Report on theoretical framework on selected core issues on conditions for productive learning in network learning environments.

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D24.3.1 (Final)

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Summary

This report contains three parts. Part one presents the conclusions from the work in the JEIRP and contains the following chapters:

- Identification of core issues, theoretical approaches and empirical findings
- State of the Art - CSCL The next ten years – a European perspective
- A theoretical framework for analysing conditions for productive learning in networked learning environments

Part two presents all the case studies brought into the JEIRP by the participants, and part three presents articles elaborating specific core issues, which were presented in a symposium organised by the JEIRP at the CSCL SIG in Lausanne, Switzerland, October 2004.

History

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Abstract

This deliverable 24.3.1 reports the work of the Jointly Executed Integrating Research Project (JEIRP) on conditions for productive learning in networked learning environments within the Network of Excellence, Kaleidoscope. The aim of the JEIRP is to develop theoretical concepts and understandings of the field Computer Supported Collaborative Learning, and to establish a (shared) theoretical framework for productive learning in networked learning environments. This work has been based on a case study approach. The partners have brought existing or ongoing cases into the JEIRP dealing with distinct aspects of productive learning within networked learning environments within higher education. The theoretical framework, which is reported in this deliverable, has been developed in an iterative and networked process based on these case studies. The theoretical framework has aligned the work of the case studies between the partners and provided theoretical as well as methodological tools for studying conditions for productive learning in networked learning environments. Especially, 'activity theory' and 'the theory of community of practice' have provided insightful concepts and methodologies, which interact and help in the process of analysing and concretizing practice. The case studies are focussing on various aspects of the structural and social-cultural elements of the networked learning environments. The case studies complement each other and as so they provide insight into different aspect of the conditions for – as well as various dimensions of productive learning. The case studies have contributed to the further development of the theoretical framework e.g. the notion on indirect design, technology affordance, ethics and phronetic knowing, place-making and a continued discussion on network and / or communities of practice as the unite of analysis. This discussion is brought forward in the final chapter of the deliverable, which has been accepted as a plenary paper for the International Conference on Computer Supported Collaborative Learning, Taipei 2005.

1   Introduction

By Lone Dirckinck-Holmfeld

Deliverable 24.3.1 is written on the basis of the work in the Jointly Executed Research Project (JEIRP) "Conditions for productive learning in networked learning environments" within Kaleidoscope, the European Network of Excellence within Technology Enhanced Learning. The objective is to justify the need for theoretical work on selected core issues, and to develop a theoretical framework for analysing conditions for productive learning in network learning environments.

The JEIRP has been motivated by the fact that many researchers and teachers are working in relative isolation from each other. The research funding is predominantly national in focus and little work has been conducted in taking work from one national or cultural context and making it both available and understood in different contexts. Currently networked learning environments in various European educational settings are designed without a deep understanding of the pedagogical, communicative and collaborative conditions embedded in networked learning. Despite the existence of good theoretical views pointing to a social understanding of learning, rather than a traditional individualistic and information processing approach, these ideas seem to have had minor impact both among designers and within the higher education community (see Lakkala et al. 2001). It is also one of the main conclusions in a European study on virtual universities, that we lack innovative use of ICT for learning, and educational research to follow up (PLS Rambøll Management 2004).

The opportunity is therefore for Kaleidoscope to provide a ground for researchers within this interdisciplinary area to develop and to qualify European research approaches dealing with the social approaches to learning in networked environments.

Our methodology to do this has been to invite partners from Kaleidoscope to join the work in the JEIRP, and based on case studies, which they were involved in, to use this as a point of departure for pointing at problem areas and theoretical issues, which should be researched deeper. Furthermore, the partners have engaged in the development of a (shared) theoretical framework, which could contain the different research perspectives and methodologies brought into the JEIRP through the cases.

This kind of work is not trivial. All partners in the JEIRP are internationally recognized research groups and have their own research agendas. The mission and challenge of the JEIRP, was therefore to integrate the established perspectives and agendas to achieve a synergetic effect of combining competencies and resources within a European-wide collaboration. All partners in the JEIRP find, that it has been a very productive collaboration, where labs, which did not collaborate beforehand have gained the opportunity to work together, and to start the complex process of establishing a shared theoretical and conceptual framework for conditions for productive learning in networked learning environments. Seen from the perspective of the participants, a network is not merely based on "transmission" of ideas, and simply packages of knowledge. Rather, in order to really develop something new, where we benefit from the different practices and theoretical approaches, we have to spend time dis-embedding knowledge from one context and re-embedding it in another.
In the following, we will explain the outline of the deliverable. The work has been concentrated on the work with the case studies. The case studies therefore play an important role in the deliverable. Other sections of the report synthesize the work on the case studies. Some of this work is still "work in progress", while other work has been accepted for publication in journals.

