Bjørn Faugli

Evolution of Education, Theories of Learning and Computer Supported Learning

Høgskolen i Hedmark
Rapport nr. 20 – 2003

On-line versjon

Utgivelsessted: Elverum

Forfatteren er selv ansvarlig for sine konklusjoner. Innholdet gir derfor ikke nødvendigvis uttrykk for Høgskolens syn.

I rapportserien fra Høgskolen i Hedmark publiseres FoU-arbeid
og utredninger. Dette omfatter kvalifiseringsarbeid, stoff av lokal
og nasjonal interesse, oppdragsvirksomhet, foreløpig publisering
før publisering i vitenskapelige tidsskrift etc.

Rapporten kan bestilles ved henvendelse til Høgskolen i Hedmark.
(http://www.hihm.no/)

Rapport nr. 20 - 2003

ISBN: 82-7671-337-8
ISSN: 1501-8563

Hedmark University College

Title: Evolution of Education, Theories of Learning and Computer Supported Learning			
Author: Bjørn Faugli			
Number: 20	**Year:** 2003	**Pages:** 28	**ISBN:** 82-7671-337-8 **ISSN:** 1501-8563
Financed by: Hedmark University College			
Keywords: History of education, learning theories, computer support			

Summary:

Understanding how educational systems has evolved through history and insight in theories of learning is important for efficient planning and implementation of computer supported educational solutions in the years ahead.

In prehistoric times we were all hunters, either as predators or vegetarians searching for plants. When the sons' and daughters' professional careers were predetermined by the profession of their fathers and mothers, the teachers or mentors where available in a natural way. But, when the sons and daughters of hunters, farmers and craftsmen wanted to pursue a different professional carrier than their parents, the possibility of adapting the behavior of the experienced parents diminished.

Education was institutionalized, the student factories emerged. The teacher lectures, the student listens and assumes the role of passive, rather than active participants. With modern instructional technology , alternative and improved learning processes can be realized. This is not new pedagogy. Two thousands years ago, the Greek philosopher Socrates claimed that true knowledge comes from the inside and cannot be introduced by «external forces». The teacher should take the role of a Midwife and help to deliver the learning processes. This principles of learning have for practical, economical reasons, rarely been applied in modern education. With modern ICT the «old fashion» principles of learning can experience a renaissance.

Høgskolen i Hedmark

Tittel: Evolusjon av utdanning, læringsteorier og IKT støttet læring			
Forfattere: Bjørn Faugli			
Nummer: 20	**Utgivelsesår:** 2003	**Sider:** 28	**ISBN:** 82-7671-337-8 **ISSN:** 1501-8563
Oppdragsgiver: Høgskolen i Hedmark			
Emneord: Utdanningshistorie, læringsteorier, IKT			

Sammendrag:

Forståelse av hvordan utdanning har utviket seg gjennom historien og innsikt i læringsteorier er viktig for effektiv planlegging og implementering av IKT støttede læringsprosesser i årene som kommer.

I førhistorisk tid var vi alle jegere og samlere. Når sønner og døtres yrkeskarierer var forutbestemt av foreldrenes yrker var lærere og veiledere tilgjengelig på en naturlig måte. Men når sønner og døtre av gårdbrukere og håndverkere ønsket en annerledes karriere vei enn foreldrene så forsvant mulighetene til å lære direkte fra foreldrene.

Utdanningen ble institusjonalisert og student fabrikker dukket fram. Lærerne foreleser, studentene lytter og har en rolle som passive og ikke aktive deltagere i læringsprosessen. Med moderne teknologi kan alternative og forberede læringsprosesser realiseres. Dette dreier seg ikke om ny pedagogikk. For mer enn to tusen år siden så hevdet den greske filosofen Socrates at sann kunnskap kommer innenfra og kan ikke bli pådyttet med eksterne krefter. Læreren skulle ha rollen som en jordmor og bistå til å forløse læring. Dette læringsprinsippet har av praktiske, økonomiske grunner, sjeldent blitt anvendt innen moderne utdanning. Med moderne IKT kan disse «gammeldagse» læringsprinsippene oppleve enn renessanse.

