much easier accomplished during meetings at the seminar. This may, however, be a matter of culture, habit and technology available. When, in the next project, sound and video will be available for chat meetings, these views may change.
- *Virtual group meetings require a strict planning and control.*
  In chat meetings, informal meeting behaviour is not adequate, but with strict planning and control, they are a useful supplement to asynchronous communication. With sound and video, initial trials indicate that virtual meetings are more efficient and easier to control.

Acknowledgement

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