The deliverable has five chapters:
Chapter two contains the following sections: Clarifying the aim of the JEIRP; Justifying the need for conceptual work; Methodological approach, arguing for the approach of case studies.

The main work within the JEIRP has been conducted primarily in the field of Computer Supported Collaborative Learning (CSCL). As a point of departure, JEIRP capitalized on existing cases/ongoing cases to establish a theoretical common ground and to identify issues for future research. The first year represents a first step in laying down a foundation for future work.

Chapter three contains an introduction to the case studies and the cases. Nine prototypical case studies have been reported. The case studies have contributed to the identification of core issues, productive, theoretical approaches, and empirical findings as well as grounding of the theoretical framework. Some of these cases were ongoing cases, while other were existing cases, which each partner analyzed in terms of their implications for JEIRP issues. Some of the papers on the cases presented in relation to JEIRP have later been published in journals, e.g. "Information Systems Frontiers" (the first issue of 2005).

Chapter four presents and discuss the theoretical framework, which has been developed in an iterative process in relation to the case studies. During the JEIRP a shared set of categories was initially developed to analyze case studies brought into the project by each partner. Subsequently,

these categories were used as a framework for the analysis and conceptualisation of the case studies and as a focal point in the identification of core issues of and theoretical approaches to the conditions for productive learning in network learning environments. This approach made possible the integration of a number of varied cases (see above). Based on a seminar on the case studies, the theoretical framework was further refined, and the core issues to which the JEIRP partners could contribute were identified.

The work on the theoretical framework has been documented in several papers. The first draft was developed by Ponti, M., Dirckinck-Holmfeld, L., et. al. 2004 as deliverable D24.2.1 for Kaleidoscope. This was later refined and accepted for presentation as a "work-in-progress" paper at the World Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education, Washington, DC, November 1-5, 2004 (Dirckinck-Holmfeld, L., M. Ponti, et al. 2004). The present version has been revised and further elaborated including comments, provided by the JEIRP partners.

The aim of the JEIRP is to develop theoretical concepts and understandings of Computer Supported Collaborative Learning, and to build up a (shared) theoretical framework for productive learning in networked learning environments. We see this as a long-term and complex process. During the first year of the JEIRP, it has not been our intention to apply a theoretical framework to and make a comparative analysis of a number of case studies. The aim was, however, – in line with a theory of practice perspective – to use case studies as basis for the development of concepts – and the theoretical framework for networked learning in practice. The tentative theoretical framework has functioned as a reification of the shared understandings, and has supported the alignment of the work of the JEIRP pointing to a set of common theoretical approaches and methodologies, core structural and socio-cultural elements, and has providing insights into various aspects of productive learning. The next step in the ERT – as formulated in the introduction to Deliverable report 24.4.1 – is to continue the development of the theoretical framework based on a deep analysis of the cases applying a meta-ethnographical approach and on setting up shared design experiments on selected issues.

The long term aim is to be able to inform stakeholders and the practice community within networked learning, however it has never been the intention of the JEIRP to – within one year - be able to make guidelines for designers. However, it is our hope that the discussion of core issues is interesting and informative for actors within the area.

The chapter provides a presentation of the theoretical framework, and a discussion of the framework and the lessons learned in the light of the case studies. If the reader desires more knowledge about the themes and issues, we invite the reader to look into the case studies (chapter 4) or the papers, which were presented at the symposium on "Conditions for Productive Learning in Networked Learning Environments" at the Computer Supported Collaborative Learning – SIG in Lausanne, October 2004.

In the final chapter *(chapter 5)*, we provide a discussion of the "state of the art" identifying the "vacuum" in a European setting and justifying the need for theoretical work on selected issues. The chapter is based upon the paper "*State of the Art - CSCL The next ten years – a European perspective*" written by Chris Jones, Lone Dirckinck-Holmfeld, Berner Lindström (2004) and was accepted as a plenary paper at the premier international conference within the field, CSCL Computer Supported Collaborative Learning 2005: The Next 10 years, Taipei, Taiwan, May 30 –

June 4. Furthermore, we have been invited to submit a journal-length version of the paper to be reviewed for the inaugural volume of ijCSCL, the International Journal of CSCL (see http://www.ijcscl.org).