Introduction

The reflections presented in this paper is based on experience from research and development activities at Hedmark University College (HUC) through the past decade and in particular from the experiments conducted in the PedTek (Pedagogy and Technology) project. In 1997, the Norwegian Ministry of Education and Research granted economical support for the PedTek project. The overall goal of the project was to design educational solutions for physically handicapped and other students unable to comply with the requirements of ordinarily on-campus teaching. The experimentation process of PedTek was terminated in fall 2002. Throughout a period of six years, experiments were conducted based on principles from experimental systems development.
The development objective was to:
«Design an efficient and flexible Net Based Learning Environment (NBLE) for off-campus students, applying pedagogical principles based on Collaborative Learning (CL) in combination with Problem Based Learning (PBL).»
And the objective of the research activity was to:
«continuously acquire knowledge as feedback in support of the development process and to gain general knowledge in the field of NBLE».

Net Based Learning Environment (NBLE) prototypes were tested and continually redesigned during the course of experimentation. Based on constructivist learning theory and in particular the work of Piaget and Vygotsky, operational NBLE prototypes were designed in accordance with guidelines from CL (Collaborative Learning) and PBL (Problem Based Learning). This represented a learning environment, different

from the traditional knowledge-PUSH-based way of organizing learning processes. The objective was to provide the students with favorable conditions for «pulling» required information from a surrounding support system and allowing the construction of new knowledge. During the project period, six prototype versions of a Net-Based Learning Environment (NBLE) for an undergraduate course in Project Management was designed, tested, evaluated and redesigned. Approximately 650 undergraduate Computer Science students have attended the experimental courses during the project period.

The R&D activities conducted by the PedTek project gradually directed the attention towards the question of why we are organizing our present educational programs the way we are. In many cases we just take for granted that this is the way it must continue to be in the future. The solutions developed through the experimentation in the project made it gradually clearer that we as educators, for many years have operated inside constraints of an artificial framework. Our acceptance of the present days educational solutions has been internalized by the educational culture we are an integrated part of. With this realization, which is somewhat embarrassing to reveal, we took a considerably step forward in the understanding of the possibilities of applying alternative solutions.

Computer supported learning

Information and Communication Technology (ICT) will play an increasingly important role, as a supporting component of educational systems in the years ahead. IC technology has a considerable potential for enhancing the quality and efficiency of learning-processes and making educational programs available for larger proportions of the population. Since the start of organized learning in societies, with the establishment of schools and universities, it has been required that learners and teachers meet face to face in classrooms or lecture theaters. With a few exceptions, this has been the only practical way of organizing effective communication and interaction between learner and teacher. Cost efficiency considerations favor the gathering of large number of learners within hearing distance of the teacher. These considerations and requirements represent frameworks, imposing limitations on the freedom to choose alternative ways of organizing education and to apply suitable pedagogy. Formal learning processes have traditionally been based on transfer of knowledge directly from the teacher to the students, applying a pedagogy, which can be characterized by a knowledge PUSH approach, where the learners are passive receivers of knowledge.

> «It is as if the knowledge the teacher has can be transmitted directly to the students; the metaphor is that of pouring information from one container (the teachers head) to another (the students head).» (Brown, Campione 1990)

Computers have been used in education for several decades, but until recently, computer applications have been limited to peripheral and supplementary support functions for traditional learning processes.

Computers have rarely been included as a major component in educational systems. The recent development of more powerful computers, high capacity data communication, advanced software and in particular the Internet, have created new, favorable conditions for constructing efficient flexible learning systems. It allows realization of flexible learning processes where learners can choose the time and place to study and the teachers are freer to apply appropriate pedagogy. For the past half a century, flexible learning solutions have been successfully applied in traditional distance education programs organized as correspondence courses. However, with modern ICT, the conditions for delivering distance education, is dramatically changed. With lifelong learning on the agenda, worldwide, efficient and flexible educational programs of high quality are expected to be increasingly in demand in the future. A growing proportion of the population needs continuously refill of knowledge or a more comprehensive reeducation to comply with the rapidly changing working life conditions. Many of these learners are fully or part time occupied in jobs, has family obligations, reduced mobility due to handicaps or are for various other reasons unable to spend long periods of time with physically presence on campus. Off-campus students represent a new category of learners requiring flexible learning conditions and constitute a new an important part of the student market. Providing efficient and high quality educational programs for this new category of students is a major challenge for most educational institutions.

