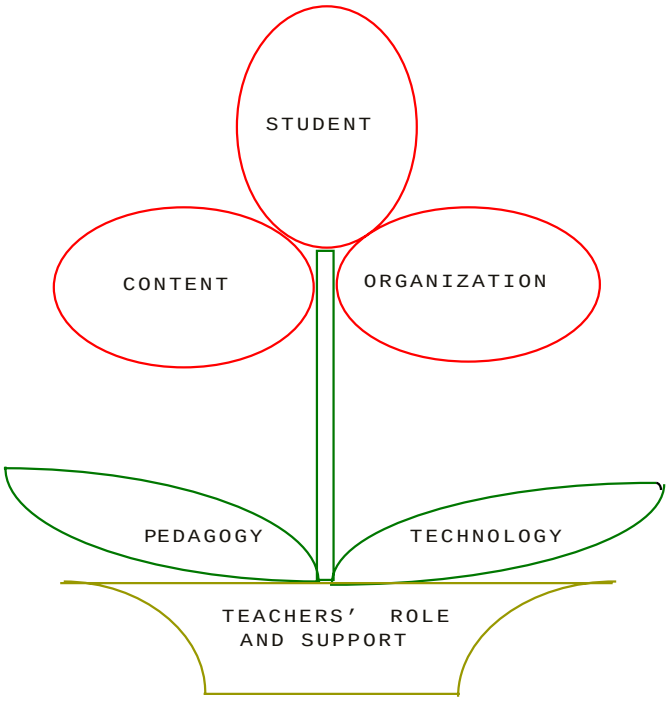
# Growing Knowledge

## How to Support Collaborative Learning e-Discussions in Forum Systems




**Eva Rydberg Fåhræus**

**evafaahr@dsv.su.se**

**http://www.dsv.su.se/~evafaahr/eng.html**

**Department of Computer and Systems Sciences**

**The Royal Institute of Technology and Stockholm University**

Graduate School for Human-Machine Interaction (HMI)

# Abstract


## *Växande kunskap / Att odla kunskap*

### Hur man kan stödja lärande-i-samarbete vid e-diskussioner i forumsystem

Informations- och kommunikationsteknik (IKT) möjliggör diskussion på avstånd och utan att den är samtidig. Detta kan vi kalla e-diskussion. Det stödjande tekniska systemet brukar kallas forumsystem. Lärande kan stödjas av IKT. Här är fokus på kommunikation mellan människor, främst på hur lärande-i-samarbete kan stödjas genom forumsystem. När deltagare själva kan välja tid och plats samt även metod för sitt lärande, kan vi kalla det flexibelt lärande.

En trädgårdsmästare kan ge växter en god miljö. Hur kan lärare skapa en god miljö för växande kunskap i grupper av lärande människor? Denna fråga analyserades i en e-diskussion före en internationell konferens samt vid deltagarnas fysiska möte, samdiskussion och samskrivning. Dokumentation ges i studie C här. Rön från två egna empiriska studier (A och B) av distanskurser med två olika forumsystem används vidare för att underbygga en begreppsmodell. Modellen behandlar hur pedagogik och teknik kan samverka med deltagare, organisation och kursinnehåll för att underlätta flexibelt lärande.

Ur tidigare praktik, empiri och teori samt de karakteristiska dragen hos datorstödd kommunikation härleds: 1/ Tips för lärare och 2/ förslag till funktioner att bygga in som stöd i forumsystem. Lärares roll, beteende och stödbehov belyses särskilt.

## *Growing Knowledge*

### How to Support Collaborative-Learning e-Discussions in Forum Systems

Information and communication technology (ICT) enables discussion at a distance and without it being simultaneous. This we can call e-discussion. The supporting technical system is often called a forum system. Learning can be supported by ICT. Here, the focus is on communication between people, mainly on how collaborative learning can be supported through forum systems. When participants themselves can choose time and place as well as their method for learning, we can call it flexible learning.

A gardener can give plants a good environment. How can teachers create a good environment for growing knowledge in groups of people who learn? This question was analyzed in an e-discussion before an international conference as well as in the physical meeting of the participants, their discussion and their collaborative writing. Here, documentation is given in Study C. Further, findings from two own empirical studies (A and B) of distance courses with two different forum systems are used to underpin a conceptual model. The model deals with how pedagogy and technology can interact with participants, organization and course content so as to facilitate flexible learning.

From previous practice, findings and theory as well as the characteristics of computer-mediated communication the following are derived: (1) Tips for teachers and (2) suggested functions to insert support in forum systems. In particular, the role of teachers, their behaviour, and need of support are illuminated.

## Acknowledgements

It has been a great pleasure for me to do research and to write this thesis. I have received tremendous help, support and encouragement from my main supervisor, Professor Jacob Palme, and from co-supervisors Professor Yvonne Wærn and Associate Professor Robert Ramberg.

An important source of inspiration and knowledge has been my colleague, Sirkku Männikkö, M.A. The collaboration with her has had a decisive influence on the direction of this research. She has also given useful comments on my texts. Other valuable comments and suggestions have come from my colleague Peter Hökenhammar, 'fil.lic'., and from my sister Kristina Lundvall, M.A., and my son Erik Westerberg, M.Sc. The conferencing system used in the second study was developed by Torgny Tholérus, B.A. I owe him a great thank for his timely and painstaking work.

My first study was financed by DUKOM, a Swedish governmental committee for the support of distance education. I want to thank especially Margareta Gisselberg, Ph.D, for her helpful advice. My second study was financed by NUTEK, the Swedish National Board for Industrial and Technical Development. My third study was a working group during an international conference, co-chaired with Barbara Chamberlain, M.A., whom I cordially thank for her inspiring and supportive collaboration. The coordinator of the working groups at the conference, Dan Joyce was also of great help, for which I convey my thanks.

I am very much indebted to all the students who took part in the courses studied, totalling almost 100 persons, for answering questions and letting me use their utterances in my analyses and reports.

The most important support I have received from my beloved husband, Sven Rydberg. He both read and commented on my texts, and encouraged the work through discussions of ideas and through positive reinforcements. At last, I want to mention the immense emotional support I have got from my three children Erik, Karin and Petronella, and the distraction I got from my grandson Albert.

# Contents

# Part I

# Focus, Aims, Approaches and Framework

# 1. Introduction

## 1.1 Background

Gardening is a fruitful metaphor for learning and teaching. Already in 1926, Vygotsky used it when he discussed the teacher's role:

> *Just as a gardener would be acting foolishly if he were to try to affect the growth of a plant by directly tugging at its roots with his hands from underneath the plant, so is the teacher in contradiction with the essential nature of education if he bends all his efforts at directly influencing the student. (Vygotsky, 1926/1997, p. 49).*

Just as gardeners sometimes need to use a stick to support a plant or an automatic irrigation system to create a fertile environment in their gardens, teachers can be helped by information and communication technology (ICT) to create a stimulating and effective learning environment.

## 1.2 Focus

ICT can be used to support learning in many ways. Elen and Clarebout (1998, p. 81) suggest a rough structure for learning environments supported by ICT:

- Tutorial environments
- Explorative environments
- Interaction environments

I have concentrated my research on **interaction environments** and their use in collaborative learning. To be more precise: I study how groups learn by discussing via a forum system, how teachers can facilitate such learning, and how ICT can support this learning and facilitation. The expression "**forum system**" is used, in this thesis, for a mainly text-based, asynchronous (= non-simultaneous) electronic conferencing system. Such systems may also provide the possibility to exchange other forms of information, e.g., pictures and sound, and they might contain functions also for synchronous communication.

I focus mainly on the teachers´ roles, methods and support. When I use the expression "**teacher**", it can be a teacher or course leader, a team of teachers, or what some authors call a facilitator or coach.

My motives for choosing this focus are:

- Text-based electronic communication applies a relatively simple technology that is accessable by many individuals, at least in developed countries, and reachable from many remote places.
- Asynchronous electronic communication provides an independence of

time and place that is highly valued in the society of today and enables lifelong learning.

- A forum system is an easy-to-use tool, yet complicated to design and construct: a real challenge!

- I consider the teachers as responsible for the efficiency in planned learning, and thus the most important persons to study and influence.

ICT support, and especially interaction environments, are often used within distance education. However, the use of collaborative learning via a forum system is by no means restricted to distance education. It can as well be used to augment the learning process in a traditional course. Here, I will use the term ”flexible learning” to denote a learning situation in which the learner has a freedom to choose how and when to learn (e.g., Holmberg, 1998).

### 1.3 Research Motives and Relevance

Lifelong learning is a concept of great relevance today. Augmented demands at work, new technologies emerging in all areas of work, and a higher tempo also in the recreation area call for a continuing development of knowledge and skill. This implies that new groups with new needs will require training and education. These students cannot always travel to learning centres, such as schools or universities, and spend time away from work or home. At the same time, these groups may need more help and support in their learning. Still, most of them will demand the same stimulance and social contacts that campus students benefit from (e.g., SOU, 1998).

The new information and communication technology might enable us to provide learning environments, suitable for these new groups of students. However, this puts new demands on the teachers and the education providers. Teachers may need to develop new skills and they need support from effective systems and organizations. A discussion about pedagogic perspectives and teaching methods has been deemed fruitful for this process.

I hope that this thesis will contribute to this discussion and that my suggestions will prepare the ground or even sow seeds, so that new methods and support systems will grow out from this.

### 1.4 Thesis Overview

This thesis contains a body and three published papers. The first paper describes a study (here called Study A) that I conducted together with my colleague Sirkku Männikkö. She is also the second author to this paper.[i] The second paper describes a study I have conducted alone (Study B). The third paper is a report from a working group that I co-chaired during an international conference (Study C). The three papers form Apendices A, B, and C in the thesis.

[i] The publishers unfortunately omitted Männikkö’s name at the publication of this paper.

Part I contains this introduction (Chapter 1), a description of my research approach (Chapter 2) and a framework for flexible learning (Chapter 3). I have built this framework on experiences and observations during my studies and with inspiration from the literature. This framework is used in Part II as a structure to describe theories and practice in the field.

In Part II, Chapter 4 comments on the student, and Chapter 5 on the organization of flexible learning. Chapter 6 deals with pedagogic issues, including different perspectives, their impact on instruction, and collaborative learning. Chapter 7 introduces technology as a tool to support learning, and especially computer-mediated communication (CMC). Chapter 8 deals with the teachers´ role and support.

Within each of these chapters, the studies are described and discussed - when relevant - in the light of theories presented.

Part III presents conclusions (Chapter 9) from the studies and from the theories presented in Part II. Here, you find The list of tips and support functions. This part ends with ideas for future research (Chapter 10).

The reader of this thesis can read about the studies as a unit, following the "study thread" below:

Chapter 2, Page 8 - 10: Description of methods used in the studies.

Chapter 3, Page 14 - 15: Description of the courses studied using the Framework.

Chapter 4, Page 20 - 21: Students in the courses studied.

Chapter 5, Page 26 - 27: Organization of the courses studied.

Chapter 6, Page 36 - 37: Pedagogic perspectives in the courses studied.

Chapter 6, Page 40: Collaboration in the courses studied.

Chapter 7, Page 44: Technology used in the courses studied.

Chapter 8, page 55: The teachers´ role in the courses studied.

Chapter 9, page 60 - 67: Conclusions from the courses studied (in The list of tips and support functions).

Study C is referred to on the following pages: 25, 26, 37, 41 - 43, 51, 54, 62 - 67.

# 2. Research Approaches

## 2.1 Aims

We do not know enough to arrange efficient flexible learning, especially concerning collaborative learning using forum systems (Moore & Kearsley, 1996). This might cause students to spend their time on courses without learning what they were promised, and teachers working hard without producing acceptable results. It also implies that the forum systems we use are not quite as effective as they could be.

The aims of the research reported in this thesis are

- to review and supplement the knowledge about collaborative learning via forum systems by
    - finding and describing factors influencing effective collaborative learning via forum systems, and especially
    - identifying the teachers´ role and behaviour and need for system support and
- to use this knowledge to suggest effective teacher behaviour and ICT support functions.

## 2.2 Research Questions

When I started research within the area of flexible learning, the first questions that came to my mind were:

Q1 What new possibilities do teaching and learning at a distance offer?

Q2 What new problems are introduced?

The best way to find out was to try. So I gave a course together with a colleague and made a research study on it at the same time (Study A). We found, among other things, that in this type of learning environment:

R1 It was difficult for us as teachers to activate inactive groups.

R2 The teachers´ facilitating work was hard and took a lot of time.

R3 It was possible to learn when groups collaborated through a forum system but students were not familiar with communicating electronically.

R4 Students appreciated the freedom of time and place, and the confidence we showed them to choose methods.

Based on these results, I formulated the following questions:

Q 3 Is it possible to support the teachers by adding functions to the forum system?

Q4 Is it possible to help students collaborate by giving them an introduction to human communication?

Based on these questions, I designed support functions to be added to the forum system, and studied the use of these in a course. In the same course, I made an experiment by giving an introduction to human communication to some of the students (Study B).

This study gave the following results:

R5 It was possible to support the teachers with the functions tested, but those were maybe not ideal and more support might be helpful.

R6 The experiment did not prove any noteworthy impact from the introduction about human communication.

Thus, I decided not to continue along the line about the introduction, but to elaborate on the teachers role and need for support. I also decided to keep the focus on the online discussion as learning format. The resulting questions were:

Q5 How can we take advantage of possibilities and reduce problems, introduced by the use of computer-mediated communication (CMC)?

Q6 What help is available from theories about learning, collaboration, and communication, to understand processes and influencing factors?

Q7 What help is available from practitioners within the field?

Next step was to establish a working group around the theme: Creative Teaching of Electronic Collaborative Learning Groups. I co-chaired this group during the conference ITiCSE'99 and it resulted in a report (Study C).

I have also experimented informally with different kinds of online discussions as components of a campus course I am responsible for. During and after the studies, I have read literature about theories and practice within the field. I used this knowledge to interpret results from the studies and to draw the conclusions reported in this thesis.

### 2.3 Approaches and Perspectives

Alternating between practical and theoretical studies, I have found new problems to solve and new possible solutions to try. Integrating my own results with theories and other researchers' results, I have synthesized the results reported in this thesis (see Figure 2.1.) By describing this process and my findings, I hope to stimulate other researchers and practitioners to continue the experimenting and analysis, shaping a good environment for growing knowledge.

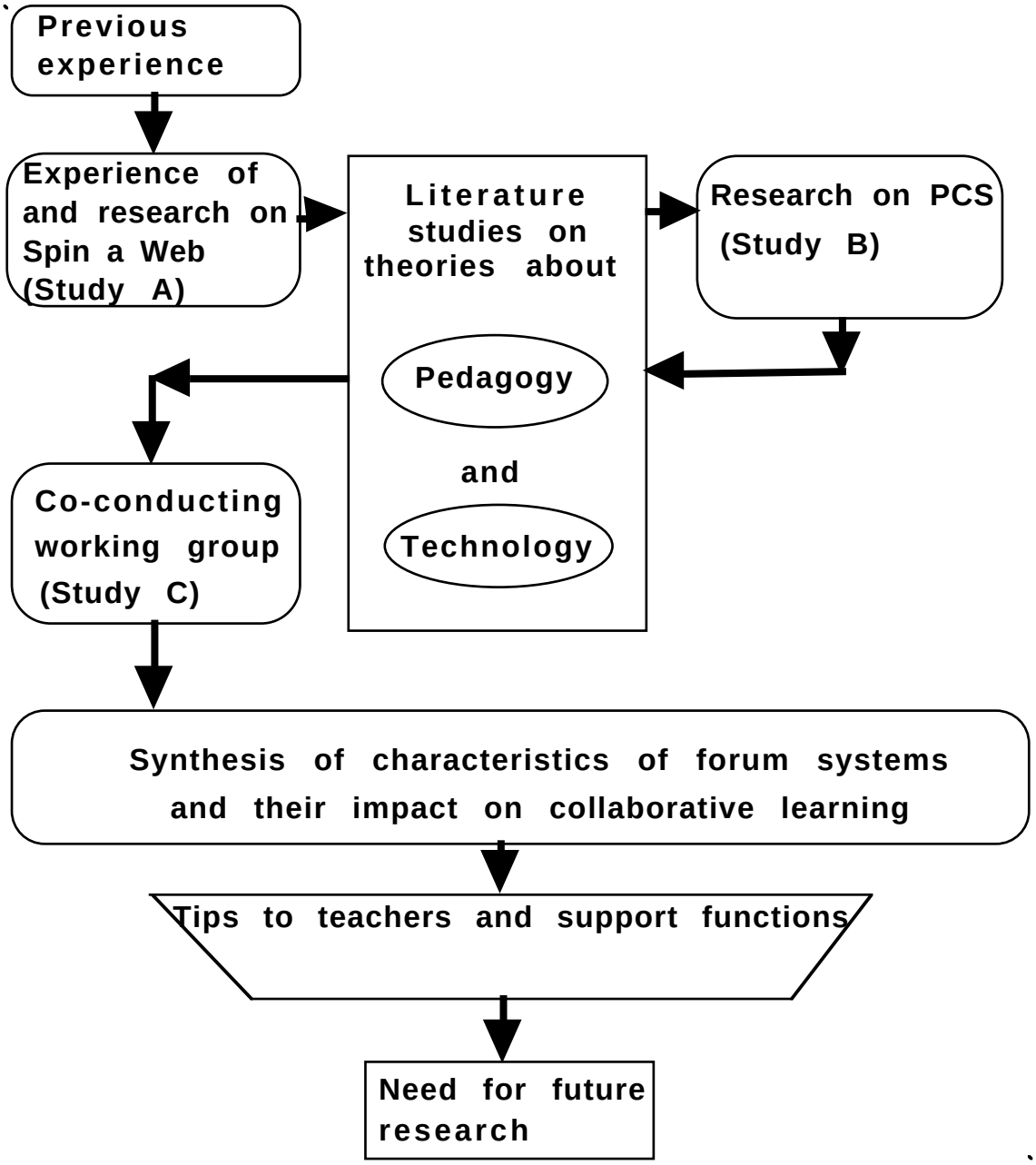



**Figure 2.1. Flow chart illustrating the research process**

I have alternated between sharing the responsibility for a whole course and doing research on courses given by others or by myself. That means that my perspective has changed from at first having a focus on a course overview, to studying the single discussion contributions from individual students, and from being the observer, to experiencing being a teacher. In my interviews and dialogue analyses, I have tried to understand what it means to be a student or a teacher at a distance, and how the learning process is impacted by the teachers´ behaviour and the system used.