The paper is our contribution to the milestone M1 "State of the art", where we review some core concepts and issues related to conditions for productive learning in networked learning environments. The paper is based on the discussions and the work in JEIRP, building on the case studies and the symposium papers. The paper concludes the work of the JEIRP identifying and reviewing core issues, and contributing to the theoretical conceptualising of core principles within networked learning from the perspective of computer supported collaborative learning.

1.1 References

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2   Background

Kaleidoscope is a Network of Excellence, which brings together European teams in technology-enhanced learning. The goal is to integrate 76 European research units, covering a large range of expertise from technology to education, from academic to private research. Altogether, it is a community of more than 800 researchers in 23 countries, who have joined in their efforts to develop new concepts and methods for exploring the future of learning with digital technologies.

Kaleidoscope places the learner at the centre of a multidisciplinary research perspective, with theoretical foundations in the cognitive and learning sciences as well as in computer science and technology design. The network also has a strong practical orientation, aimed at increasing innovation and competitiveness, and at generating new forms of cultural and learning experiences. Kaleidoscope is organized around different activities: Backbone activities like a shared virtual laboratory, a virtual doctoral school, and an Academy-Industry Digital Alliance; Special Interest Groups on topics as Computer Supported Collaborative Learning (CSCL), Participatory Design, Context and Learning etc.; European Research teams, which are smaller groups of research labs developing a shared research policy; and finally the Jointly Executed Integrated Research Projects (JEIRP). In the following, we are going to present and discuss the work of the JEIRP on "Conditions for Productive Networked Learning Environments".

2.1   The aim of the JEIRP

The aim of the JEIRP is to develop theoretical concepts and understandings of CSCL, and to establish a (shared) theoretical framework for productive learning in networked learning environments.

We see this as a long term and complex process. During the first year of the JEIRP, it is not our intention to apply a theoretical framework or to make a comparative analysis of a number of case studies. However, the aim is – in line with a theory of practice perspective – to use case studies to base the development of theoretical concepts and a theoretical framework on networked learning in practice.

> *"The objective of the JEIRP on "Conditions for productive learning in network learning environments" is to develop theoretical concepts and understandings of CSCL emphasizing the use of a cross cultural comparative approach of case studies in different concrete higher educational settings and existing practices"*

The objective is further more, *"to use an action- and social experiential oriented approach to, in an iterative process to further develop the network learning environments, and to carefully study the interventions in order to further develop the theoretical understandings of the conditions".*
With this statement we want to underline, that several of the researchers and research labs involved in the JEIRP also are practitioners who are continuously engaged in testing out new ideas and design of networked learning environments.

In that respect, the JEIRP-methodology share research interest with the emerging field of design-based research (Barab and Krishner 2001; Brown 1992; Collins 1992; Sandoval and Bell 2004; Shavelson et al. 2003). "Design experimentation has become an increasingly accepted mode of research appropriate for the theoretical and empirical study of learning amidst complex educational interventions as they are enacted in everyday settings" (Bell 2004). Design-based research is

characterised by research methods that attend both experimental control and ecological validity (Sandoval and Bell 2004). Design-based research is carried out in a continuing cycle of design, enactment, analysis and redesign (Design-Based Research Collective 2003).

The Design-based Research Collective op.cit. p. 5 proposes five characteristics for good design-based research methods:

- First, the central goals of designing learning environments and developing theories or 'proto-theories' of learning are intertwined.
- Second, development and research take place through continuous cycles of design, enactment, analysis, and redesign.
- Third, research on designs must lead to sharable theories that help communicate relevant implications to practitioners and other educational designers.
- Fourth, research must accounts for how designs function in authentic settings. It must not only document success or failure but also focus on interactions that refine our understanding of the learning issues involved.
- Fifth, the development of such accounts relies on methods that can document processes of enactment to outcomes of interest (ibid. p. 5).

The work in the JEIRP can be viewed as a contribution to this emergent field of design-based research. The dialectic between development and research as well as the continuous cycles of design, enactment, analysis and redesign is embedded in the methodology of the JEIRP. However, in our approach to design-based research a second ordered conceptualisation has been suggested, see below.