Numerous educational institutions are promoting net-based educational programs for off-campus students as better or satisfactorily alternatives to traditional on-campus programs. E-learning has become a fast growing and prosperous business. Most Net Based Learning Environments, however, are implemented as high-tech solutions for off-campus students using powerful computers and the Internet without achieving more than could be done by using old-fashioned books, chalk and blackboard and sometimes not even that. The IC technology is superimposed on traditional lecture-based learning processes. A prevailing attitude among many ICT experts and

educators seem to be that with access to the Internet it is a trivial and straightforward task to organize and deliver off-campus education programs. This attitude is reflecting an insufficient understanding of the complexity of developing and implementing systems involving people, technology and organizational issues. *«When educational IT is examined there is often little evidence of it being grounded in any learning theory.»* (Jones A. 1996). And when a connection to learning theory is apparent it is frequently related very traditional pedagogy. *«Instructional theories, though, which have been influential in American educational software design, have in the main drawn on behaviorist ideas.»* (Jones A. 1996). Successful utilization of the potential of modern ICT requires that pedagogical, learning theoretical, technological and organizational issues are addressed.

Evolution of Education

> «In prehistoric times we were all hunters. Social organizations was limited to the formation of smaller groups or the family and most of the time was spend, engaged in activities with the purpose of catering for the satisfying of basic needs. The learning process, of each individual, is believed to mainly be a matter of adapting the behavior of the more experienced members of the group such as biological parents or leaders of the group.» (Enc. Brit. 2003)

Cultures we commonly denote as modern civilizations have for the past few thousand years, evolved with different rate of progressions in different parts of the world. Efforts to systematically plan and organize learning process and enhance the efficiency of learning processes are closely related to the evolution of modern cultures. When the sons' and daughters' professional careers were predetermined by the profession of their fathers and mothers, the teachers and mentors where available in a natural way. The boys spend the days with their fathers and the girls with their mothers and learned by doing under «natural» guidance. The sons became hunters, collectors or craftsmen like their fathers and similarly the daughters learned to cater for conditions at the camp, like their mothers. And as long as the career paths were determined by the parent's professions this natural educational system served its purpose well. And there are no indications or reasons to believe that the young's learning progression was less steep under these conditions than it is in present day's educational system. The level of knowledge of a skilled hunter was probably not inferior to the knowledge level of to day's skilled carpenters or lawyers. This indicates that the efficiency of the learning

process of the young hunter was at least comparable, perhaps superior, to learning process in modern educational systems. These old ways of training and teaching learners worked perfectly under the prevailing conditions up to a few hundred years ago. But gradually and in particular with the industrial revolution, societies became more complex with increased specialization and division of labor. When the sons and daughters of hunters, farmers and craftsmen wanted to pursue a different professional carrier than their parents the possibility of adapting the behavior of the experienced parents diminished. To cater for the learning requirements of a farmer's daughter who, for example, chose to pursue a carrier as a lawyer, it was necessary to organize education in new ways. Education had to be institutionalized and learners pursuing the same skills and competence were gathered in large groups to gain new knowledge by reading books and listening to teachers. The student factories emerged.

> «As societies grow more complex, however, the quantity of knowledge to be passed on from one generation to the next becomes more than any one person can know; and hence there must evolve more selective and efficient means of cultural transmission. The outcome is formal education – the school and the specialist called the teacher. As society becomes ever more complex and schools become ever more institutionalized, educational experience becomes less directly related to daily life, less a matter of showing and learning in the context of the workaday world, and more abstracted from practice, more a matter of distilling, telling, and learning things out of context.» (Enc. Brit. 2003)

Cost efficiency considerations favor the gathering of large number of learners within hearing distance of a single teacher. The traditional, formal learning processes of to days educational institutions are based on transfer of knowledge directly from the teacher to the students, applying a pedagogy, characterized as a knowledge PUSH approach, where the learners are passive receivers of knowledge.