Describing the overall research process like this, it looks like a hermeneutic approach (see Figure 2.2.). There is an alternation between the whole and the parts, between pre-understanding and understanding, interpretation of

meaning, the use of "growing" as a metaphor, the integration between theory and practice (Alvesson & Sköldberg, 1994).

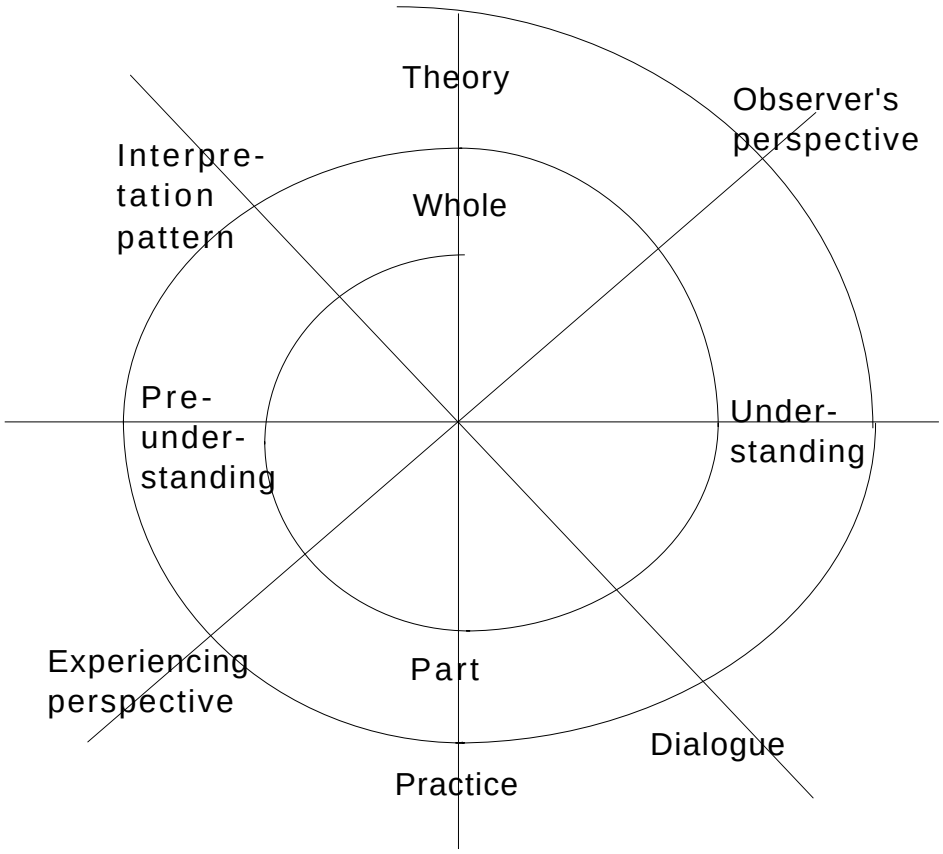



**Figure 2.2. The "hermeneutic spiral" (inspired by Alvesson & Sköldberg, 1994, p. 174)**

Hopefully, my knowledge has grown during these alternations, which indicates that I have followed a spiral going up instead of just going around in the circle.

However, I did not use hermeneutical methods like source critique or text interpretation in my studies. My approach in the single studies can be described as inductive ethnography, largely built on observation of recorded behaviours. It is a primarily qualitative approach, studying phenomena and action in naturalistic environments with quantitative data collected when considered feasible and relevant. The qualitative approach requires a close and durable contact with the studied group or community in its natural environment, narrowing the gap between the observer and the observed. Often, one starts with a rather wide perspective, narrowing it as one finds interesting questions or details to focus on. It is important to be open-minded, flexible, and not restricted by theories or presumptions (Alvesson & Sköldberg, 1994).

## 2.4 Methods

Mainly qualitative methods were used in the studies. The reason was that my main goal was to create a deep understanding of factors influencing collaborative learning via CMC.

One alternative approach would have been to compare a course given via CMC with the same course given in a traditional setting. Another alternative or complement could be to examine a great number of similar CMC courses and make a statistical analysis of factors that might influence the learning process. If a comparison between two courses should be meaningful, you have to control most variables. In a course situation, there is a huge amount of variables, and one of the most important is the student. It was impossible to conduct an experiment with the same students in two courses, and very difficult to experiment with so many students that the differences can be reliably eliminated by random assignment to experimental and control groups. Both in the studies reported and in the alternative approach mentioned above, it could have been interesting to measure the knowledge, resulting from the courses. However, the kind of knowledge aimed at here is very difficult to measure, and if you measure, you influence the knowledge. E.g., for the course examined in Study B, one of the knowledge goals is:

> *To support the development of an analytical understanding and to awaken a lifelong interest in the social aspects of computerization.*

Thus, I have not tried to measure the knowledge resulting from the courses. Instead, I have judged the implications on learning outcomes from the students' self-assessments.

Below, you will find a structured description of methods used in the three studies.

### *2.4.1 Methods of Data Collection*

#### a) Data from relatively natural and spontaneous processes

In Study A, behaviours indicating the learning and group processes were observed, and the experiences as active teachers were noted. Produced reports and the electronic communication, recorded automatically by the forum system, were saved.

In Study B, the electronic communication was saved and the group processes were observed, without the present author taking part in the course.

#### b) Data produced on request or by the researcher

In Study A, the students were asked to write diaries about their learning process. They also got three questionnaires each, and we made participant observations, as teachers.

In Study B, an experiment was conducted and the students got three questionnaires each. Some students and the main teacher were interviewed.

In Study C, there was a group discussion among researchers, documenting experiences and opinions in a report.

### *2.4.2 Methods of Data Analysis*

#### a) Quantitative Processing

In Study A, the electronic communication during one month was analyzed. Contributions were categorized and counted, in order to identify and compare different communication strategies. The questionnaires contained some quantifiable data, e.g., data about background and former experiences and these were processed.

In Study B, the quantifiable data in the questionnaires were processed.

#### b) Identifying interesting cases

In both Study A and Study B, examples of utterances and interaction were identified that illustrate different phenomena from the point of view of communication theory, activity theory, and theory about group processes.

#### c) Narratives

Answers to open questions in questionnaires and interviews, experiences from the participation and observations in Study A and Study B were reported as narratives.

### *2.4.3 Methods of Inference*

#### a) Induction

In Study A and Study B, induction was used to generalize that some of the conclusions might be true also concerning other courses.

#### b) Theory-guided generalization/abduction

In Study B, student behaviour in the CMC situation were found that seemed to agree with a corresponding behaviour in a face-to-face situation, according to a group-process theory. Thus, it was generalized that this behaviour might be typical also in other CMC situations.

#### c) Situated conclusion

In Study A, some conclusions were drawn about the studied groups without generalizing to other groups.

## 2.5 Foundations for this Thesis

To conclude, this thesis is based on the following:

- Previous experiences, e.g.,

    - in my earlier work in and with industrial, public and private organizations
    - from the course "Human-Computer Interaction", in some cases given as video-mediated lectures, and experiments with discussions via forum systems
    - teaching employees and university students in traditional classroom settings
- Literature studies about theories and practice. The theories have been of help at the interpretation of study results. The practice have given ideas about what to study and how problems can be solved.
- The experience of giving the distance course "Spin a Web Between the School and the World" (abreviated ”Spin a Web”), and doing research on the same, reported in Study A.
- Doing research on the course "People, Computers, and Society" (abreviated PCS), reported in Study B.
- Arranging and co-conducting the working group "Creative Teaching of Electronic Collaborative Learning Groups", reported in Study C.

## 3. A Framework for Flexible Learning

As a tool for the description of theories and practice within collaborative flexible learning, I have constructed a simple model (see Figure 3.1.). In this, I was influenced by a systems approach, also advocated by Moore and Kearsley (1996). This model might also support teachers in their course work.

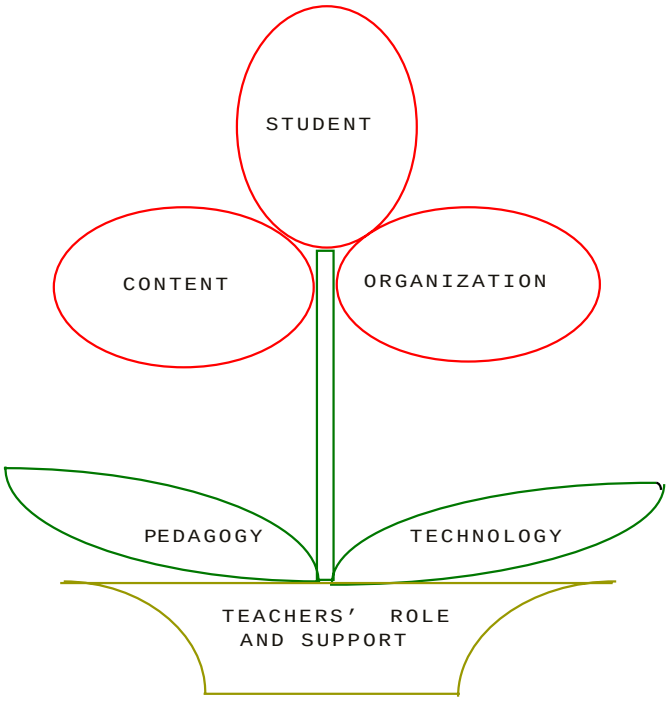



**Figure 3.1. A framework for flexible learning**

When we plan for a flexible course, we normally have a group of **students** who want to learn something, we have the **content**, and the course is to be arranged within a certain **organization**. If we do not have the students from the beginning, we normally have an idea about which category of students we aim at. So, the students, the content, and the organization form the pre-requisites for the planning of the course.

Depending on these prerequisites, we choose a **pedagogic approach**, and **technology** to support our work and the learning process. Based on this, we design the course. During the course, we probably have to revisit this model to adjust the pedagogic methods or the use of technology according to the students' special needs or other factors influencing the learning process.

All these factors are mutually dependent and should be designed in congruence with each other (Moore & Kearsley, 1996). The model tries to illustrate only the most important connections between the factors. If one factor is changed, e.g., the technology, you may have to consider also changes of other factors in order to achieve an effective learning environment. The design of the factors send signals to members of the organisation, e.g., teachers, students and administrators, about how they are supposed to behave. If these signals are incongruent, members will be confused. This may lead to less coordinated, and even counter-productive individual behaviour and

consequently lower organizational, individual, and pedagogical effectiveness and learning (see also Porras & Robertson, 1994).

For instance, if a teacher decides to give the students the opportunity to do group work at a distance, it may be necessary to reconsider the formulation of the group task and the way the result is to be reported. And this might need the introduction of a new role as co-teacher, who works as a group facilitator. This is not only a technological issue but also a question of pedagogy, organization, and the form of collaboration, depending on the course content and the actual students (Moore & Kearsley, 1996).

Depending on the content that is to be learned and the pedagogy applied, the teachers decide about types of collaboration needed. This decision will put demands on technology. Depending on pedagogy and technology, a certain distribution of time and place will be possible. Therefore, the students´ situation and the content ought to influence the choice of pedagogy and technology.

In this thesis, we will not deal with the content of courses. However, each of the other factors in the model will be found in each of the chapters in Part II.

## 3.1 The Framework Applied to the Courses Studied

### *3.1.1 The Course "Spin a Web Between the School and the World"*

We wanted to arrange a course where high-school teachers could learn how to use the Internet pedagogically in their teaching. The **content** was "Pedagogical use of the Internet in high-school education".

The **students** were senior high-school teachers from all over Sweden. The economy of the schools that sent students to the course made it possible to meet with the whole group only during 5 days, so we chose to meet once at the beginning and once for their reporting at the end of the course, 2 1/2 days each time. The students had to manage their normal teaching and related work in parallel with the course. This meant that they could study 25% of full time. The course was to be equivalent to 5 weeks full-time studies. This meant that we had to let it strech out for about half a year. It was important to let the students choose time and place for their studies to fit with their work. Therefore, we chose an asynchronous mode of communication. But the groups had to coordinate their work both within each group, and between groups towards the reporting session, so all students had to start and finish the course at the same time.

The course was delivered within a traditional, on-campus university **organization**.

As the **pedagogical** idea for the course, we chose Problem-Based Learning (PBL; Finkle & Torp, 1995), and a format in which the students were to collaborate in small groups of their own choosing. Based on this and the students' situation, we had to choose a **technology** which enables collaboration

in groups at a distance. We found that the forum system FirstClass would work as communication tool and learning environment.

The literature used during the course was to be found on the Internet, naturally enough, due to the course subject and the technology used.

In the rest of this thesis, this course is called **Spin a Web**.

### *3.1.2 The Course "People, Computers, and Society"*

The aim of this course was to help computer students to develop an understanding of the social aspects of computerization, of how technology interacts with people and with politics, and the importance of how decisions about technology are made. The aim was also to prepare the students for problems they might meet in working life and to introduce forum systems as a medium for instruction.

The **students** came from the program for Computer and Systems Sciences studies which is an on-campus program. However, many of the students took this course towards the end of their studies, when some of them already had (part-time) work. So, some of them may have chosen this course because they did not have to come to the campus very often during the course.

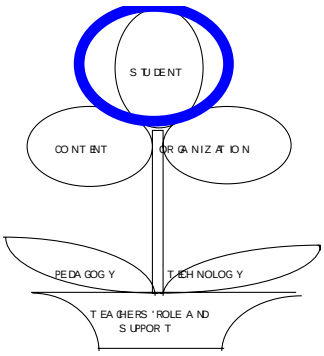
Although the format of this course is very different from most other courses at our department, it was administered within the ordinary **organization**, in accordance with all normal routines.

The **content** of the course was the reason why the **pedagogical** design was chosen: The issue "People, Computers, and Society" was divided into five themes, and each theme was to be discussed among students during two weeks. The evaluation of learning results was based on participation in these discussions. The students could participate at times and places of their own choice as long as they followed the overall timetable, which said that each theme should be treated during two specific weeks.

The forum system KOM2000 was chosen as **technology** for this offering of the course. It had been equipped with special support functions for the grading of contributions (Palme, 2000).

In the rest of this thesis, this course is called **PCS**.

# Part II
# Aspects of Flexible Learning




## 4. On the Student

### 4.1 New Categories of Students

New categories of students will presumably be attracted by the possibility to study at a distance, in addition to the traditional students. It is likely that here, we find older students, students with physical and social handicaps, and students combining their learning with work in companies, in other organizations, or at home (e.g., Moore & Kearsley, 1996; Harasim et al., 1995). The reasons why these students choose to study may vary. Perhaps, we will even see an increasing amount of students who choose studies as an alternative form of entertainment (c.f., "edutainment"), instead of going to the cinema or workout.