The model below illustrates our approach to design based research.
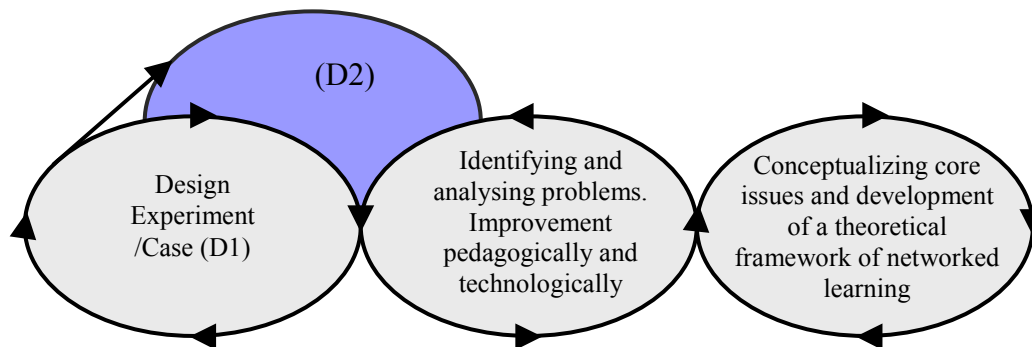
Fig. 1: Pedagogical design-based research

The point of departure is a design experiment or a case study (D1), followed by a first ordered analysis of the learning environment identifying problems and core issues. Traditional these are acted on in a continually design circle. In our approach, however we suggest a second ordered analysis, conceptualising core issues in perspectives of theories on computer supported collaborative learning (CSCL) – before a new design circle D2 may be established.

2.1.1   The development of a (shared) theoretical framework

The development of the (shared) theoretical framework has in itself been a productive collaborative learning process. The JEIRP made it possible to bring together researchers and scholars around the shared enterprise of theoretical conceptualising conditions for productive learning in networked learning environments. The researchers and scholars are coming from different outstanding European research labs, who have been central national and international players in dealing with as well practical design issues as well as conceptualising and theorizing core issues within networked learning.

The research teams share repertoire in the way the problem area of design is understood, and in the approach to learning based on a socio-cultural approach in a broad sense. The work of the JEIRP has been integrative based upon the contributions of all partners. It's our understanding that the work expresses genuine collaboration, where the results are more comprehensive and integrative than the single partners could have produced individually.

As expressed in the paper by Jones, Dirckinck-Holmfeld et. al. (2004), collaboration is not based on "transmission" of ideas, and simply packages of knowledge, however in order to really develop something new, where we benefit from the different practices, and theoretical approaches of each partner, we have to spend time dis-embedding knowledge from one context and re-embedding it in another.

> *"Integrating concepts from different disciplines involves a cost in terms of the intellectual work necessary to ensure that the historically embedded meaning travels with the concepts, and that the concepts are rethought and integrated in the perspective of the new practices and the insights from neighbouring disciplines".* (ibid p. 2)

The general theoretical framework adopted in this work can be described as a socio-cultural framework, more specifically drawing upon cultural-historical approaches to learning, for example Vygotsky (1978) and in the Engeström version of Activity Theory (Engeström 1987), and Social theories of learning, for example Wenger (Wenger 1998) or Giddens (1984).

The development of the theoretical framework has been developed through three iterations. First iteration was based on the partners' presentation of provisional case studies on productive learning in networked learning environment and a preliminary discussion of critical parameters for describing and presenting a case study (Lindström et. al. 2004; Ponti, Dirckinck-Holmfeld et. al 2004). These cases were further elaborated and conceptualised during the summer. The second iteration took place up to the CSCL SIG in Lausanne and during the symposium and the JEIRP workshop on "Conditions for productive learning in networked learning environments". During these activities the problem area, core issues and theoretical approaches were identified. Finally, the third iteration took place after the CSCL SIG, where the case studies were peer reviewed and finalised, and the findings were integrated in this report. Furthermore, the theoretical framework for analyzing conditions for productive learning in networked learning environments was refined.

Based on the JEIRP we have succeeded in going through the first design circle (see fig. 1) The next step will be to develop the second iteration of design experiments (D2), and, on this basis, to continue the work on developing theoretical concepts, empirical findings, and a shared theoretical

framework. This process will be carried out in the European Research Team (ERT) on "Conditions for Productive Learning in Networked Learning Environments".

2.2   *Justifying the need for conceptualisation work on networked learning environments.*

In the following section, we are going to justify the need for conceptualisation work on networked learning environments. The argumentation will be based on empirical findings from a study of virtual models of European universities (PLS Rambøll Management, 2004). First we present the main findings from the study, and afterwards we will discuss, how the work in the JEIRP may be viewed as a response to the need presented in the study.