This can with reasonably degree of accuracy be characterized as «the state of the art» of our present educational systems.

Socrates revisited

Applying modern instructional technology for supporting learning processes allows alternative learning processes to be introduced. This is not necessarily a matter of new pedagogy. Old principles are reintroduced and contribute to enhancing the quality and flexibility. Pedagogical solutions such as Problem Based learning (PBL) and Collaborative Learning (CL) have proved to be interesting. And this is based on principles of learning introduced more than two thousands years ago by the Greek philosopher Socrates. He claimed that true knowledge comes from the inside and cannot be introduced by «external forces». The teacher should take the role of a Midwife and help to deliver the learning processes. This is interesting principles of learning, but have for practical, economical reasons, not been applied to any extend in modern education. With modern ICT the old fashion principles can now experience a renaissance.

Constructivism

According to Constructivist theory, learning is a reflective process. By reflecting on our experiences we are constructing new knowledge. Through interaction with the surrounding environment the perception and understanding of the world around us is developed.

> «Constructivism is a process of learning whereby the learner personally constructs and interprets a given set of information based on his or her experiences.» (Kaur A. 2000)

Constructivist theory is represented by to two slightly different schools. The Swiss Psychologist J. Piaget and the Russian Psychologist L. Vygotsky are considered founders of modern Constructivism. Between the two, it is common to consider Piaget as the first to introduce the principles of Constructivism.

Grabingar et al. characterizes Constructivism by three different aspects. According to the first. Learning is an active and evolving process in which the learner attempts to make sense of the world. Based on this, knowledge cannot be acquired by the learner as a well-defined product *«knowledge of the world is not absorbed, but actively processed by the learner, emerging in the form of mental models»* (Szabo 1998). According to the second, knowledge is constructed and developed in an authentic learning environment where context is significant in the building of knowledge. Thirdly, the social context in which the learning takes place is of great importance to conceptual development and takes place by sharing and testing ideas with others.

> «The pedagogy of constructivism includes learning by doing, learning through interaction, learning in rich environments, learning at higher order thinking levels and learning in a teacher-supported environment.» (Kaur A. 2000)

The term rich environments used here relates to situations were the learners can apply and try out their knowledge. According to Brown, Collins and Duguid (1998) and Kaur A (2000) the design of rich learning environments is one of several prerequisites for efficient constructivist learning. Designing rich learning activities is required due to the fact that students are frequently suffering from the «inert knowledge syndrome», that is knowledge learned but not applied in everyday life. *«What students learn should not be separated from how they learn it»* (Brown et al. 1998 and Kaur 2000). The term «Learning by doing» was introduced by John Dewey (1910) who rejected authoritarian teaching methods, and viewed learning as a process of inquiry. Children should learn by doing and not be passive receivers

of knowledge with issues defined by the teacher. Later, Bruner emphasized that learning is an active process and advocated the use of discovery learning.

> «In its purest form, discovery learning allows the learner a free choice of how and what is to be learned. At a moderate level, discovery learning permits experimentation, whereby the teacher intervenes in the form of coaching, providing learning clues and creating a learning framework for the student. In a purely prescriptive perspective, the learner discovers completely what the teacher wants him to discover.» (Kaur A. 2000)

Piaget's theories are denoted socio-cognitive theories of learning, and centered on development through different stages of the learning process of children. Children develop through a gradual process of interaction with the environment. Faced with new and unfamiliar situations that don't fit with their existing view of the world, development occurs. In this situation *«a disequilibria occurs which the child seeks to resolve through one of two processes of adaptation. The child either fits the new experiences into his or her existing view of the world (assimilation) or changes the cognitive structure to incorporate the new experiences (accommodation). Based on the Piagetian principle, it is important that the child be exposed to a variety of learning activities»* (Kaur A. 2000). According to Illeris, 1974 referred in Fjuk, 1998 the assimilative part of Piaget's learning theories is described as «traditional school teaching» but accommodative learning has deeper and more fundamental effects on the learner. *«Accommodative learning is a learning style, in which an individual's cognitive structures are changed through disintegration, when existing learning elements are released from the original learning context and can be included in new structures.»*. (Illeris 1974, Birknes and Fjuk, 1994 referred in Fjuk 1998)