The situation for the students will be different from the traditional on-campus studies. Harasim and her colleagues (1995) compare this with a journey (p. 193):

> *Think of an online course as a voyage of discovery through the world of knowledge. As with ocean voyages, one of the main attractions is the opportunity to interact with complete strangers who become one's fellow passengers.*

The distance-learning situation presupposes and sometimes even bravely encourages a certain degree of independence and interaction among students. The distance makes it difficult for the teachers to apply direct, extrinsic motivation to students. Neither do students get the same stimulation from peer students as when they meet in a classroom. It is thought that adult students are more intrinsically motivated than young ones, and this might imply that children will be less common among the distance students (see for instance Moore & Kearsley, 1996). Other researchers and experienced distance teachers, e.g., Bååth (1999), argue that children very well can study at a distance.

One conclusion is, that a group of students in a flexible-learning situation might be less homogenous than a traditional class and that the teachers need to apply all the possibilities given by the technology to individualize the facilitation.

### 4.2 Buyers on a Market: A New Position for the Students

Nuldén (1999) introduces the concept of education as a market place (p. 21):

> *One important change is a change of view of education, from a factory with a well-regulated production line to a market-place bustling with interaction and negotiation among all actors.*

In this demanding new world, the student is one of the actors, and maybe a stronger one, when universities and private education institutes compete about the students on the market. This may give students a strong position and enable them to choose the most suitable course, independent of time and place. There is, however, a risk that the less gifted and those without resources will be left behind if the society does not deal with this (Hiltz & Turoff, 1993).

### 4.3 New Demands on the Students

Harasim and her colleagues (1995, p. 195) have found that not all individuals are successful online students: Factors that influence their success are "access, attitudes, motivation, and the self-discipline to participate regularly".

The use of technology to mediate communication implies the need of certain technical skills among students (and teachers). Nowadays, however, forum systems are easy to install and use. Some students might still need instruction and support from a software expert or technical support staff. Often, a knowledgeable friend is of help (ibid.).

### 4.4 Students in the Courses Studied

The students of the course **Spin a Web** were senior high-school teachers from all over Sweden. Their age varied from 35 to 60 with an average age of 47. They chose this course mainly because it enabled them to study, yet continue their ordinary full-time work; school authorities are very restrictive about granting leave of absence for studies (sometimes even when all concerned may profit). The students valued the opportunity to aquire new knowledge and to make new aquaintances with colleagues in similar situations. These students were very motivated to learn. We awarded academic points equivalent to 25% of one semester (5 points out of 20). However, for most of our students, the academic points did not matter much (Study A).

We deliberately encouraged the students to be independent of us as teachers and we also noticed examples of this to be the case in the actual behaviour of the students (Männikkö & Fåhræus, 1998, p. 675):

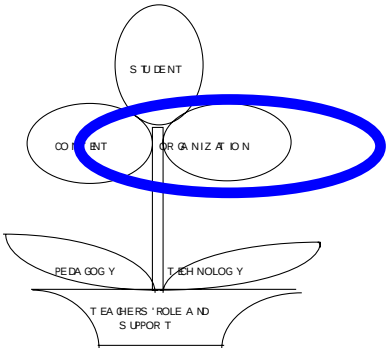
> *Internet supports both asynchronous and synchronous communication. Our course design gave greater emphasis on asynchronous communication. To our surprise, we were to find out very soon that the participants developed strategies where they combined asynchronous*

*and synchronous communication, and often favoured the synchronous one. This is a beautiful example of the learners taking responsibility for their group development and their learning, showing independence towards the teacher.*

The technical experience and skill varied a lot among the students. Most of them had no or very little experience of computer conferencing or other forms of Internet use, but were familiar with word-processing and e-mail. Those who knew more were of great help for the others (Study A).

The course **PCS** was attended by students at the department of Computer and Systems Sciences at Stockholm University. Their age varied from 20 to 42 with an average age of 29. They attended this course in order to get three academic points and chose this course among other because of the subject, but also because of the special format. Apparently, a considerable proportion of the students already had started working, and these students saw the opportunity to combine their studies with work (Study B).

Initially, the students were probably mainly extrinsically motivated, but as the discussion went on, the motivation coming from the wish to take part in the discussion, gradually grew. The technical competence was of no concern since they were students of Computer and Systems Sciences (ibid.).




## *5. On Organization*

The organization is the environment in which the teachers work and the courses are administered - the administrative systems and people working with students' admission, with economy, marketing of courses, decisions about plans for new courses and so on and so forth. Such an organization ought to be a support for the teachers, but it is often also perceived as a restriction. If the organization is old and designed for arranging traditional education, the introduction of flexible learning might give rise to strong feelings and defence actions. However, in the best of cases engaged teachers with a strong conviction and with the aid of technology as a lever, might be able to cause changes.

Porras and Robertson (1994) introduce two different views to characterize organizational change: category (whether change is planned or not) and order (first or second) (see Table 5.1, below!)

**Planned change** normally starts from a decision by the system itself to deal with new demands from the market or other factors in the environment. External resources might be engaged and the change can include most of the organization, aiming at an improvement of its functioning in general. **Unplanned change** starts outside the system, in events out of control from the system. This forces the system to adapt in an unplanned manner which leads to the fact that an unplanned change normally is restricted to a limited segment of the organization.

**First-order change** does not include change of fundamental assumptions or basic paradigms. **Second-order change** is a much more radical change, causing a paradigmatic shift.

We have now got a matrix with four squares, characterizing different kinds of organizational changes. Planned, first-order changes are called **developmental** and unplanned, first-order changes are called **evolutionary**. Among second-order changes we have planned, **transformational** changes and unplanned, **revolutionary** changes.

**Table 5.1. Characterisation of organizational change (Porras & Robertson, 1994, p. 722)**

| Type of change | First-order change | Second-order change |
|---|---|---|
| **Unplanned change** | 1. Evolutionary change | 3. Revolutionary change |
| **Planned change** | 2. Developmental change | 4. Transformational change |

Applying this model on the introduction of flexible learning and combining it with my own experience and observations, I imagine the following patterns:

1. **Evolutionary change** would be the case, e.g., if a single teacher starts giving a course in a distance mode without waiting for a management decision in beforehand, maybe initiated by students demanding the possibility to study at a distance. More evolution could occur if this spread to other teachers, with or without support from management.

2. **Developmental change** will occur, e.g., if management identifies new student groups needing to study at a distance. This leads to the decision to offer some of the traditional courses in a distance mode.

3. **Revolutionary change** would be the case , e.g., if other education institutions would offer flexible courses, thus competing about the same students. This might force management to arrange flexible courses without adequate planning and resources.

4. **Transformational change** would start with a process in the organization, identifying, e.g., new needs and new technological possibilities. Based on this information, different pedagogical perspectives would be discussed and implications on, e.g., instruction planning, teacher roles, and practical arrangements identified. This process might result in a decision to build a separate division for distance education, or to introduce a flexible-learning view in the entire organization.

It is rather obvious that the revolutionary type of change risks being authoritarian, unsuccesful, and generally undesirable. Among the others, my opinion is that the developmental type is the most common one, but that the transformational type is the most desirable. It is, however, not obvious which of them will result in the quickest change or whether a quick change is desirable at all.

Up to now, in this chapter we have been discussing the introduction of flexible learning in organizations for traditional education. This form has been called ”dual mode”, i.e., one organization offers both traditional and

distance courses. ”Single mode” organizations are those offering only one of these types of courses (Holmberg, 1998). Open University in UK is a typical example of a single-mode organization, offering only distance courses.

The Swedish committee on distance education (Göransson, 1998) recommended the Swedish government to support mainly the dual-mode organization and to invest in a centre for the development of methods for distance education. The committee also gave other recommendations, concerning different aspects of organizing distance education. I base the following presentation on these recommendations, on Moore and Kearsley (1996), and on my own experiences.

### 5.1 New Time Frames

One of the main advantages with flexible learning is that the students have freedom to choose the time and place for their studies. This usually means that they need more calendar time to take a course, compared to traditional studies.

There are distance courses, e.g., given by the Norwegian organization NKI, that students can start and finish at any time (M.F. Paulsen, personal communication, 1999-10-15). Individual students follow different time tables. This implies that the course schedules will look different from the traditional ones.

Another time aspect is that the teachers will be less restricted in their work hours. There are fewer (or no) lectures restricted to certain hours of the week, but instead, a continuous demand from students to get online feedback. Some teachers might find it frustrating to be "always on duty", others will find this freedom of time and place very convenient. New contracts about working hours for teachers might be needed (Study C).

For courses with elaborated study guides and course material, the time for planning and preparation will be substantial and this has to be planned for, both concerning time and resourses.

### 5.2 New Groups of Students

The availability of distance learning will attract new groups of students with different needs, compared to traditional students (see Chapter 4). These students do not always need academic credits for their studies but they might need technical and other support.

One way of arranging for student support is to build local study centres in the country, where students can meet other persons of flesh and blood, use computers, and get some support from local facilitators (Åström, 1998).

### 5.3 Faculty Teams

New competences might be required to produce a distance course, for instance those usually found through technicians, librarians, multimedia experts, and group facilitators. Teachers are traditionally used to working

alone, managing all equipment, material and tasks by themselves, so this new order might be frustrating for some of them.

New pedagogic approaches and technical tools imply the need of educating the teachers (Study C).

### 5.4 Technology

The technology is in many cases a new issue to deal with and it concerns not only the computers, used by the teachers, but also a communication network and equipment used by the students. The equipment, hardware as well as software, is to be acquired but also maintained and renewed as new models are needed. A support organization for this maintenance and for teacher support is a very important ingredient in an organization for flexible learning (Study C).

### 5.5 Organization of the Courses Studied

Both the courses examined in my studies (Study A; Study B) followed the developmental type of change. The course Spin a Web did not result in any change in the organization. It was arranged only once (Fåhræus & Männikkö, 1997). The course PCS, however, has been given continuously once a year since 1995. It has probably also inspired some other teachers to try the use of CMC and Web-based technology in their courses, because several experiments are going on in other courses at the actual department.

The course **Spin a Web** gave five credits, which means that it should normally be completed in five weeks. We offered it during half a year, which is equivalent to a quarter of full-time studies. This was convenient for the students, because they were working full-time during the course. These students would not have been able to take the course, had it been given in the traditional way.

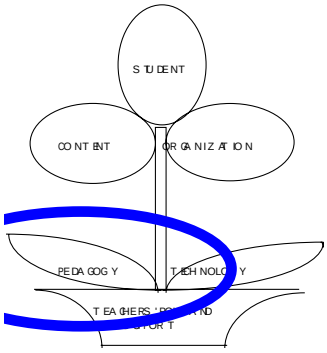
Our impression as teachers of this course was that we spent more time facilitating the students than we would have done if the course would have been offered in a traditional way.

We were two teachers working closely together as a team. We also had arranged for access to four experts within different branches of the course subject. The students did not, however, use this possibility much. During our preparation for the face-to-face meetings, we got valuable help from our technical staff. However, the students had to rely on technical competence at their local schools, which was sometimes problematic.

The course **PCS** gave three credits which means that it should normally be completed in three weeks. In the format chosen, it ran during ten weeks. The main teacher has in an interview witnessed that her workload was heavy, but that she got some relief from the support functions in the forum system. During the course, she had some help from a co-teacher, facilitating

the group discussion.

The students taking this course were normal on-campus students, but probably many of them had already started working, and thus took advantage of the possibility to study at a distance. Because of their studies, they were already familiar with the technology used, even if they had not used forum systems before, and they did not need any extra support.




## 6. On Pedagogy

The term "pedagogy" is chosen here to denote the primarily conscious application of a system of beliefs about how learning is to be achieved. "Educational psychology" would be too inclusive and it also covers many special fields of psychology of mainly indirect relevance to how learning is to be achieved.

### 6.1 Three Perspectives

There are at the moment many different theories and several perspectives or world views concerning knowledge, learning, and instruction. There is little unambigiuous concensus between the perspectives; they live side by side, and scholars and practitioners use several of them, sometimes in a mix, and sometimes without articulating or even knowing which one they are using.

I have chosen to lean on a structure presented by Hickey (1999), because it illustrates the developmental process. On the other hand, as we will notice, the different perspectives borrow from each other and there is definitely no clear-cut line between them. Hickey names these three world views the **empiricist**, the **rationalist** and the **sociohistoric** perspective. I will continue by describing their views on

- knowledge,
- learning,
- motivation to learn, and
- transfer of knowledge from the learning situation to the context where the knowledge is to be used.

I will also present my interpretation of how they might influence the facilitator role.

#### *6.1.1 The Empiricist Perspective*

This perspective has some of its roots in behaviourism (Watson, 1928, via Atkinson et al, 1990) and the psychology of stimulus-response associations (Skinner, 1961). Here, behaviour is learned as a result of experience, be it in a human or in an animal. Experience is a central theme already for Dewey

in My Pedagogic Creed (1897, p. 91), when he writes: ”I believe finally, that education must be conceived as a continuing reconstruction of experience; that the process and the goal of education are one and the same thing.” The causes of behaviour lie in environmental events, especially those that are perceived as rewarding or punishing (ibid.). We learn by association, by reinforcement and by modeling (Bandura & McDonald, 1963, via Atkinson et al, 1990 ; Sears et al, 1991).

An empiricist's view on **knowledge** is that there is an objective, knowable reality. The knowing about this reality is built bottom-up from small pieces of knowledge, adding to each other to form the whole. You need knowledge of the small pieces in order to grasp the higher levels of a complex entity.

> ***Learning*** *is the process of forming, strengthening, and adjusting those associations. Such learning occurs when we are exposed to patterns and become able to recognize and respond to those patterns efficiently (Hickey, 1999, p. 11).*

Learning is the result of changed behaviour according to the feedback - including lack of response - one gets from the environment. This means that we engage in learning because we are reinforced extrinsically. This may be called the source of **motivation** (Elen & Clarebout, 1998).

According to the empiricist view, knowledge is **transferable** from one situation to another similar situation. Knowledge is seen as a combination of many small components. As long as these small components are relevant also in the new situation, the learner is supposed to be able to add these components together to a knowledge usable in the new situation.

If you think of yourself as a **facilitator**, you should arrange situations in which the learner has many possibilities to respond to the associations they are supposed to learn, and you should give frequent feedback, preferably positive reinforcements. You start with the smaller, basic and more easily manageable components of knowledge and you let the learner proceed when these are learned.

As a facilitator of flexible learning, you could create a detailed study plan, showing step by step what the student has to do, requirements for proceeding to the next step, and assessment means for each step. As collaborative ingredients, you could use role playing where the students can exercise new behaviours and give each other feedback about right and wrong behaviour. As the facilitator, you should also give frequent but not excessive reinforcement, prepare and encourage the students to try failed exercises again.

### *6.1.2 The Rationalist Perspective*

According to this view, the assumption is that we as humans have a general inclination to make sense of the environment. **Knowledge** is seen as structures of information and processes, handled as symbols. We mentally represent aspects of the world; and then we are capable of operating on these

mental representations, rather than on the world itself, according to a multi-step strategy. This is a top-down approach and each individual constructs his or her knowledge by rationalizing experience, which means that "everyone's knowledge of the world is unique" (Hickey, 1999, p. 20).

**Learning** consists in acquiring cognitive structure in order to make sense of the world and this is seen as a natural, intrinsic process.

> *Piaget described the processes of assimilation (where patterns in the environment are assimilated into existing knowledge structures) and accomodation (where those knowledge structures are modified when they are no longer appropriate to make sense of the new pattern) (ibid., p. 20).*

Students are believed to be intrinsically **motivated** by the mere knowledge construction. Because of that, they do not have to be reinforced by extrinsic rewards (Elen & Clarebout, 1998). "If people are rewarded for doing things they would choose to do for intrinsic reasons, they will no longer do them in the absence of the rewards." (Hickey, 1999, p. 23)

**Transfer** of knowledge depends on whether the learner has understood the knowledge structures and stored the representation of them, and whether and how these structures apply also in the new situation (Ramberg & Karlgren, 1997).

The rationalist perspective has a "focus on current perceptions rather than on past learning" as the empiricist perspective has. It also emphasizes ”the importance of the individual's perception or interpretation of a situation, not the ‘reality’ of the situation as it might be viewed by a neutral observer." (Sears et al, 1991, p. 11)

Here, as a **facilitator** of flexible learning, you should arrange exploratory activites that challenge the students' prior knowledge and force them to modify their knowledge structures so as to bring them to a more complete understanding. You should give groups of students complicated tasks without simple answers. This should stimulate the students to search for solutions and argue about them, thus making them more aware of possible inconsistencies in their thinking.