2.2.1   Main findings from the study of virtual models of European universities

The Danish consultancy PLS RAMBOLL Management has carried out a strategic study of virtual models of universities for the European Commission, DG Education and Culture during 2002-2003 (PLS Rambøll Management, 2004). The aim of the study was to provide the Commission with a report concerning the current and potential future use of ICT by European universities. The initiative is part of the eEurope Action Plan, whose aim is to encourage Europe to exploit its strengths and overcome the barriers that are holding back the uptake of digital technologies.

The study was based on interviews with national and regional representatives, experts and stakeholders, a questionnaire-based survey among all universities in the EU Member States, and eight illustrative good-practice case studies in eight very different university institutions.

The study has provided an analytical overview of the current situation of the EU universities regarding their use of ICT integration and e-learning by using a cluster analysis. Based on this analysis the universities were organised into four clusters (ibid p. 12):

1. The front-runners;
2. The co-operating universities;
3. The self-sufficient universities; and
4. The sceptical universities.

The front-runner universities (16%)[1] are distinguished by their pre-eminence in all respects, including their level of co-operation with other universities and other suppliers of education. The co-operating universities (33%) are characterised by the extensive involvement in strategic co-operation with both domestic and foreign universities and with other education suppliers. Additionally, they are, like the front-runners, quite advanced in the integration of ICT into their campus-based teaching. The main difference is a more limited use of e-learning courses and digital services than the frontrunners. The self-sufficient universities constitute the largest cluster, encompassing 36% of the universities. Their level of ICT integration in the organisational and educational setting is similar to that of the cooperating universities, but they engage in strategic co-operation with domestic and foreign universities or with other suppliers of education only to a minimal degree. Finally, the sceptical universities (15%) are observed to be lagging behind the rest in almost every respect. They are characterised by a limited use of digital services such as on-line course registration, limited ICT integration in their on-campus teaching, and a very low proportion

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[1] In the chapter on key-findings, the frontrunner universities make up 18%, however in other chapters, they are described with 16%.

of e-learning courses in the spheres of both basic academic training and supplementary training. Additionally, their attitudes towards ICT are significantly more sceptical than the rest.

The study found that basic ICT technological infrastructure, including access to computers, the Internet, e-mail accounts and intranets exist in most universities. On-line registration and access to administrative functions are also widespread. The use of ICT for interactive digital services, such as online examinations, is however less common.

With regards to the conceptual framework for ICT in the educational setting, the report distinguish between ICT as a tool for campus-based teaching and communication on the one hand, and e-learning as such on the other. E-learning can be 100% virtual, for example when a course is followed via the Internet, but e-learning also includes learning models in which distance learning is combined with physical meetings or seminars held at the university (sometimes referred to as 'blended learning')[2].

The study found (p. i) that the general level of integration of ICT in teaching has increased significantly over the past two years among the EU's universities, with three out of four of them experiencing a high level of increase in this regard. Nevertheless, considerable variation still exists in this area.

> *"Most universities are still at the stage where the use of ICT consists of treating the computer as a sophisticated typewriter and as a means of facilitating communication via traditional pedagogy and didactics in the actual teaching situation, e.g. through the use of presentation programs, databases or simulation modules. Other examples are the usage of electronic learning environments for exchanging information, communication, and co-operative activities undertaken in courses and programmes. **Only a minority of universities have yet reached the stage of using ICT as a tool to redesign educational programmes, content and curricula on the basis of novel didactic frameworks"** (ibid. p. ii, highlighted by LDH).*

With regards to e-learning, the majority of universities offer some e-learning courses at the level of basic academic training and supplementary training. However, in the majority of subject areas, e-learning does not seem to be a preferred delivery mode in either basic academic training or supplementary education. "*However, the study indicated that a large increase in the number of courses offered in e-learning format could be anticipated, since 65% of universities state that this will be one of their key priorities over the next two years (ibid p. x)."*

The development of ICT competence
The study throws light upon the development of ICT competences among both the students and the academic staff, which turns out to be a relatively new focus area for the universities. The report stresses that ICT competence is not just a matter of technical skills, since the students also need to learn how to use ICT in their learning, as well as the teachers need to learn how to use it pedagogically.

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[2] Following this definition of campus-based teaching and e-learning it seems as if e-learning in this study primary is related to distance learning activities and extension programmes.