Piaget's cognitive theories were further developed by Papert (1980). Papert claimed that learners should get opportunities to test hypotheses about the challenges they encounter. Although Piaget is regarded as the founder of Constructivism his work and theories are criticized for focusing too much on learning as an individual process and less on intersubjectivity and culture. *«Piaget underestimated, to a considerably degree, the new born child's ability to take part in the fine graded cooperation with others. On this point he is fundamentally mistaken.»* (Aukrust Grøver V. 1996). With respect the lack of focus on cultural factors in children's development process, Piaget is also criticized for failing in his inductive reasoning and conclusions. His research is based on the study of children in Geneva, Switzerland, and thus getting research results of limited validity in other cultures. This critique of Piaget's research and theories is one of the reasons for a shift of attention from Piaget to Vygotsky during the past decades. Vygotsky lived and worked in the old Soviet Union, simultaneously but isolated from Piaget, but their theories have much in common. But Vygotsky's theories are denoted as social-cultural theories of learning and differs from Piaget's theories by focusing more on the social-cultural perspective of learning. Vygotsky was strongly concerned with the relations between cognitive development and social development and the cultural environment of the learner.

According to Vygotsky, learning takes place at two levels: the interpsychological and the intrapsychological level. At the interpsychological level, the interaction children have with adults and other children is essential to their construction of knowledge. One of Vygotsky's most important conclusions is that the development potential of learners are determined by what the learner can accomplish on his own and in addition, what the learner can accomplish in an environment with help from others, such as a teachers, peers and tutors.

> «This notion of cognitive growth is related to what Vygotsky terms as the Zone of proximal development (ZPD), which is

> defined as the distance between actual development 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 knowledgeable others.» (Vygotsky L. 1978)

> «The gap between actual and potential ability can be bridged through what is metaphorically known as the «Scaffolding process».» (Bruner, Ross 1976)

> «A more experienced partner (peer or teacher) is able to provide scaffolds to support the student's evolving understanding of the subject matter at hand.» (Kaur A. 2000)

ZPD is representing the learners potential for acquiring new knowledge, a potential that only can be fully utilized when learning is collaborative. The constructivist theory of Vygotsky emphasizes in particular on the effects of language and communication in the learning process which is of particular importance for the design of learning environments (Vygotsky 1934. Thought and Language).

> «Vygotsky's revolutionary idea is that thinking and language constitute one unit, and that this unit is the result of human development. Language expressed thinking, and thinking takes place with the help of language, and therefore the thinking and language must be studied simultaneously, as language based thinking.» (Skodvin A. 2001)

The main challenge involved in designing learning environments based on these theories is to combine the structuring of the learning process with large degree of freedom for the learners to search for new solutions and take responsibility for own learning. And it is obviously important to create environments or metaphorically speaking, arenas for communication and peer and expert interaction with the learner.

Problem Based Learning (PBL)

Among educational institutions, particularly in the field of medicine and health care in Europe, Problem Based Learning has been extensively and successfully applied for many years. «Problem-Based Learning» (PBL) is a curricular reform that was first introduced with the founding of the Faculty of the Health Sciences at McMaster University in the late 1960s (Spaulding 1996). And it seems to be a tendency that applying PBL «inspired» approached is spreading. Choosing to characterize PBL as a theory of learning is perhaps stretching definitions a little too far, but in the context of the present paper this is not a significant issue. It is most correct to denote PBL as a pedagogical approach based on principles from basic Constructivist theory.