> *Students should be provided with opportunities to experience success on reasonably challenging tasks, should be encouraged to see competence and ability as changeable and malleable, and should not be explicitly compared to more capable others (Hickey, 1999, p. 24).*

### *6.1.3 The Sociohistoric Perspective*

Learning takes place when students construct new knowledge, based on what they already know, augmented by external information and stimulated in the social situation. This view on learning is accepted in wide circles today. It was formulated by Vygotsky already in the 1920's but was not available in English until 1978. He spelled out a formula of the educational process:

> *Education is realized through the student's own experience, which is wholly determined by the environment, and the role of the teacher then reduces to directing and guiding the environment (Vygotsky, 1926/1997, p. 50).*

Vygotsky (1926/1997) strongly emphazised the importance of experience and the social history mediated by tools, a socio-cultural view. He discussed the teacher's role as "the director and foreman of the social environment." He pointed out that "the teacher is powerless to produce immediate effects in the student" but stressed how the teacher works through the social environment, "just as a gardener..." (ibid., p. 49).

Lately, theories called ”situated cognition” or ”situated learning” are formed from this tradition (Littleton & Häkkinen, 1999). Greeno and Moore (1993) talk about situativity theory and include in that "the development of ecological psychology, the ethnographic study of activity, and philosophical situation theory." (p. 49) They continue: "The central claim of situativity theory is that cognitive activities should be understood primarily as interactions between agents and physical systems and with other people." (p. 49) They argue that, although symbols often are important parts of the interaction, most of the processes are not symbolic. "From this viewpoint, operations on and interpretations of symbols can be important aspects of cognitive activity, but constitute only some of the phenomena that a theory of cognitive activity should endeavor to explain." (p. 50)

The traditional constructivist thinking of knowledge as actively constructed by the learner might be regarded as belonging to the rationalist perspective. Lately, the social interaction among learners has been added to this model, which means that it fits in more and more as a branch of the sociohistoric perspective (Harasim et al, 1995). E.g., Salomon and Perkins (1998) emphasize that active construction of knowledge is crucial also in a social learning situation. The expression socio-constructivist perspective has become the common use of this concept.

**Knowledge** is seen as a cultural entity and it is developed in the social situation where it is used. "Knowing (in preference to knowledge) is activity always exercised in relation to the situations individuals find themselves in. ... **Learning** thus becomes an adaptation of the learning person to aspects of such circumstances as they encounter them," (Crook, 1994, p. 47) The whole environment with tools and other artifacts interact in the knowledge construction, as they are now and with its history. "Knowledge is represented by the individual's ability to participate in a community of practice." (Hickey, p. 28). A person who participates in an activity tries to do so as successfully as possible, using all available tools like using the same language as more experienced participants do (Karlgren, 1998).

An important component of the sociohistoric perspective is the notion of the zone of proximal development (ZPD) describing the potential for development. Vygotsky (1978) introduced this concept as a tool for determining

the developmental level of children.

> *It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers (p. 86).*

Vygotsky discussed the connection between learning and development and argued that these two are mutually dependent and that learning is a social activity. For instance, he stated that a child is able to learn by imitating an adult performing within the child's ZPD.

> *We propose that an essential feature of learning is that it creates the zone of proximal development; that is, learning awakens a variety of internal developmental processes that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers. Once these processes are internalized, they become part of the child's independent developmental achievement.*
>
> *From this point of view, learning is not development; however, properly organized learning results in mental development and sets in motion a variety of developmental processes that would be impossible apart from learning (Vygotsky, 1978, p. 90).*

Elen and Clarebout (1998, p. 12-13) summarize the sociohistoric view on learning in three propositions:

- *Learning is an activity*
- *Learning is a constructive activity*
- *Learning is a contextualised constructive activity*

Students become engaged in learning because they want to be accepted as full partners in the social situation. This is taken to mean that they are intrinsically **motivated** (Hickey, 1999). The students are motivated to conduct the learning actively if they perceive the task attractive, and if they regard the task not to be too difficult or too simple to execute (Elen & Clarebout, 1998).

With this perspective, **transfer** of knowledge is problematic. Focus is on the situation and it is not evident that knowledge constructed in one situation is applicable to another situation. "For transfer to occur, some constraints and affordances must be the same across both situations and the learner must learn (become 'attuned' to) these invariants in the initial learning situation." (Hickey, 1999, p. 30) Even if all knowledge is situated, the mind has the ability to use analogies between different situations. "The particulars of the second situation seem to enable the mind to make the connection with the similarities of the first situation and apply them to the second, in a way that abstraction devoid of situations may, in fact, fail to do." (Brown, 1990, p. 270). Knowledge is recreated in each situation (Ramberg & Karlgren, 1997).

In order to bring about transfer, it is necessary to bridge the gap between the known and the new. According to Rogoff (1995) this can be done through an apprenticeship system:

> *The metaphor of apprenticeship provides a model in the plane of community activity, involving active individuals participating with others in culturally organized activity that has as part of its purpose the development of mature participation in the activity by less experienced people (Rogoff, 1995, p. 142).)*

A typical learning activity based on the sociohistoric perspective is a realistic exercise where both experienced and inexperienced students take part, helping each other to create new knowledge that is useful for this situation. The **facilitator** may help if necessary but should let the students struggle with the challenging task.

To take advantage of the ZPD, a facilitator should give students tasks that they find too difficult to solve alone but possible to solve together with more knowledgable peers or some guidance from the facilitator. However, it is important to withdraw the guidance as soon as the students manage by themselves.

Problem-based learning (PBL) is a method applying constructivist perspectives on learning and instruction. According to Finkle and Torp (1995), the idea is to place the students in an active role, solving ill-structured, real-world problems. It aims at engaging and motivating students to explore the world and to construct a deep understanding (Männikkö & Fåhræus, 1997b).

### 6.2 Pedagogic Perspectives Related to Instruction and Technology

Wærn (1997) describes the relationship between the use of different technologies and educational cultures. She argues that the approach is not dependent upon the technology but on the educational culture. She continues: "If different cultural expectations prevail among students and between students and teachers, cultural conflicts and disappointments will result." (Ibid., p. 135). Her conclusion is that this topic ought to be discussed both among students and between the teachers and the students in a course. But she also points out that this meeting of different educational cultures is challenging and may inspire new breakthroughs.

In her defence of instructional planning, Wasson (1996) describes the different camps in terms of modelers versus non-modelers, instructivists versus constructivists, and individualists versus socio-cultural theories. Her main point seems to be that those theories are descriptive concerning the learning process, but not prescriptive concerning the design of a learning environment. When it comes to the use of computers in education, she refers to Vygotsky and his followers, and especially to Activity Theory. According to this theory, the social dimension of object-oriented activity is central. Vygotsky's concept of the zone of proximal development (ZPD) is also men-

tioned. Wasson deduces that these theories indicate not one but many different roles for the computer in education and that the computer should be regarded as a mediating tool. The entire learning environment needs to be taken into account when instruction is designed.

There is a wide range of opinions about instruction among adherents of the different camps within pedagogy. Some constructivists, Wasson mentions, accept coaching or help systems, and even drill-and-practice use is acceptable. According to ”radicals”, however, there is no shared objective reality and therefore, no instruction is needed (ibid.).

The sociohistoric perspective emphasizes the communicative part of the teaching and learning process. This focuses on the computer as a communication tool. An important difference between the empiricist and rationalist perspectives, on the one hand and the sociohistoric on the other, is that the former mainly deals with individual learning and the latter with social learning (ibid.).

Salomon and Perkins (1998) distinguish six meanings of social learning (excerpts from pp. 3-6)

1. ***Active social mediation of individual learning.*** *... [A] person or a team helps an individual to learn. ...*

2. ***Social mediation as participatory knowledge construction.*** *... Social mediation of learning and the individual involved are seen as an integrated and highly situated system in which the interaction serves as the socially shared vehicles of thought. ...*

3. ***Social mediation by cultural scaffolding.*** *... [T]he learner may enter into some kind of intellectual partnership, or at least be greatly helped by cultural artifacts in the form of tools and information sources. ...*

4. ***The social entity as a learning system.*** *... [T]eams or organizations or other collectives ... [-] as a collective [-] acquire more knowledge, understanding, or skill, or a different climate or culture. ...*

5. ***Learning to be a social learner.*** *... [L]earning to learn in ways that participate in and capitalize on the social milieu. ...*

6. ***Learning social content.*** *... [H]ow to get along with others, how to maintain reasonable assertiveness, how to collaborate in reaching descisions and taking collective actions, and so on. ...*

According to my interpretation, the empiricist and the rationalist perspectives regard the individual knowledge as the important result of learning, also if the learning takes place in a social context as in Case 1, mentioned above. According to the sociohistoric perspective, on the other hand, the important result is a distributed knowledge around ”the target activity system”. Salomon and Perkins suggest that the instructional design would differ in the following way: The cognitive (rationalist) approach would be to let a team work on joint problem-solving activities in order to improve indi-

vidual problem-solving abilities. This ability could then be used individually, independent of the team. The sociohistoric approach would be to arrange for a joint problem-solving activity, aiming at the improvement of the team's problem-solving competence and the hoped-for transfer to other similar activity systems (ibid.).

Salomon and Perkins argue that there is a need for both individual and social learning. These should be seen as ends on a continuum of social mediation: "While almost all individual learning is social in some sense, the degree of active social mediaton may vary considerably from situation to situation." (Ibid., p. 17) And the goal of the learning can also be both individual and collective. "[T]he two complement each other in a spiraling dynamic of reciprocal influences." (Ibid., p. 18) To take advantage of this dynamic, instruction ought to involve different learning systems, adapted to the situation, they argue. They also stress the need of learning to learn, also in the expanded sense in learning from others and with others (ibid.).

### 6.3 Pedagogic Perspectives in Practice

**Paulsen** (1995) explicitly mentions different perspectives on learning and knowledge and how they influence facilitation.

> *The moderators' pedagogical styles are based on their philosophical orientations and theories toward education. ... [M]oderators will perceive their role in educational computer conferencing in light of their basic theories and philosophies toward education. (p. 82)*

However, it is difficult to classify practice reported in the literature, according to different pedagogic perspectives. They are often hidden in unmentioned goals and not explicitly declared, neither to the students, nor to readers of a report.

Experienced teachers will probably adapt their instruction to the student group at hand, independent of a certain pedagogic perspective. Flexibility is crucial in a dynamic course situation, even if the teachers probably lean on a certain view of knowledge and learning, almost unconsciously. It is not always easy for teachers to stick to one perspective, due to external demands. For instance, the demand from most schools and university systems to use individual examination in order to give grades to each student does not make it easy to evaluate social knowledge, which is important according to the sociohistoric perspective.

### 6.4 Pedagogic Perspectives in the Courses Studies

In the studies I have conducted, the sociohistoric perspective has dominated. The course **Spin a Web** was designed on the foundation of socio-constructivist thinking and problem-based learning (Study A). The students worked in groups with ill-structured problems, chosen from their own reality. Both explicitly and implicitly, by not answering questions immediately,

we as tutors/facilitators encouraged students to help each other. At the end of the course, we gave prizes to the groups that had managed best, but the existence of these prizes was not announced until the very last day, so the students were mainly intrinsically motivated.

In the paper describing the course **PCS** (Study B), I used Activity Theory to analyze the relations between the students, their objectives, and the tools and instruments they used for the communication. In another paper (Fåhræus, 1999b), I have analyzed the course regarding the pedagogic perspective applied. I found many components that characterize a situated-learning approach which is related to the sociohistoric perspective (ibid., p. 169):

- *The learning environment is similar to some of those where the knowledge is going to be used, namely in discussions.*
- *Situations were arranged where the students could experience the need of knowledge, namely to take part in discussions.*
- *The students had to reflect on what they read in order to be able to make contributions in the discussions.*
- *The apprenticeship model was used in that the teachers took part in the discussions.*

However, the teachers did not have situated learning in mind when they constructed and implemented the course.

## 6.5. Collaboration and Collaborative Learning

### *6.5.1 Collaboration*

The word "collaboration" implies that individuals work together. In this thesis, collaboration is interpreted in a closer sense than cooperation. If a group cooperates on a project, participants might divide the task in different subtasks. Each individual works on one subtask and the group might meet only to coordinate the work and to merge the results. A collaboration would require two or more individuals to work together with each subtask. As Dillenbourg and colleagues (1995) put it: ”... in cooperation, the task is split (hierarchically) into independent subtasks; in collaboration, cognitive processes may be (heterarchically) divided into intertwined layers.” (p. 190). Collaboration involves the idea of intent and non-compliance. To collaborate, you have to make an effort to reach a shared meaning (Schwartz, 1999). There is, however, a *social dilemma:* What is reasonable for an individual to do might be less rational for the group. This might lead to ”... a tension between individual and collective rationality.” (Kollock & Smith, 1996, p. 109). Collaboration might lead to a loss in performance due to (a): Shifts in member motivation (not always losses) and (b): The need for coordination (Steiner, 1972, via McGrath, 1984). This implies that, for collaboration to occur, the individuals have to be motivated to work for the group (Study C).

### *6.5.2 Collaborative Learning*

If we adopt the sociohistoric perspective and accept that learning is a social process, we may also see collaboration as equally important in education. There is research showing that collaboration can be beneficial for learning, especially if the purpose is to enhance critical thinking and problem-solving skills, or to introduce multiple perspectives on an issue (e.g., Gokhale, 1995; Harasim et al., 1995).

Dillenbourg suggests a broad definition (1999, p. 2) of collaborative learning as "a situation in which two or more people learn or attempt to learn something together". He also points out that each element of this definition may be interpreted in many ways. Here, we consider mainly small learning groups (3-10 individuals) but to some extent also larger groups (up to about 50). The learning we discuss in this thesis is planned learning within some kind of course context.

Learning together might imply a collaboration in the sense specified above, but in practice we do not always know whether (a) real collaboration takes place or (b) the students cooperate or even (c) just coordinate their results. Even if we arrange situations where collaboration is expected, we have no guarantee that it will actually occur (ibid.).

### *6.5.3 Group-Learning Situations*

Collaboration goes on within a group. Groups can be characterized as problem-solving groups, educational groups, and experiential groups (Study A). In Study A, I also describe the group process in five stages and how it normally develops in a face-to-face situation from the initial stage to the end (Wendelheim, 1997). Tuckman has suggested four stages that have been named as: ”forming", "storming", "norming", and "performing” (Tuckman, 1965, via McGrath, 1985, p. 160). Important to notice here is that these stages involve both the emotional and the task-performing processes. Both processes influence the group-learning process.

Crook makes a distinction between three types of group-learning situations: (1) tutorial, (2) cooperative, and (3) collaborative (Crook, 1994, p. 132).

1. In a **tutorial** situation, a student is assigned to act the role of tutor. This may be a useful learning experience for this student and, at the same time, help the peer students to learn.

2. The **cooperative** learning situation is more common and it implies a large group working together. The tasks are often partitioned and different members take responsibility for different components of the task. Research in this area is often concerned with the motivational factors.

3. Research concerning **collaborative** learning situations shows more interest in cognitive processes than in the motivational issues.

Ploetzner and colleagues (1999) have studied a special aspect of what Crook called tutorial situations, namely learning by explaining to oneself or to others. They comment that self-explanation frequently leads to the acquisition of new knowledge. Their hypothesis is that the group-learning form, explaining to others, would be even more effective, because the receiver of the explanation identifies missing information, points out inconsistencies, etc. Ploetzner and colleagues have not, however, found research demonstrating this effect. They think that one explanation is that the research they report on did not focus specifically on this question. Another explanation, they speculate, could be that "the mechanisms involved in explaining to oneself and explaining to others are not distinct enough or that the effects of these mechanisms are confounded." (p. 119)

In order to look closer at the collaborative learning processes, Crook describes three types of processes: (1) articulation, (2) conflict, and (3) co-construction (ibid, p. 133).

1. Students need to **articulate** their thinking publicly and explicitly in order to collaborate with peers (ibid.). This articulation may imply a learning process on a deeper level and this might motivate the extra effort needed in a collaborative situation. Note that here, the word "articulation" is not used in the sense ”division of tasks among a cooperating group”, as sometimes within computer-supported cooperative work (CSCW) (Schmidt & Bannon, 1992).

2. The process of **conflict** occurs when peers disagree and try to resolve these disagreements. "It is a convention of conversation that disagreement should prompt discursive moves of justification and negotiation. So, the cognitive consequences of conflict might be quite productive" (Crook, 1994, p. 135).

3. But, according to Crook, conflict is not at all necessary for effective group work. **Co-construction** is also possible when students use strategies of sharing responsibility for a common object (ibid.). This is in line with Vygotsky's socio-cultural thinking.

Crook points at the importance of the role of language as a tool for reflection and metacognition. Schwartz (1999) describes this as follows (p. 213):

> *Collaboration typically involves heavy doses of language. This language should lead cooperative groups toward structural descriptions in their language. Moreover, groups may move toward abstractions as the members try to find a safe place to communicate where their idiosyncratic differences of interpretation will not get in the way. It is this pull toward abstraction and structure in the verbal communication of groups that strikes me as the sort of place to find a special effect of collaboration on cognitive outcomes.*

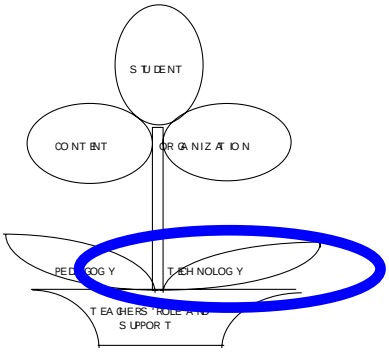
Groups can be given tasks that force or stimulate members to communicate their thoughts and to collaborate. Such tasks are additive or conjunctive. Additive tasks are those where group productivity is the sum of the effort of

all members. In conjunctive tasks, all group members must succeed for the group to succeed. (Sears et al., 1991).

### *6.5.4 Collaboration in the Courses Studied*

In the course **Spin a Web,** we strived towards the collaborative type of learning situation, but in effect both tutorial and co-operative situations occurred. Most of the groups partitioned the tasks between them, thus applying the co-operative type. In many cases, the partitioned tasks were given to pairs to solve. These pairs applied a collaborative type of learning situation, probably by a co-constructing process. We also saw some signs of conflicts occurring in the groups, where the process of resolution lead the group forward. Tutorial situations appeared, e.g., when someone in the group had technical problems and asked for help. In most cases, help was given by peer students (Männikkö & Fåhræus, 1998). The first month of the group process in some of the groups were analyzed. We found similarities with group processes described for face-to-face situations: The groups passed through what could be called forming , storming, and norming stages before they started to work on their task effectively. Successful groups had managed to pass the first two stages already during the first face-to-face meeting (Fåhræus, 1999a).

In the course **PCS,** there were two different group-learning situations: the small groups, and the whole class. The tasks for the small groups were to choose articles to read, and to make a summary of each chosen article. The groups studied solved the task by partitioning it between group members, as individuals or pairs. The discussion in the whole class can be characterized as an articulation process within a collaborative situation. By articulating their understanding and opinions about the articles, the students invited peer students to collaborate. By reading each others' contributions and trying to formulate a response they had to reflect on their own thoughts (Study B).




# 7. Technology to Support Learning

## 7.1 Different Ways to Use Technology for Learning

For a long time, technology has been used to support learning, with more or less success. Various information and communication technologies are used today in many different ways and for different purposes. Elen and Clarebout (1998) have introduced a structure that I find fruitful for this presentation. First, they identify three types of environments**: tutorial, explorative and interaction environments**. Later, Elen and Clarebout have pointed out that the Internet technology enables us to integrate all these techniques in one learning environment (see Figure 7.1.). Apart from these uses, ICT can also support course administration.

This thesis focuses on the use of forum systems as interaction environment, but the value of explorative environments is also recognized and the possibility to combine the use of all three environments is considered (Study C).

Originally, the development of **tutorial environments** was based on the empiricist perspective on learning. Computer-based instruction aimed at embedding all kinds of support in the computer. Later, cognitive psychology has expanded the understanding of the role of prior knowledge and other variables, thus applying the rationalist perspective. This lead to the development of intelligent tutoring systems (ITS) containing modules for learner, content, and tutoring, as well as an interface to the learner (ibid.). Today, there is a trend from tutoring systems toward coaching systems, sometimes called "unintelligent tutoring systems" (Ramberg & Karlgren, 1997).

**Explorative environments** aim at information delivery and they allow for human-machine interaction. Within this environment, we find information tools like CD-ROM and hypermedia, and simulation and modelling tools like flight simulators and microworlds. The information tools give the learner possibilities to select, process, store, and retrieve information according to individual needs. "Simulation and modelling tools support the application of prior knowledge to real world problems or the construction of personal understanding." (Elen & Clarebout, 1998, p. 77)

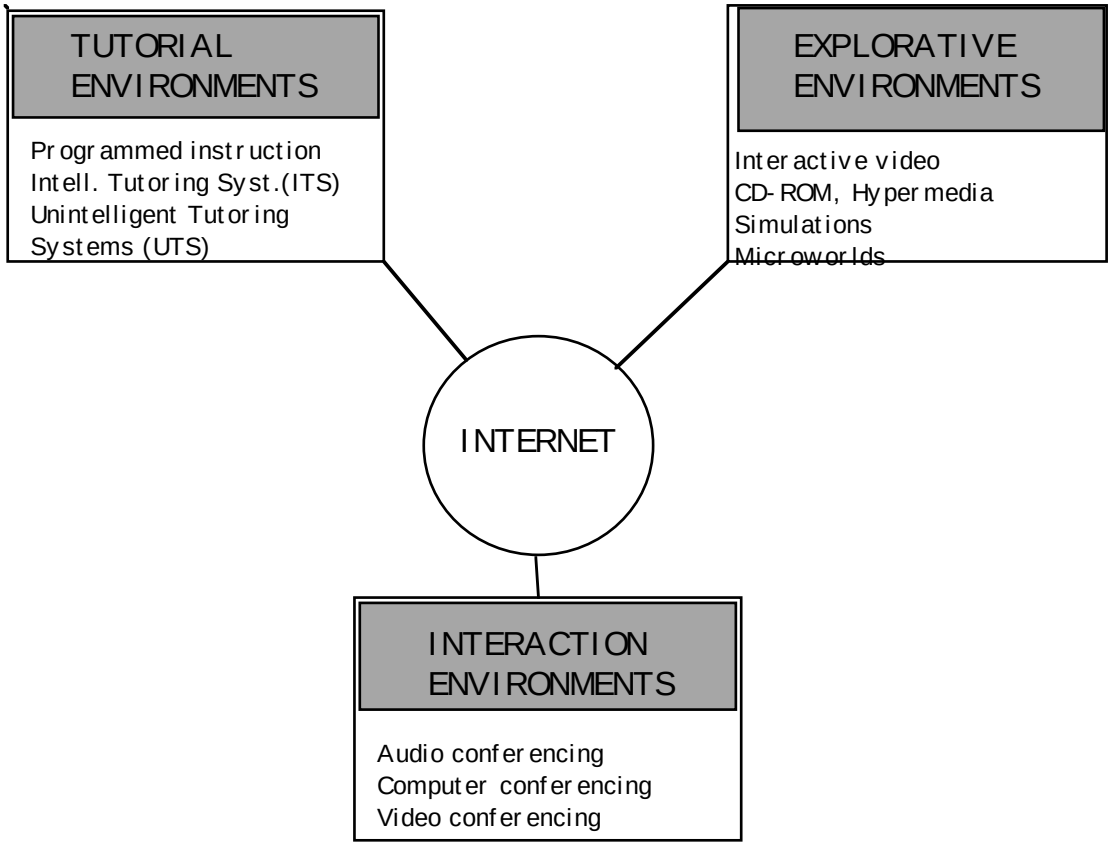



**Figure 7.1. Potential for synergy through the Internet between the three environments (modified from Elen & Clarebout, 1998, p. 81).**

**Interaction environments** give opportunities for human-human interaction by using telecommunication. Elen and Clarebout mention audio conferencing, computer conferencing, and video conferencing as techniques used within this environment.

## 7.2 Tools for Interaction

Tools for interaction carry different labels: CMC tools, groupware, tele-conferencing systems, electronic conferencing systems, asynchronous learning networks (ALN), virtual learning spaces, virtual classrooms, and forum systems (Hiltz, 1995; Hansen et al, 1999; Nuldén, 1999; Study C). Here, mainly the term *forum system* will be used, for a text-based asynchronous (=non-simultaneous) electronic environment for interaction.

One way to classify these tools is in terms of time and place characteristics (see Figure 7.2.). If you want to get in contact with a friend you may go to his room and have a chat (same time/same place). If he is not in you might put a post-it note on his desk that he will find when he returns (different time/same place). You may also make a phone call to your friend and he answers (same time/different place). If he does not answer, he might have a voice mailbox where you leave a message, which he receives and acts on (different time/different place).

| | Same place | Different place |
|---|---|---|
| **Same time / Synchronous** | Face-to-face meeting<br>Blackboard | Telephone call<br>Electronic chat |
| **Different time / Asynchronous** | Post-it note | Voice mailbox<br>E-mail |

**Figure 7.2. Time/Space Matrix (modified from Dix et al., 1998, p. 465)**

E-mail is a typical example of an asynchronous tool, while electronic chatting is synchronous. Modern forum systems contain both synchronous and asynchronous functionality. Some tools, e.g., a blackboard, are designed to support face-to-face meetings, i.e., meetings at the same place.

With a flexible-learning approach, we may combine different tools and different learning formats so that part of the time is spent in synchronous face-to-face meetings or lectures, part in asynchronous discussions or individual work (Lawhead, 1997).

Another way of classifying CMC tools is according to what kind of signals they can mediate: text, moving or still pictures, sound, and maybe kinesthetic (body movement), haptic (active touch) and passive-touch signals. Forum systems normally use plain text communication in order to take advantage of the fact that we read faster than we listen to spoken text. Modern systems can often mediate also other types of signals. However, this requires higher capacity of the telecommunication lines and perhaps also of the computer equipment (Palme, 1995).

A third classifying dimension is whether the tool supports one-to-one, one-to-many, or many-to-many communication. E-mail, for instance, is originally designed for one-to-one communication but by the use of lists, it has developed both one-to-many and many-to-many capabilities. For many-to-many communication, however, the forum systems are best suited (ibid.). Study C contains a figure, illustrating how a forum system could support access both to shared information spaces and to individual spaces and tools (p. 123).

If we compare the communication we can have with peer students via a CMC tool with a face-to-face meeting, then we consider the **compensating role** of the tool: We focus on the restrictions that the tool puts on our communication. If we, instead, look at technology as a means to take a course at a distance, we consider the **facilitating role** of the tool. It allows us to do more than we could do before we used this tool. (Hansen et al, 1999). If we just regard the technology as compensating us for not beeing able to meet face to face, then such simulated meetings would not be considered as good as the ”real” meetings. We then miss the extra benefits that this technology is able to give us in its facilitating role (Study C, p. 122):

> *Participants can have access to all the resources in their local environment, be in several meetings at the same time, form private chat channels and subgroups without disturbing others. They can comment and vote with anonymity, be automatically forced to follow meeting protocols, rely on the computer to keep a log of the meeting and do their private work when an item being discussed is not of interest to them. They can also easily share electronic information, and can even have some access to each other's systems, useful when working on jobs that are software related, such as debugging.*

In this thesis, the facilitating role of technology is emphasized.

Forum systems are built on different technical principles, which also influence the user. One principle is the client-server solution. In this case, the users need a programme, a special client, installed on their computers and access to a central computer, the server, where the connection to other users is processed. This can be problematic when the users do not know how to install the client on the computer. On the other hand, this solution may facilitate offline work - without having to occupy a telephone line while writing and reading contributions. Another technical principle is the World Wide Web (WWW) solution. This means that users use an ordinary Internet browser as client to connect to the conference. No installation is needed but normally, the users have to be online while reading and writing contributions.

Elen and Clarebout conclude their presentation of technology for learning: "[T]he instructional merit of a technological device does not depend on its underlying technology but on the way in which that device is used to provide adequate support to the learner" (1998, p. 69).

### 7.3 Technology Used in the Courses Studied

In both courses reported in this thesis, we used forum systems. In the course **Spin a Web** (Study A), it was a commercial product called FirstClass, using a client-server solution. It was mainly used for asynchronous communication, but the students also found the synchronous chat function valuable for planning and decision-making. Students also sent pictures of themselves to illustrate their presentations (Männikkö & Fåhræus, 1997a).

Since the content of the course was pedagogical use of the Internet, it was natural that the students also used the WWW. Some of the groups created homepages to present their results. One group gave references to resources on the WWW providing simulation tools for use in the schools. Another group created an interactive instructional material to be published on CD-ROM. In these cases, WWW was used as an explorative environment (ibid.).

For the course **PCS**, a forum system called KOM2000 was used. It is developed by the CMC group at the department of Computer and Systems

Sciences at Stockholm University/KTH (Palme, 2000). This system is developed for the WWW and is accessed via a normal Web browser. For this course, it was provided with support functions to help the teachers administer the assessment of student contributions and feedback (Study B). The system was used as a text-based asynchronous tool. (At the time of the course, the system did not provide a chat function.)

## 7.4 Characteristics of Different Kinds of Communication

### *7.4.1 Characteristics of Face-to-face Communication*

Before we discuss computer-mediated communication, it is fruitful to start looking at the characteristics of face-to-face communication. According to Berger and Luckman (1967) the face-to-face situation "... is the prototypical case of social interaction. All other cases are derivatives of it." (p. 43).

Clark (1996) argues for the face-to-face conversation as the basic and primary use of language. His arguments are that it is universal to human societies, it does not require special skills, and it is the basic setting for children's acquisition of their first language. Table 7.1 lists ten characteristics of the basic face-to-face conversation.

**Table 7.1. Some Characteristics of the Basic Face-to-face Conversation (From Clark & Brennan, 1991, cit. via Clark, 1996, p. 9 - 10).**

| Characteristic | Explanation |
|---|---|
| Co-presence | The participants share the same physical environment |
| Visibility | The participants can see each other |
| Audibility | The participants can hear each other |
| Instantaneity | The participants perceive each other's actions at no perceptible delay |
| Evanescence | The medium is evanescent - it fades quickly |
| Recordlessness | The participants' actions leave no record or artifact |
| Simultaneity | The participants can produce and receive at once and simultaneously |
| Extemporaneity | The participants formulate and execute their actions extemporaneously, in real time |
| Self-determination | The participants determine for themselves what actions to take and when |
| Self-expression | The participants take actions as themselves |

Berger and Luckman give a colourful description that I want to share with you:

> *In the face-to-face situation the other is [p]resented to me in a vivid present shared by both of us. I know that in the same vivid present I am [p]resented to him. My and his "here and now" continuously impinge on each other as long as the face-to-face situation continues. As a result, there is a continuous interchange of my expressivity and his. I see him smile, then react to my frown by stopping the smile, then smiling again as I smile, and so on. Every expression of mine is oriented towards him, and vice versa, and this continuous reciprocity of expressive acts is simultaneously availible to both of us. This means that, in the face-to-face situation, the other's subjectivity is availible to me through a maximum of symptoms. To be sure, I may misinterpret some of these symptoms. I may think that the other is smiling while in fact he is smirking. Nevertheless, no other form of social relating can reproduce the plenitude of symptoms of subjectivity present in the face-to-face situation. Only here is the other's subjectivity emphatically 'close'. All other forms of relating to the other are, in varying degree, 'remote' (ibid., p. 43).*

Berger and Luckman also point out that the relation in a face-to-face situation is highly flexible. This means that it is difficult to impose rigid patterns on the interaction. If we try to introduce a pattern, it will soon be modified through the interchange that goes on (ibid.).

### *7.4.2 Characteristics of CMC Communication*

#### a) Comparison with face-to-face conversation

A comparison between the text-based asynchronous computer-mediated communication and the face-to-face communication shows differences in almost all of the characteristics listed in Table 7.1.

Instead of **co-presence,** participants in the CMC situation can dwell in quite different physical environments.

**Visibility** and **audibility** disappear with the distance. With no visual cues, it is more difficult to influence people's feelings and engagement. The communication might go on anonymously.

**Instantaneity** is severely hampered even in synchronous CMC. It takes time for the 'speakers' to write down their thoughts and to send them and the 'listeners' need some time to read. And when we deal with asynchronous CMC, their messages can be received days after they were sent. Whereas in a face-to-face situation the senders get immediate feedback from the recipients, they may have to wait several days to get feedback in the CMC situation.

**Evanescence** and **recordlessness** are characteristics of the face-to-face com-

munication, while CMC is characterized by permanence: What is written stays in the computer system and can be retrieved, reused, and reflected on again and again.

On **simultaneity:** Production of one message in CMC can go on in parallel with and independent of the recipient's production of another message. But the recipient cannot read one message while writing another. Thus, the perception of the process is that it is non-simultaneous. This gives the opportunity to take the time needed, both for reading, writing, and reflecting (Harasim et al., 1995; McDaniel et al., 1996).

The **extemporaneity** is non-existent in the asynchronous CMC situation as the sender cannot control the time at which the recipients read the message. In many systems, it is even impossible to know if and when the recipients read it, unless they reply.

The CMC situation is normally characterized by a high degree of **self-determination** in that the participants determine what to do, and when. Normally, only a small part of a CMC message has a standard format that has to be followed, e.g., there has to be a sender's and a recipient's address, following a standard format. You yourself decide who should be able to read your messages, but this is ”a truth with modification”: The electronic communication is not quite safe. Something can go wrong or some ill-willing person can intrude on your system and "overhear" your conversation.