> «Design of practical pedagogical solutions based on Constructivist theory should be based on guidelines given by Collaborative and Problem Based Learning.» (G. Bjørke 1996)

For practical applications, pedagogical approaches based on PBL differs and varies from using PBL in its purest form to approaches where PBL principles are hardly detectable. In order to avoid complex discussions and argumentations to justify whether a particular approach is «real PBL» or not, the term POB (Problem Oriented Learning) is frequently used as a substitute. In it’s purest form it is required that PBL based pedagogical approaches is organized in specific ways to comply with distinct steps. According to Gerd Bjørke, problem based learning can be described in following way:

> «A small group of students work with tasks consisting of description of a problem, phenomena or activities from real life which requires an explanation. The descriptions are usually based on situations from working life. The group discusses the problem, tries out different explanations,

> describes fundamental processes, principles or mechanisms, and formulate their own learning requirements, which is the point of departure of individual studies. Finally the group come together and discus explanations and their understanding of the problem, based on a new platform of understanding.» (Authors translation from Bjørke G. 1996)

Collaborative learning and computer support

During the recent years, collaborative learning (CL), has received increased attention as a pedagogical methodology, suitable for applications in technological supported learning environments. But as a learning theory or pedagogical methodology CL also stand on it's own, but a strict definition is to large degree absent and its easier to start with stating what Collaboration not is:

> «Learning based on a transmissive or information-processing model of education, where the main learning activity is the individual reception and organization of information from books, lectures, videos or computer-based training materials, is not collaborative.» (Antony R. Kaye, 1991)

It is also apparent that working according to the principles of CL is more common in working life situations not involving formal education programs.

> «One reason why collaborative learning appears to be more commonplace in the work environment than in many parts of the formal education system may be because, in our culture, the latter is mainly based on recognition of individual achievements within an essentially competitive environment (collaboration between schoolchildren, in certain circumstances, is still sometimes labeled as «cheating». Another reason might be that the formal education system

> assigns relatively hermetic roles to participants (one is either a student, or a teacher), and these roles imply an unequal relationship based on differential levels of authority and power.» (Antony R. Kaye, 1991)

Some attempts to define CL can be referred:

> «Collaborate (co-labore) means to work together, which implies a concept of shared goals, and an explicit intention to add value – to create something new or different through the collaboration, as opposed to simply exchanging information or passing on instructions.» (Antony R. Kaye, 1991)

> «Successful collaboration assumes some agreement on common goals and values, and the pooling of individual competencies for the benefit of the group or community as a whole.» (Antony R. Kaye, 1991)

In her PhD thesis, Abtar Kaur, at the University of Malaysia, is making a distinction between collaboration and cooperation

> «Cooperative learning:
> Groups of students working together to attain a predetermined group-learning goal
> Collaborative learning:
> A group seeks help from another group with regards to their group goal (peer collaboration) and/or a group seeks help from the teacher or any other expert (teacher-learner collaboration, expert-learner collaboration)» (Abtar Kaur. Phd Thesis 2000).

With the increased actuality of applying computers as a mediating tool in learning situations the term Computer Supported Collaborative learning (CSCL) has been introduced. CSCL is concerned with situations where computers or rather Information and Communication technology (ICT) is used for supporting learning process based on

Collaborative learning. CSCL is hence not concerned with all kind of situations where ICT is used for supporting learning. During recent years, the increased focus on life long learning and the use of Internet for providing off-campus students with educational programs has raised the question of how to apply CSCL in this particular context. This led to the introduction of Computer support for distributed Collaborative learning (CSdCL). The term CSdCL was introduced by Annita Fjuk in her Dr. Scient thesis at the University of Oslo (Computer support for Distributed Collaborative Learning. Exploring a Complex problem Area. 1998). The thesis is focusing on collaborative learning situations where the students are individually separated by physical distance. In this respect CSdCL is basically an application of CSCL in situations involving students geographically separated, both from fellow students, the teacher and supervisor. In most respects CSdCL involves the same challenges as with CL and CSCL, but as pointed out by Fjuk (1998), «involving distance education students, introduces some additional challenges and problems».