**Self-expression** exists and is normal in CMC, but how do you know about the others? It is possible to pretend to be someone else when using an electronic medium and it is normally impossible to reveal the fraud.

### b) Text-based mode

Text-based communication lack body language and other non-verbal or para-verbal cues. This narrows the expressivity in the communication and can lead to misinterpretations (e.g., Chesebro & Bonsall, 1989). It also keeps the focus on the content (Hiltz & Turoff, 1993; Mantovani, 1996).

Written language is usually more formal than spoken. The language used in CMC is more informal and speech-like than other text-based communication but more deliberate and well-structured than spoken language (McDaniel et al., 1996).

Written communication can be more efficient to digest. We read faster than we talk, and if we do not understand immediately, we can re-read (Chesebro & Bonsall, 1989).

Communication as such forces interlocutors to abstract their thinking (Schwartz, 1999). Text-based CMC puts even stronger stress on this abstraction and externalization of thought.

### c) The technological character

The technological character of CMC can infuse a feeling of lack of humanity in some people. They feel that they cannot ”see”, ”hear”, and "get in touch"

with group members through the technical devices. Their social skills need to be replaced by technical skills (Chesebro & Bonsall, 1989). If learners perceive such a demand, this can create an inequality between those who like and feel at ease with the medium and those who do not.

The technology may have different symbolic meanings for different individuals. For some people, CMC is the ideal way to communicate (Hiltz & Turoff, 1993). For others, there will be a threshhold to climb. The meaning of the locality where the collaboration takes place influences the atmosphere and the work. When the locality is a virtual space, the meaning of it is unclear and needs to be the subject of negotiations (Harrison & Dourish, 1996; Männikkö & Fåhræus, 1997b). Social norms and rules used in face-to-face situations are of no use here, according to Chesebro and Bonsall (1989).

### d) Dependency on task

The degree in which restricted communication influences collaboration depends on the task at hand. For assembling information before a meeting, CMC is a convenient medium (Palme, 1995). For more complex tasks and especially tasks involving negotiation or conflict resolving, research has shown that the face-to-face situation is more effective. Such tasks might need broader-band channels and more information about the interlocutors (positions, attitudes, moods etc.) than the CMC situation normally gives (McGrath, 1984; Adrianson & Hjelmquist, 1988; Palme, 1998). This is not only due to loss of visibility and audibility. McGrath expresses the conclusions from research done by Rutter and Robinson (1981):

> *[D]ifferences between communication under face to face and restricted modality conditions arise not so much from a loss of visual cues per se, but from a loss of social cues of various kinds. They refer to this as 'cuelessness', though others have talked about 'social presence', 'immediacy' and the like (McGrath, 1984, p. 179).*

### e) Conclusions about CMC characteristics

To conclude, the most important characteristics of text-based asynchronous CMC concerning the learning situation are the following:

- Independence of place
- Independence of time
- Permanence
- Text-based mode
- Dependency on technology
- Dependency on task

## 7.5 Some Important Communication Concepts

### *7.5.1 Common Ground*

An important concept within communication theory is common ground. The **initial common ground** is the first of three representations of common ground. The other two are **current state of the joint activity** and **public events so far** (Clark, 1996, p. 43). The process by which a common ground (or mutual understanding) is constructed and maintained is called **grounding** (ibid.).

When we join a course, we know something about the participants' **initial common ground**, just from the fact that they have joined this course. For instance, the students in Study A knew that all participants were high-school teachers; they belonged to the cultural community of high-school teachers (Clark, 1996). When we meet face to face, we judge age and maybe some other characteristics among each other from what we look like and how we behave. This is not possible in the distance-education situation. In many courses, the students are encouraged to present themselves briefly (e.g., background, course goal, personal interests) in the forum system so that everybody can reach the information at any time and thus experience some initial common ground.

The **current state of the joint activity** is often visible as an external representation, e.g., the chess board when playing chess or the boiling water when demonstrating 100°C in a physics class. Clark describes five properties of this external representation in order to stress its importance (1996, p. 43):

1 Physical model

2 Markers

3 Locational interpretation

4 Manipulability

5 Simultaneous and parallel accessibility

At a distance, these properties have to be symbolized electronically if we shall be able to benefit from this strong tool for mediating current common ground. In a forum system, we try to illustrate participants' presence and actions, especially text contributions, so it resembles a physical model and markers of the group and its interactions. Red flags signal new contributions, localized close to other contributions, concerning the same subject. But students might arrange the objects on their screens differently and, normally, they cannot manipulate objects on each others' screens. This confuses the common ground about current state. The time delay also confuses the concept of currentness and might distort the meaning of a message (Mc Daniel et al., 1996).

The third part of the common ground, **public events so far**, does not differ very much in the CMC situation, compared to the face to face situation. What is regarded as public events to a CMC group is about the same as to a

corresponding face-to-face group if the members read the same papers or watch the same TV channels. Only if the CMC group reaches quite different cultural areas might this cause problems.

### *7.5.2 Feedback*

Clark (1996) defines a communicative act: "The joint act of one person signaling another and the second recognizing what the first meant" (p. 130). This means that he does not treat feedback as a separate act but as an integrated part of the joint act of communication: What is needed to close an action. He names the two parts of the communicative act: Signaling and recognizing. These two are linked - "A's intentions depend on B's recognition, and vice versa. ... [I]nstead of putting all onus on speakers, it treats speakers and addressees as partners. " (Ibid., p. 131-132)

Moore and Kearsley (1996, p. 119) state that feedback to students is an important prerequisite for student involvement.

> *Any time students have to hand in assignments or respond to questions, they should receive feedback, from the instructor, moderator, or tutor. If students do not receive feedback, they will fail to develop a sense of participation in the course or program. While many students can tolerate some delay, most people like feedback to be immediate, and few people find one-way communication with no feedback to be satisfying. While there are many aspects to providing feedback (Howard, 1987), in general it should be prompt, focused, and constructive. Lack of sufficient relevant feedback is one of the most common sources of dissatisfaction and frustration for distance learners.*

Contributors look for positive evidence that their partners have understood what they meant. Normally, these positive evidences come from signals like utterances, gestures, and manifest actions (ibid.). According to my experience, feedback does not have to come from the instructor, moderator, or tutor, as Moore and Kearsley (1996) suggest. In an ongoing discussion, it might as well be a reaction from a peer student (Study A; Study B).

### *7.5.3 Bonding and Group Cohesion*

The distance in time and place seems to impede the process of bonding and of building cohesion in a group. Cohesiveness in a group is positively reinforced if the group goals match the members' own goals, if the group interacts effectively and harmoniously, and if members are attracted to each other (Sears et al., 1991). To build trust and create a feeling of cohesion, intensive personal attention and presence is required, which is difficult to achieve via CMC (Wærn, 1997). Bonding is much easier if members have met face to face first. In my opinion, we tend not to trust as much a person who does not look us in the eye when talking to us.

High cohesiveness is not always positive in a collaborating group. Highly

cohesive groups implies a strong pressure toward conformity. However, such pressure seems to be weaker in a CMC situation (Hiltz & Turoff, 1993).

## 7.6 CMC Characteristics Influencing Collaborative Learning

Many factors influence successful collaborative learning and these are both augmented and impeded by CMC. Building on the conclusions from the chapters about collaborative learning and technology supporting learning and on a discussion in Study C, I suggest the following factors as important:

- Possibility for learners to **communicate effectively**, to reach and understand each other and to build trust and common ground.
- The learners' **motivation to collaborate** with each other, taking responsibility for the whole group.
- Efficient **access to information** and to other resources, valuable for learning to occur.

Figure 7.3 tries to illustrate how the characteristics of CMC can augment and impede the efficiency of collaborative learning. Depending on how the technology is applied in a learning situation, the augmenting or the impeding power will take the lead.

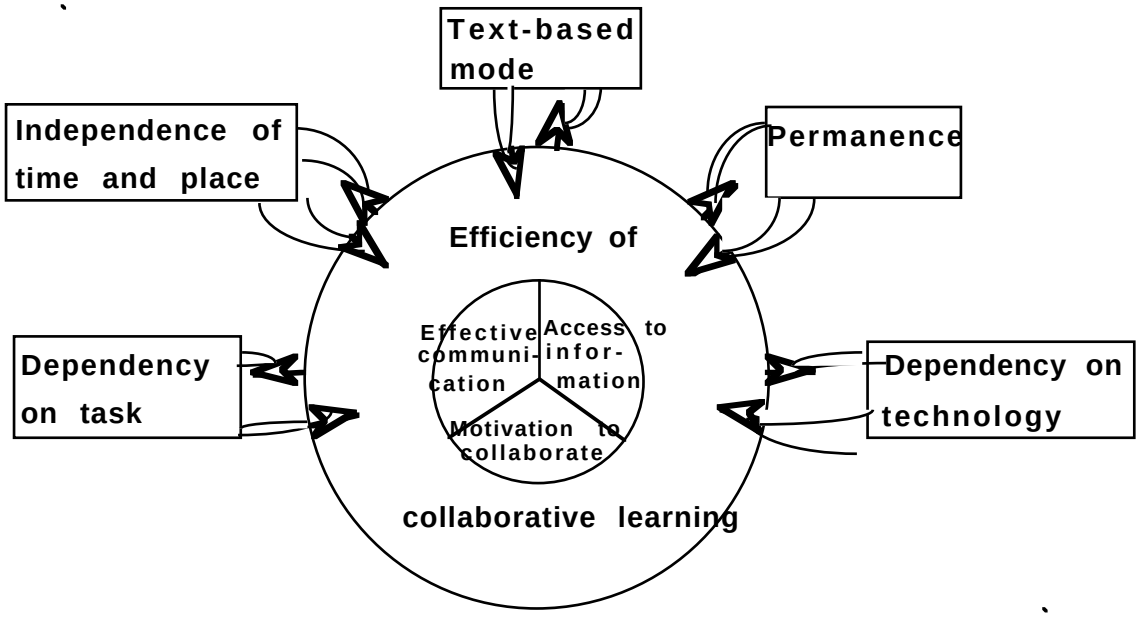
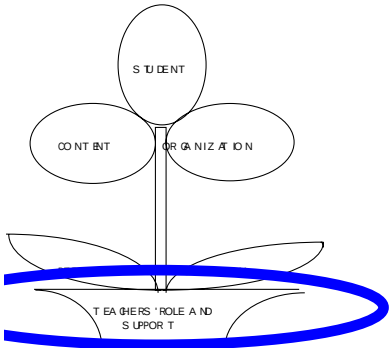



**Figure 7.3. How characteristics of CMC can augment (outward arrows) and impede (inward arrows) collaborative learning**

In this chapter, we have dealt with possible technical tools and how they might impact learning. In the next chapter, we will see how the teachers can handle these tools so that the augmenting powers will be strengthened and the impeding hopefully weekened.




# 8. Teachers´ Role and Support

## 8.1 Different Views

The teachers' role in a text-based asynchronous CMC environment is not one single role - it is as divergent and flexible as the gardeners'.

Gardeners plan a garden with areas for plants to look at, lawns for playing on, and paths for walking around, taking into account the environmental factors. They observe the plants when they are growing, to be able to decide when to water or to fertilize, and when a plant needs support. The gardeners also have to take into account how different plants and trees influence each other - both stimulating and disturbing each other.

Analogously, the teachers arrange for learning environments, combining individual work, face-to-face meetings, and lectures with asynchronous discussions, depending on what is suitable, according to the course content, the students, available technology, and organizational support and restrictions.

During the course, the teachers have to be observant of each student's behaviour and adapt their facilitation to what each student needs. E.g., if a student is delivering late, there might be some personal or technical problems that the teachers can help with. If the discussion in a group is fading, the teachers might stimulate it by adding some questions, provocations, or encouraging elaboration on a certain issue.

An important aspect on the teachers' role is the degree of freedom and control that they give the students. Moore has introduced the concept "transactional distance" (Moore & Kearsley, 1996) and Wærn (1999) describes this as a continuum: At the "control end", the students get detailed instructions and clear descriptions of what the examination will cover. At the "freedom end" of the continuum, the students are presented relevant problems that they are to solve as and when they want to. Waern compares these two approaches to "fordism" and "post-fordism", but she warns us not to "get carried away" by these emotional labels. She concludes: "... [T]he question does not lie in promoting *either* freedom *or* control but rather how best to utilize the expertise of teachers while still respecting the individual needs and competences of the learners" (ibid.).

An experienced high-school teacher points out the importance of frequent assessments in order to discover the need of action from the teachers (Lundvall, personal communication, 2000-01-12).

According to Elen and Clarebout (1998), the sociohistoric perspective gives the teachers the responsibility to provide resources and to arrange for experiences and interventions that help the student or group of students to achieve a learning goal. To do this, the teachers can act in the role of a model, a coach, or a "scaffold". To act as **models** implies that the teachers perform a mental task. ”It is an externalisation or verbalisation of the internal processes or activites involved in expert problem solving.” (Ibid., p. 54) In **coaching**, the teachers observe the students completing their tasks and provide them with hints, help and feedback. In **scaffolding**, the teachers perform tasks that the students are not yet able to perform themselves. Gradually, this support is withdrawn, as the students themselves learn to perform.

The teachers can be **pro-active** or **re-active**. In the pro-active case, they are part of the group and practice, e.g., cognitive apprenticeship. In the re-active case, the teachers apply discovery learning and give support and answer only when the students ask (ibid.).

Vygotsky (1926/1997) argued that the teachers´ main responsibility is to arrange the best environment for the learning to take place (p. 49):

> *Though the teacher is powerless to produce immediate effects in the student, he is all-powerful when it comes to producing direct effects in him through the social environment. The social environment is the true lever of the educational process, and the teacher's overall role reduces to adjusting this lever.*

In a flexible learning situation, the teachers create this social environment by choosing and combining a mix of formats and technologies, hopefully suitable for the actual students, content, and organizational circumstances. Then, the teachers have to act in a way that takes advantage of the possibilities and reduces or eliminates the possible problems provided by the environment. It is important that teachers can maintain a wide perspective and a holistic view on the learning process (Hiltz & Turoff, 1993; Study C).

### 8.2 Support from the Forum System

The forum system does not only provide an environment for the communication and learning but could also support the teachers in their facilitation and administration of courses. Teachers need all support they can get from the system in order to be able to concentrate their effort and time on the students’ needs and the learning processes (Study C).

Forum systems could be of help in different kinds of activities: (a) administration of students and groups, (b) monitoring individual and group tasks, and (c) facilitation of the communication with and between students and

with other sources and persons (ibid.).

### 8.3 Tips for the Teachers

So, what is special about the teachers´ role when planning and facilitating collaborative learning via text-based asynchronous CMC? From the characteristics presented in Chapter 7, I have deduced several tips to the teachers how to take advantage of the possibilities and how to reduce problems. They are based on the theories described in this thesis, on what I have found in the literature about flexible learning, and on my own experiences and studies. I call them "tips" because they are not normative prescriptions. Some of them might even be contradictory, and the responsibility is on the teachers to use what is relevant in each situation.

These tips are presented in Chapter 9 (Conclusions), intertwined with the characteristics and consequences of CMC, and possible forum functions to support the teachers.

### 8.4 The Teachers' Role and Support in the Courses Studied

In the course **Spin a Web**, our roles as teachers were mainly of the coach type. Our instructions to the students were goal-oriented and did not contain any details about how to solve problems. We had, however, strict rules about how to report the results. The students could choose rather freely the areas to work within and methods for this work. During their work, we interfered as little as possible, thus acting in a re-active mode. When questions were asked, we normally waited, thus encouraging students to answer each other's questions. This worked quite well for most of the groups, but some of them were very inactive. It was very difficult to activate these inactive groups and a few of them did not manage to fulfill the demands for the course.

In the course **PCS**, the main teacher acted mainly as a re-active coach. She did not take part in the discussions but gave some advice about how to write effective contributions. She gave the students feedback about their performance mainly by putting a grade on each contribution. Only in very few cases did she comment individually on a contribution. This behaviour was a choice of hers, because of the heavy work load to read and assess all contributions. She also felt that the students were satisfied by this kind of feedback. My interviews with some of the students confirmed this feeling. The co-teacher also acted as a model, taking part in the discussions.

For this course, the forum system had been provided with special support functions for grading of contributions.

# Part III
# Conclusions, Tips and Future Research

# 9. Conclusions

## 9.1 Summary of the Discussion about Flexible Learning

Flexible learning is a general expression, implying great freedom for the learners to choose place, time, and method for their studies. It includes many different formats and environments for teaching and learning. Among them are the traditional classroom format and the one focused on in this thesis: collaborative learning discussions via forum systems (i.e., text-based electronic conferencing systems).

I have constructed a model as a framework for describing and analyzing flexible learning. It points at important factors influencing the learning outcome, and how these are mutually dependent. These factors are: (1) student, (2) content, (3) organization, (4) pedagogy, (5) technology, and (6) teachers role and support. This can help the teachers when creating a course outline. The content is not dealt with in this thesis.

**Students** attracted by the new possibilities with flexible learning may well come from a broader base than traditional groups of students. They will probably be stronger actors on the ”market place” for education. Learning at a distance requires and encourages more intrinsically motivated and independent students. They might be less homogenous than a traditional class of students, and that implies that the teachers need to apply all the possibilities given by the technology to individualize the facilitation.

Introducing flexible learning in an **organization** might give rise to strong feelings and defence actions. In most cases, a developmental change will probably occur, i.e., a planned change, not including any fundamental shifts in paradigms. Most desirable would be a transformational change, which is planned and results in more radical conclusions for the organization. New time frames, the technology, and new groups of students might imply new needs of support, and thus impact the organization. Changes to the teachers' roles will also call for organizational development.

The **pedagogic** approach advocated in this thesis is the sociohistoric perspective. This seems to suit the learning environment focused on here. Collaboration is an important component in the sociohistoric perspective. Collaborative learning via forum systems is possible but problematic. It is important to take into account the differences and similarities between face-to-face communication and computer-mediated communication (CMC). Important factors for collaborative learning to work effectively via forum systems are:

- Possibility for learners to communicate effectively, to reach and understand each other and to build trust and common ground.
- The learners' motivation to collaborate with each other, taking responsibility for the whole group.
- Efficient access to information and to other resources, valuable for learning to occur.

The type of **technology** used here is a forum system, used as an interaction environment. The most important characteristics of text-based asynchronous CMC concerning the learning situation are the following:

- Independence of place
- Independence of time
- Permanence
- Text-based mode
- Dependency on technology
- Dependency on task

These characteristics can both augment and impede collaborative learning. The teachers´ role is to arrange for a fruitful learning environment. To do this, teachers need to take advantage of the possibilities given by the forum system, and to try to reduce the problems. The characteristics and consequences of CMC have lead me to deduce **tips to teachers**, and corresponding **support functions** that such a forum system ought to contain to aid the teachers and the learning process. Below, you find a list of these tips and support functions under the headings of the important factors, mentioned above.

## 9.2 List of Tips and Support Functions

This list is not complete, but hopefully, it could work as an inspiration and checklist for teachers and system designers. In the list,

- the characteristics and consequences of CMC are marked **CC**,
- the tips to teachers are marked **TT**, and
- the forum functions to support teachers are marked **FF**.

### *9.2.1 Possibility to Communicate Effectively*

#### a) No non-verbal or para-verbal cues

**CC** If communication is restricted to text-based communication, there is no body language or other non-verbal or para-verbal cues. This narrows the expressivity in the communication and can lead to misinterpretations (e.g., Chesebro & Bonsall, 1989). It also keeps the focus on the content (Hiltz & Turoff, 1993; Mantovani, 1996).

**TT** Try to establish an effective communication (a) between the teachers and the students, and (b) among the students. Be aware of the differences between text-based asynchronous CMC and face-to-face communication and how to compensate for the shortcomings. Especially, we have to realize

many good effects of frequent and timely feedback. Be careful not to use irony or jokes that can be misunderstood.

**FF** A system could provide icons with smilies, easy to insert in the text.

### b) Written language more formal than spoken

**CC** It can take some time for some members to adjust and feel confident with the language used in forum systems, but usually, people learn it within a few hour's use (Hiltz & Turoff, 1993; Adrianson & Hjertquist, 1988).

**TT** Declare when informal language is accepted. Be aware of the time it takes for each collaborating group to develop a language culture and for new students to adjust to it.

### c) Delayed feedback

**CC** Delayed feedback in the CMC situation can discourage activity (Study B).

**TT** Make students aware of this problem and help them find a communication pattern that works (Study A).

**FF** An optional function could be that the system signals when a message is not responded to within a certain amount of time.

### d) The grounding process may be impeded

**CC** With interlocutors located in different environments, communicating via a narrow medium, the grounding process may be impeded. If the "speaker" refers to a thing or a condition, e.g., the temperature in the room, this cannot be understood by the "listener" without thorough explanations. Without a common ground, misunderstanding is frequent.

**TT** If possible, arrange for a face-to-face meeting before the online discussion starts. Tell students to exchange some information about themselves, their context, and background (Männikkö & Fåhræus, 1997a; Fåhræus, 1999a).

**FF** A system should provide an area for self presentation, easily accessable while reading the messages.

### e) Time delay can distort meaning and create parallel threads

**CC** The time delay and parallel threads can be confusing, if the contributions are mixed in the same forum (Study A; McDaniel et al., 1996).

**TT** Make students aware of the time delay and its consequences. By placing the discussion about each topic in different forums, the problem with parallel threads may turn into an asset.

**FF** The system should visualize the discussion threads, e.g., by indenting contributions. It should also make it possible to split an existing forum into two or more, and distribute the existing messages according to subject.

### f) Meeting is possible without travelling

**CC** CMC can go on, independent of time and place. We do not have to find common time slots or to travel to meetings. This is especially convenient for those whose mobility is restrained by a handicap, etc. (Hiltz & Turoff, 1993).

**TT** Take advantage of the possibility for students to study at home or at work. This may give opportunities to practice learned skills at once in a relevant environment.

### g) Time for reading, writing, and reflecting

**CC** The permanent quality of the medium and the time independence can help those who need more time to find information, to formulate their thoughts, and to understand, sometimes simply because they are not yet quite familiar with the language used. Impaired people who have problems with talking or hearing can use this medium on more equal terms with other people (Study C).

**TT** Give students enough calendar time to manage their discussions, even if members in the group use their time quite differently (Study C).

### h) Written text is more efficient to digest.

**CC** We read faster than we talk, and if we do not understand immediately, we can re-read (Chesebro & Bonsall, 1989).

**TT** The advantage of fast text-reading should not be overestimated. Students might be tempted to copy texts from the Internet to insert in their contributions. The gain of time is lost if one has to read much more text to find the interesting one. Instead, encourage students to be brief, to make efforts in formulating relevant labels to their texts, and to structure the messages in a clever way to help the readers to find relevant information (Chesebro & Bonsall, 1989).

**FF** A system could provide the possibility to label a contribution with keywords (Jansson, 1995), or icons, symbolizing different kinds of contributions: e.g., own opinion, question, answer, something read or heard (Hietala, 1998).

### i) Text-based communication stimulates abstraction

**CC** The fact that the CMC is text-based implies the opportunity for learners to practice text formulation (Sherman, 1995). Communication as such forces interlocutors to abstract their thinking (Schwartz, 1999). Text-based

CMC puts even stronger stress on this abstraction and externalization of thought.

**TT** Try to integrate the practice of text formulation with the natural communication. Encourage comments about the written text among students.

### *9.2.2 Motivation to collaborate*

#### a) Difficult to engage in group work

**CC** At a distance, with no visual cues, it is more difficult to influence people's feelings and engagement. E.g., if students have lost their interest in the course, it is difficult for the teachers to activate them (Männikkö & Fåhræus, 1997a).

**TT** Formulate the task so that the knowledge of each member is valued, especially of those who are silent or inactive (Fåhræus, 1999c). Use intrinsic motivation as far as possible, e.g., by letting students choose tasks or topics to discuss that which interest them and give them knowledge that they can see the need of (Männikkö & Fåhræus, 1997a). Give tasks that force or stimulate students to communicate their thoughts and to collaborate. Such tasks are additive (group productivity is the sum of effort of all members) or conjunctive (all group members must succeed) (Sears et al., 1991). Consider different kinds of activities, such as seminars, debates, simulations or games, role play, discussion groups, project groups, trancript-based assignments, brainstormings, Delphi techniques, and nominal group techniques (from e.g., Paulsen, 1995, and Hiltz, 1995).

**FF** A system could provide means for students to choose tasks from lists, to vote about what to do or to rate each others contributions.

#### b) The process of bonding in a group may be impeded

**CC** Bonding is much easier if members have met face to face first. In a CMC situation, we have to compensate for this by presenting ourselves and our goals verbally. During the collaboration, cohesion is built by action, like giving help when required, and delivering in time (Study A).

**TT** If possible, start the course with a face-to-face session. Plan for a special start-up task. Introduce a forum for mutual help between students (Harasim et al., 1995; Study C). Stress the responsibility that each student has for the whole group (Study C).

#### c) Resources of all group members should be utilized

**CC** The possibility to communicate anonymously in CMC can stimulate collaboration. A shy person or a person with lower social status may be more active in a CMC situation than in a face-to-face situation. The anonymity does not have to be formal but perceived. Without visibility, participants can communicate without revealing their appearance. This might make some people more at ease (Hiltz & Turoff, 1993; Elen & Clarebout,

1998). Odd appearance that culturally is devalued as e.g., ”attractive”, ”ugly”, or ”old”, is not influencing the communication (Hiltz & Turoff, 1993). According to some researchers, this property makes CMC more democratic than face-to-face meetings (e.g., Harasim et al., 1995). Old hierarchies and predefined roles seem to have less importance in CMC discussions. CMC groups are more disorganized, and still, the resources of all group members are utilized (Chesebro & Bonsall, 1989; Palme, 1981/1993). Other researchers (e.g., Ziv, 1996) claim that CMC does not eliminate hierarchies, but reflect the existing hierarchy in the organization.

**TT** Use anonymous communication restrictively and only when agreed upon. Create safe areas for questioning, without revealing the source (Fåhræus, 1999c). Declare the freedom for everybody to take the lead. Encourage changes of roles and procedures. Formulate the task so that the knowledge of each member is valued, especially those who are silent or inactive (ibid.).

**FF** A system can provide forums with the identity exchanged for a pseudonym and functions for safe areas and for voting. It could also contain functions for turn-taking and role-playing.

### d) Pull mode: write and read when and what you want

**CC** The independence of time, and the permanence of utterances, implies that you are not pushed by the system, instead you work in a ”pull mode”: You express yourself when you want to and you choose when and what to read. The possibility for learners to self-pace activities is valued by independent persons, but this might impede the collaboration that has to go on with all members tuned to the same key.

**TT** Be clear about the degree of freedom that is given to each student. The freedom must not be misused. All collaboration demands responsibility for the group from each member.

### e) Different views on technology for communication

**CC** The technological character of CMC can infuse a feeling of lack of humanity in some people. When the locality is a virtual space, the meaning of it is unclear and needs to be the subject of negotiations (Männikkö & Fåhræus, 1997b; Harrison & Dourish, 1996). Social norms and rules used in face-to-face situations are of no use here, according to Chesebro & Bonsall (1989).

**TT** Make sure that students have the required knowledge about the system and the technology. Introduce a discussion about the impact of the technology on human communication and the symbolic meaning of it. This discussion might result in consensus rules for the communication. Create a special ”place” for social student interaction (Harasim et al., 1995; Study C).

**FF** A system should be easy to use and contain help functions. The lay-out of the system ought to support the climate we want to create within the course, e.g., with the help of metaphors.

#### f) Uncertainty about messages sent and received

**CC** The technology can create a feeling of uncertainty whether messages sent have been received by the intended auditorium and by no others. This uncertainty is caused by the fact that you not always get a confirmation of the recipient getting the messages, but also by the fact that technology sometimes fails.

**TT** If the system does not inform senders about who has read a message, you might have to arrange for people sending receipts. After a while, when people notice that it works and feel safe, this might not be necessary any more.

**FF** A system should provide history functions where it is declared who has read a message and when.

#### g) Desision-making less effective

**CC** In a decision situation or in goal-setting, when complex negotiation can be necessary, CMC is not very efficient. A tool with higher 'richness' is needed (Adrianson & Hjelmquist, 1988; Hansen et al, 1999; Chesebro & Bonsall, 1989).

**TT** If possible, arrange synchronous communication means, e.g., chat, telephone conference, or face-to-face meeting, for decision-making. If this is impossible, make students aware of the problem.

**FF** A system can provide voting and rating functions to support decision-making.

### *9.2.3 Efficient Access to Information*

#### a) Access to information resources and resource persons

**CC** Through the electronic medium, the learners can reach a host of resources, e.g., electronically saved documents, computing functions, and other human beings (Study C). Learners can get access to questions, answers and results from other learners (Chesebro & Bonsall, 1989). The asynchronous mode makes this possibility even more convenient because there is always time to find information from other sources before a question has to be answered.

**TT** Disseminate literature for a course over the medium or recommend sources on the Internet. Learners can search for information they need from databases, libraries, etc. (Harasim et al., 1995). The system becomes a vehicle for new exploration (Chesebro & Bonsall, 1989). Let the learning network extend into campus-wide and social interaction (Study C). Arrange for resource persons to be available when relevant, and inform and encourage

students to use them (Männikkö & Fåhræus, 1997a; Harasim et al., 1995). Allow students to get access to answers to other students' questions and to their results or assignments (Harasim et al., 1995).

**FF** A system could provide means for contact service to reach resourse persons.

### b) Possibility to go back and reconsider/reuse

**CC** The possibility to go back and reread can stimulate reflection regarding the content, the learning, and the group processes (McDaniel et al., 1996; Nuldén, 1999). Contributions (or texts from other sources) can be reused by commenting in the text or by re-writing parts of it.

**TT** If we tell students to go back and reflect on their own learning and group processes, they might be able to build meta-knowledge about how to learn and how to collaborate. This can be done through their writing diaries or by acting on other students' contributions (Study A; Sherman, 1995).

### c) Help to the teachers to follow group communication

**CC** The permanence of the medium helps the teachers to follow the group communication, which normally is not possible when the group meets face to face (Study C). This implies a big work load on the teachers; but students can also help each other, thus freeing the teachers to do other tasks.

**TT** Decide if you need insight in the communication between members in a group. If you choose to follow the communication in a group, declare to the members that you are doing so and why. Be specific about your role, so that the students know if they are to report or put questions to you and if they can expect you to comment on their discussion process or on the topic discussed. Give enough feedback and support for students to feel confident and fade out support as soon as students manage without it (Harasim et al., 1995). There are many ways to follow up students' learning process. Formative assessment is preferred, since it allows us to perform corrective actions during the course. One way to follow up a group discussion is to read all contributions, but this is very time consuming. Other instruments are self-evaluation and peer-evaluation (Study A; Study B).

**FF** A system could support the teachers with simplifying feedback functions and overviews of students' contributions and the evaluations from teachers and students (Study B). It could also send reminders or other feedback to students, depending on their behaviour, e.g., those who have not delivered in time (Harasim et al., 1995).

### d) Possibility to monitor course work

**CC** When all communication goes on within an electronic medium, the teachers can control the communication and monitor the course work more

strictly than in face-to-face situations.

**TT** Monitor the course by planning tasks to be completed on set dates and by restricting some of the communication. E.g., the students can be prevented from access to each other's contributions until they have delivered their own (Harasim et al., 1995; Study C). Follow up by questionnaires, voting, and rating.

**FF** A system could support this by providing different kinds of forums, e.g., a drop box, automatically releasing the information at the right moment (Harasim et al., 1995). Resources can be reserved from a list by students or groups of students. Voting and rating functions can be provided.

### e) Many topics can be treated in parallel, risk for information overload

**CC** Permanence and time independence allow for many topics to be treated in parallel. The permanence also allows the sender to address a message to many recipients. This is often efficient, but it implies the risk of information overload. In an electronic medium it is not possible to be quite sure about who has created a message and if someone else has changed it.

**TT** Create different forums for different topics. Minimize the risk of information overload by establishing a habit to write short contributions, labeled in an understandable way. Long contributions have a greater chance to be read if they are provided with a summary or at least an understandable label.

**FF** A system could offer a search function, making it possible to extract mandatory tasks or other important information (Harasim et al., 1995).

## 10. Ideas for Future Research

Until now, I have mainly studied the teachers' roles and need for support in collaborative learning via forum systems. It would also be interesting to complement this with the students' perspective on the learning process, still considering the behaviour of the teachers and the properties and functions of the system.

The course I studied in Study A was given for the first (and only) time. In Study B, the object of study was both a course and a system with specific support functions for flexible learning. The course had been given several times before, but the system was used for the first time in a course. Knowing that the use and perception of a system changes over time (e.g., Sproull & Kiesler, 1991; Porras & Robertson, 1994), it would be interesting to study courses given by experienced teachers and that have been offered many times in about the same format and environment. Both Porras and Robertson and Sproull and Kielser talk about "the second-order effects", implying the effects that are paradigmatic, or do not show until after a long time's use and that are not really planned for or imagined in beforehand (ibid.).