Conclusions; Towards a future «Socratic» educational system

With modern Information and Communication technology, the boarders of our present educational framework can be surpassed. Combining modern ICT with the scientific cultivated principles of the Socratic approach to learning processes, educational system can be planed and implemented with fewer restrictions. However, this requires both systematic efforts and the will to see the possibilities. A more open minded attitude towards new technology and the courage to “loose” control is required. It must be accepted that learning takes place even if the teacher is not in control. Most important is that designers and educators should strive to free themselves from traditional thinking and become more imaginative. Cutting strings to the traditional, familiar and safe situation of the lecture theatre is perhaps the biggest challenge for teachers, and this requires visions of better alternatives. Applying alternative pedagogy is challenging our courage. Our reluctance to adapt new pedagogy can to some extend be explained by the psychology of rituals. When students enter the classroom or lecture theatre, they participate in a ritual, traditionally considered as a learning situation. Being present during a lecture gives the student a feeling of acquiring new knowledge and having complied to this, the student will easily be content and have a feeling of being in a learning situation, mainly because the educational institution has convinced them that the lecture theatre is the main learning arena. The same reasoning can be applied to the teachers and lecturers. Having performed in the classroom or lecture theater gives a content feeling of having «done the job». In addition, reluctance to

adapt new methods is also, in many cases, a matter of choosing the path of less resistance and effort.

> «You don’t have to teach students anything. Just make sure that proper conditions are provided. Make sure that the students feel that their work and effort is appreciated. And that they are rewarded in one way or another. Your task is to give them time, space and energy. Then they will start to observe, listen, systemize on their own. The learning ability and possibilities are latent I each student. Place yourself in the background. Don’t talk much. You have to be brave. The biggest obstacle is modesty and habits that you find amongst most academics. Consider the space, the time and the energy you allow yourself. Not quite satisfied with this? Turn it upside down.……» (Ann Kerwin. 1995 University of Arizona)

We reach our learning goals best when we are provided with appropriate conditions and it is important to keep in mind that this is not necessarily by spending time in a lecture theatre. With high-tech support of learning processes the considerations above becomes particulaly more important.

References

Bannon, L. (1995): «Issues in Computer Supported Collaborative Learning», i O'Malley, C. (Ed.): *Computer Supported Collaborative Learning*, Springer-Verlag, Berlin, pp. 267-281.

Bates, A. W. (1995): *Technology: Open Learning and Distance Education*. Routledge, London and New York.

Bjørke, G. (1996): *Problembasert læring – ein praksisnær studie-modell,* Tano Aschehoug.

Bjørgen, I. (1999): *Det amputerte og det fullstendige læringsbegrep* (The amputated and complete conception of learning).

Elster, J. (1983): *Explaining Technical Change,* Cambridge University Press, Universitetsforlaget, Oslo.

Faugli, B. (2002): *Knowledge-Based International Aid by ICT-Supported Learning Processes.*

Faugli, B. (2003): *On-Line education and Traditional Organizations.*

Handal, Holmstrøm, Thomsen (1975): *Universitetsundervisning.*

Harasim, L. (1989): «On-line education: A new domain», i Mason, R., Kaye, A. (Eds.): *Mindweave. Communication, Computers and Distnce Education*, Pergamon Press, Oxford, pp. 50-62.

Harasim, L. M. (Ed.): *Online Education. Perspectives on New Environment*, Praeger Publishers, New York.

Heap, N. et al. (1995): *Information Technology and Society*, The Open University, Sage.

Holmberg, B. (1990): A Paradigm Shift in Distance Education? Mythology in the making. *ICDE — International Council for Distance Education*, Bulletin. Vol. 22. January.

ICDE june 2-6 1997 *The new learning Envionment, A global perspective*, Conference Abstracts.

Kuhn, T. S., (1962): *The structure of Scientific revolutions*, The University of Chicago Press.

Perleman, L. J. (1992): *School`s Out. A radical new formula for the Revitalization of Americas Educational System*, Avon Books, New York.

Salomon, G. Rditor (1993): *Distributed cognitions. Psychological and educational considerations*, Cambridge.

Vygotsky, L. (1962): *Thought and language*, Cambridge, Mass., M.I.T Press.

Vygotsky, L. (1978): *Mind in Society: The Development of Higher Psychological Processes*, Harvard University Press, Cambridge.

Wells, R. A. (1990): *Distributed Training for the Reserved Component: Remote Delivery Using Asynchronous Computer Conferencing*, Report 2Q263743A794, Idaho National Engineering Laboratory, Idaho Falls, ID.