- How do students perceive their identity as distance students? Do they feel any cohesion with peer students ?
- Do students get enough contact with their teachers and do they appreciate the freedom they are given concerning time, place, and method for their studies? Which factors influence these experiences?
- How to choose assessment methods suitable for flexible learning that do not conflict with a sociohistoric perspective?
- Do people's learning behaviour change when flexible learning becomes common?
- Are there any differences between how women and men perceive this situation and how they behave? Which are these differences and what are the consequences?

## *References*


Adrianson, L., & Hjelmquist, E. (1988). User's experiences of COM - A computer-mediated communication system. Behaviour and information technology, 7 (1), 79-99.

Alvesson, A., & Sköldberg, K. (1994). Tolkning och reflektion: Vetenskapsfilosofi och kvalitativ metod. (Interpretation and reflection: Philosophy of science, and qualitative method.) Lund: Studentlitteratur.

Atkinson, R. L., Atkinson, R. C., Smith, E. E., Bem, D. J., & Hilgard, E. R. (1990). Introduction to psychology (10th ed.). Orlando: Harcourt Brace Jovanovich.

Bandura, A., & McDonald, F. J. (1963). Influence of social reinforcement and the behavior of models in shaping children's moral judgements. Abnormal and Social Psychology, 67, 274-281.

Berge, Z. L., & Collins, M. P. (Eds.). (1995) Distance learning. Computer-mediated communication (Vol. III). Cresskill, NJ: Hampton.

Berger, P. L., & Luckmann, T. (1967). The social construction of reality. London: Allen Lane / Penguin.

Brown, J. S., (1990). Towards a new epistemology for learning. In C. Frasson, & J. Gauthiar, (Eds.). Intelligent tutoring systems: At the crossroads of artificial intelligence and education. NJ: Ablex.

Bååth, J. (1999). Hundra år efter Hermods finns det större möjligheter än någonsin att bedriva distansundervisning. (Hundred years after Hermods, the possibilities to conduct distance education are greater than ever.) ITiden (KK-stiftelsen), 99 (2), 7-9.

Chesebro, J. W., & Bonsall, D. G. (1989). Computer-mediated communication: Human relationships in a computerized world. Tuscaloosa, Alabama: University of Alabama Press.

Clark, H. H. (1996). Using language. Cambridge: University Press.

Crook, C. (1994). Computers and the collaborative experience of learning. London: Routledge.

Dewey, J. (1897). My Pedagogic Creed. School Journal, LIV (1897, Jan.). 77-80.

Dillenbourg, P. (Ed.). (1999). Collaborative learning: Cognitive and computational approaches. Oxford, UK: Pergamon / Elsevier Science.

Dillenbourg, P. (1999). Introduction: What do you mean by "Collaborative learning"? . In P. Dillenbourg (Ed.), Collaborative learning. Cognitive and computational approaches (pp. 1-19). Oxford, UK: Pergamon / Elsevier Science.

Dillenbourg, P., Baker, M., Blaye, A., & O'Malley, C. (1995). The Evolution of Research on Collaborative Learning. In P. Reimann, & H. Spada (Eds.),

Learning in Humans and Machines. Towards an Interdisciplinary Learning Science (pp 189-211). Oxford, UK: Pergamon.

Dix, A. J., Finlay, J. E., Abowd, G. D., & Beale, R. (1998). Human-Computer Interaction (2nd ed.). London: Prentice-Hall.

Dunnette, M. D., & Hough, L. M. (Eds.). (1992). Handbook of industrial and organizational psychology (Vol. 3). Palo Alto, CA: Consulting Psychologists Press.

Elen, J., & Clarebout, G. (Eds.). (1998). Learning about the European parliament: Collaboration, problem-solving, and support in rich technological environments. Deliverable 3.1 of the ParlEuNet-project: Theoretical research report on the four pedagogical models.

Finkle, S. L., & Torp, L. L. (1995). Introductory Documents 1995:1 (Available from the Center for Problem-Based Learning, Illinois Math and Science Academy, 1500 West Sullivan Road, Aurora, IL 60506-1000).

Frasson, C. & Gauthiar, J. (Eds.). Intelligent tutoring systems: At the crossroads of artificial intelligence and education. NJ: Ablex.

Fåhræus, E. R. (1999a). Tutoring group learning at a distance. In J. D. Price, J. Willis, D. A, Willis, M. Jost, & S. Boger-Mehall (Eds.), Proceedings of the Society for Information Technology and Teacher Education International Conference (SITE'99, March, 1999), San Antonio, Texas.

Fåhræus, E. R. (1999b). Discussions from a Situated-learning Perspective. In C. Abbott, (Ed.), Proceedings of the Conference on Telecommunications for Education and Training (TET'99, June, 1999), Gjøvik, Norway. (Pp. 164-169).

Fåhræus, E. R. (1999c). Creative tutoring of electronic collaborative learning groups: Sustaining the human factor. Notes from a workshop at the TET'99 Conference on Telecommunications for Education and Training, Gjøvik, Norway.

Fåhræus, E., & Männikkö, S. (1997). Väv ihop skolan med världen. (Spin a web between the school and the world.) Report to DUKOM, a Swedish Governmental Committee.

Gokhale, A. A. (1995). Collaborative learning enhances critical thinking. Technological Education, 7 (1).

Greeno, J. G., & Moore, J. L. (1993). Situativity and symbols: Response to Vera and Simon. In J. Greeno, M. Chi, W. Clancey, & J. Elman (Eds.), Cognitive Science (Special issue on Situated Action, 1, 49-59).

Göransson, L. (1998). Flexibel utbildning på distans. (Flexible education at a distance.) Final report from the Swedish governmental investigation about distance methods within education (SOU 1998:84). Stockholm: Department of education.

Hansen, T., Dirckinck-Holmfeld, L., Lewis, R., & Rugelj, J. (1999). Using telematics for collaborative knowledge construction. In P. Dillenbourg (Ed.), Collaborative learning. Cognitive and computational approaches (pp. 168-196). Oxford, UK: Pergamon/Elsevier Science.

Harasim, L., Hiltz, S. R., Teles, L., & Turoff, M. (1995). Learning networks: A field guide to teaching and learning online. Cambridge: MIT Press.

Harrison, S., & Dourish, P. (1996). Re-place-ing space: The roles of place and space in collaborative systems. Proceedings of ACM Conference on Conputer Supported Cooperative Work (CSCW), Boston, USA. Nov. 1996, pp. 67-76.

Herring, S. C. (Ed.). (1996). Computer-mediated communication: Linguistic, social and cross-cultural perspectives. Amsterdam: John Benjamins.

Hickey, D. T. (1999). Epistemological reconciliation and the future of motivation research. (Paper presented at EARLI'99 in Göteborg, Sweden).

Hietala, P. (1998). Procedural facilitation in Web discussions. In G. Davies, (Ed.), Proceedings of the XV. IFIP World Computer Congress, Vienna and Budapest, 1998 (pp. 445-454).

Hiltz, S. R. (1995). Teaching in a virtual classroom. Proceedings of ICCAI'95, Hsinchu, Taiwan.

Hiltz, S. R., & Turoff, M. (1993). The network nation. Cambridge: MIT Press. (Original work published 1978).

Holmberg, C. (1998). På distans. Utbildning, undervisning och lärande. (At a distance. Education, instruction and learning.) SOU 1998:83. Stockholm: Utbildningsdepartementet.

Jansson, K. (1995). Specialfunktioner i konferenssystem för att stödja distansundervisning. (Special functions in conference systems to support distance education.) Retrieved March 14, 2000 from the World Wide Web: http://www.dsv.su.se/~jpalme/kent-speciella-funkt.html

Karlgren, K. (1998). Refining language games and fostering superficiality in learning. Licenciate Thesis, Department of Computer and Systems Sciences, Stockholm University/KTH, Sweden.

Kollock, P., & Smith, M. (1996). Managing the virtual commons: Cooperation and conflict in computer communities. In S. C. Herring (Ed.). Computer-mediated communication: Linguistic, social and cross-cultural perspectives. Amsterdam: John Benjamins. (Pp. 109-128).

Lawhead, P. (Chair), Alpert, E., Bland, C. G., Carswell, L., Cizmar, D., DeWitt, J., Dumitru, M., Fåhræus, E. R., & Scott, K. (1997). The Web and distance learning: What is appropriate and what is not. Report of the ITiCSE'97 Working Group on the Web and Distance Learning. In Working Group Reports and Supplemental Proceedings of the 2nd Annual SIGCSE/SIGCUE Conference on Integrating Technology into Computer Science Education ITiCSE'97, Uppsala, Sweden, June 1-5, 1997. (Pp. 27-37).

Littleton, K., & Häkkinen, P. (1999). Learning together: Understanding the process of computer-based collaborative learning. In P. Dillenbourg (Ed.), Collaborative learning. Cognitive and computational approaches (pp. 20-30). Oxford, UK: Pergamon, Elsevier Science.

Mantovani, G. (1996). New Communication Environments: From Everyday to Virtual. London: Taylor & Francis.

McDaniel, S. E., Olson, G. M., & Magee, J. C. (1996). Identifying and Analyzing Multiple Threads in Computer-Mediated and Face-to-Face Conversations. Proceedings of ACM Conference on Computer Supported Cooperative Work (CSCW'96), Cambridge, MA, USA.

McGrath, J. E. (1984). Groups: Interaction and performance. Englewood Cliffs, N.J.: Prentice-Hall.

Moore, M. G. & Kearsley, G. (1996). Distance Education - A Systems View. Belmont: Wadsworth.

Männikkö, S., & Fåhræus, E. R. (1997a). Spin a Web Between the School and the World. In J. Hine (Ed.). Proceedings of Internet Society Conference The Internet: Global frontiers (INET'97, June, 1997). Kuala Lumpur, Malaysia.

Männikkö, S., & Fåhræus, E. R. (1997b). Creating Places For Teaching and Learning. Proceedings of the Fourteenth International Conference on Technology and Education (ICTE'97), Oslo, Norway.

Männikkö, S., & Fåhræus, E. R. (1998). "Are you still there?!" - About Mediated Communication in Teaching and Learning. Teleteaching '98 Distance Learning, Training and Education. In G. Davies (Ed.), Proceedings of the XV. IFIP World Computer Conference, Vienna and Budapest. (Pp. 667-678).

Nuldén, U. (1999). e-ducation. Doctoral Dissertation, Department of Informatics, Göteborg University, Sweden.

Palme, J. (1993). Experiences with the use of the COM computerized conferencing system. Dept. of Computer and Systems Sciences, Stockholm University/KTH. (Original work published 1981, Report no: C-10166E-M6(H9)).

Palme, J. (1995). Electronic mail. Norwood, USA: Artech House.

Palme, J. (1998). Decision making problems. Retrieved March 14, 2000 from the World Wide Web: http://dsv.su.se/~jpalme/email-book/additions.html

Palme, J. (2000). KOM2000: Advanced, distributed forum software. Retrieved March 14, 2000 from the World Wide Web: http://cmc.dsv.su.se/kom/kom-summary.html

Paulsen, M. F. (1995) Moderating educational computer conferences. In Z. L. Berge, & M. P. Collins (Eds.). Distance learning. Computer-mediated com-

munication (Vol. III, pp. 81-90). Cresskill, NJ: Hampton.

Ploetzner, R., Dillenbourg, P., Preier, M., & Traum, D. (1999). Learning by explaining to oneself and to others. In P. Dillenbourg (Ed.), Collaborative learning. Cognitive and computational approaches (pp. 103-121). Oxford, UK: Pergamon/Elsevier Science.

Porras, J. L., & Robertson, P. J. (1994). Organizational change and organizational development. In M. D. Dunnette, & L. M. Hough (Eds.). Handbook of industrial and organizational psychology. (Vol. 3, pp. 720-822). Palo Alto, Calif.: Consulting Psychologists Press.

Ramberg, R. & Karlgren, K. (1997). Fostering superficial learning. In P. Brna & D. Dicheva (Eds.). Proceedings of the eighth international PEG conference, Sozopol, Bulgaria. (Pp. 144-155).

Reimann, P., & Spada, H. (Eds.) (1995). Learning in humans and machines: Towards an interdisciplinary learning science. Oxford, UK: Pergamon.

Rogoff, B. (1995). Observing sociocultural activity on three planes: Participatory appropriation, guided participation , and apprenticeship. In J.V. Wertsch, P. del Rio, & A. Alvarez (Eds.), Sociocultural studies of mind (pp. 139-164). Cambridge, MA: Cambridge University Press.

Salomon, G., & Perkins, D. N. (1998). Individual and social aspects of learning. In D. Pearson, & A. Iran-Nejad (Eds.). Review of Research in Education, 23, 1-24.

Schmidt, K., & Bannon, L. (1992). Taking CSCW seriously: Supporting articulation work. Computer Supported Cooperative Work (CSCW) 1:7-40, Kluwer Academic, Netherlands.

Schwartz, D. L. (1999). The productive agency that drives collaborative learning. In P. Dillenbourg (Ed.), Collaborative learning: Cognitive and computational approaches (pp. 198-218). Oxford, UK: Pergamon/Elsevier Science.

Sears, D.O., Peplau, L.A., & Taylor, S.E. (1991). Social psychology (7th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Sherman, L.W. (1995). A postmodern, constructivist pedagogy for educational psychology, assisted by computer mediated communications. In Prodeedings of the ACM Conference on Computer Supported Cooperative Work (CSCL'95), Bloomington, Indiana.

Skinner, B. F. (1961). Cumulative record. New York: Appleton-Century-Crofts.

SOU 1998:84 (1998). Flexibel utbildning på distans. (Flexible education at a distance.) Stockholm: Utbildningsdepartementet (Ministry of Education).

Sproull, L., & Kiesler, S. (1991). Connections: New ways of working in the networked organization. Cambridge, MA.: MIT Press.

Steiner, I.D. (1972). Group process and productivity. New York: Academic Press.

Tuckman, B. W. (1965). Developmental sequence in small groups. Psychological Bulletin, 63(6), pp. 384-399.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds. and Trans.). Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1997). Educational psychology. (R. Silverman, Translator). Boca Raton, Florida: St. Lucie. (Original work published 1926).

Wærn, Y. (1997). Distance learning, IT and educational cultures. Contribution to the TRANSCULT project, November, 1997.

Wærn, Y. (1999). Absent Minds. Journal of Courseware Engineering (in press).

Wasson, B. (1996). Instructional planning and contemporary theories of learning: Is this a self-contradiction? In P. Brna, A. Paiva, & J. Self, (Eds.). Proceedings of the European Conference on Artificial Intelligence in Education (pp. 23-30). Lisbon: Colibri.

Watson, J. B. (1928). Psychological care of the infant and child. New York: Norton.

Wendelheim, A. (1997). Effectiveness and process in experiential group learning. Department of Psychology, Stockholm University.

Wertsch, J.V., del Rio, P. & Alvarez A. (Eds.) (1995). Sociocultural studies of mind. Cambridge, MA: Cambridge University Press.

Ziv, O. (1996). Writing to work: How using e-mail can reflect technological and organizational change. In S. C. Herring (Ed.), Computer-mediated communication: Linguistic, social and cross-cultural perspectives (pp. 243-263). Amsterdam: John Benjamins.

Åström, E. (1998). Utvärdering av distansutbildningsprojekt med IT-stöd. (Evaluation of a distance-education project with IT support.) SOU 1998:57. Stockholm: Utbildningsdepartementet.

# Appendices

## Study A

**Fåhræus, E.R. and Männikkö, S.**

### Closer at a Distance: Learning via Conference Systems

Proceedings for NACCQ'98, Auckland, New Zealand (pp. 127-136), 1998.

This paper was first produced as an unpublished paper with the title 'Strategies for group cohesion. When learning via electronic media.

## Study B

**Fåhræus, E.R.**

### Student Interaction Stimulates Learning beyond Grading in Asynchronous Electronic Discussions

Department of Computer and Systems Sciences, Stockholm University/Royal Institute of Technology, Report series No. 00-008, 2000.

## Study C

**Fåhræus, E.R. (Co-chair), Chamberlain, B. (Co-chair), Bridgeman, N., Fuller, U., and Rugelj, J.**

### Teaching with Electronic Collaborative Learning Groups

Report of the ITiCSE'99 Working Group on Creative Teaching of Electronic Collaborative Learning Groups. In SIGCSE Bulletin - Inroads, Volume 31, Number 4, December 1999 (pp 121 - 128). The Working Group Reports of the

4th Annual SIGCSE/SIGCUE Conference on Innovation and Technology in Computer Science Education ITiCSE'99, Cracow, Poland, June 27 - July 1, 1999.