Most universities have taken this task upon themselves. In 77% of the universities participating in the survey, technical support for integrating ICT into their teaching is available to all or a majority of teachers. Half the universities (50%) offer courses or support regarding the pedagogical and didactic aspects of e-learning to the majority of their teachers. Additionally, very few universities expect not to do so within 1-2 years.

However, even though such courses and support are available to both teachers and students, the report states, that *" still seems to be a long way to go before these courses and support mechanisms become an integrated and essential aspect of normal university life"* (op.cit. p. xi).

Virtual and social mobility
Virtual and social mobility is regarded highly relevant for the universities, as a means for the enlargement of the universities' population, and the development of research and education. Virtual mobility refers to following courses at other universities or co-operating with colleagues at other universities through e-learning or other mechanisms that are supported by ICT.

> *"The issue of virtual mobility is one of the key aspects of most e-learning models identified in this study, but at present it is still mostly supported on a project basis and is limited in scope" (p. xii)*

Approximately half of the universities in the EU member states are involved in co- operation with other universities in their own country to offer joint e-learning courses, and the tendency to enter into partnerships is expected to grow over the coming years. The existence of consortia among EU universities at trans-national level is not as widespread, although such involvement is increasing. Around one third of the universities in the EU member states are involved in co- operation with universities in other countries with the intent to offer e-learning courses jointly.

The integration of ICT in the educational setting coheres with the reinforcement of the lifelong learning paradigm. As stated in the report:

> *"[…] the majority of universities accordingly consider the demand for lifelong learning to be a key driving force for their integration of ICT. However, the study concluded that they still have a long way to go in developing comprehensive strategies for their role in the lifelong learning paradigm" (ibid. p. xiii)*

Recommendations
On the basis of the analysis and study conclusions, PLS RAMBOLL Management has pointed to the desirability of further research within the following areas:

- *Pedagogical and didactic issues: There is a need for research into e-learning pedagogies and the pedagogical interactions between the students and their teachers/tutors. Other areas are: How to develop a 'social infrastructure' for e-learning which ensures that students do not drop out too easily; How to increase the user-friendliness of tools; How to use virtual learning environments to create more effective learning settings; The lack of knowledge about the risks and consequences of taking particular approaches to e-learning.*
- *Organisational issues of ICT and e-learning in higher education: The management of innovation, the sustainability of solutions, and how to increase the receptiveness of university management towards innovation.*

- *Cost/benefit studies of ICT and virtual learning: Where is ICT effective? Where do we need ICT (indeed, do we need ICT)?*
- *Best practice in terms of content development. Development of common standards.*
- *Has ICT and e-learning changed the evaluation and examination procedures? Is there a need for the development of new evaluation procedures?*
- *Are physical surroundings a barrier for the extended use of ICT on university campuses? What comprises best practice for improved support and enabling of the use of ICT in terms of the layout of the physical environment?*
- *Has the extended use of ICT and e-learning changed the picture among Europe's universities concerning student fees? What are the future models for student fees?*
- *The development of ways to evaluate and assess the quality of e-learning. How to quality assure and accredit e-learning classes.*
- *Changing the attitudes and cultures of teachers: How can incentives for the improvement of teaching and the use of web-based learning environments be created?*
- *Gender aspects: Why are the majority of on-line course students in Sweden female? Is this an international trend, and if so, why? How can on-line courses be made more attractive to men?*
- *Problems of scalability: How can ICT pilot projects undertaken in one or two departments be successfully scaled up to encompass entire universities? (ibid. pp.165)*

Based on the report on "Studies in the Context of the E-learning Initiative: Virtual Models of European Universities" it is our understanding, that there is a growing understanding among stakeholders within universities of the added value of integrating ICT in the practice of universities. Especially, the integration of ICT in teaching and learning as well as ICT for collaboration is in the centre of the report. Through the clustering analysis, the report provides an insight into the level of use of ICT, the main differences between the universities, and some of the challenges for the European universities in dealing with ICT.

The report underlines the need for research in order to improve our understandings of teaching and learning with ICT and knowledge about how to implement and design ICT in university context. This is research, which in a broad sense can help the universities in the transition process towards new practices.

The work in this JEIRP is seen as a step in this direction. The focus on the conceptualisation of core issues on "conditions for productive learning in networked learning environments" is viewed as an important contribution to the educational use and socio cultural aspects of ICT within higher education practice. A step in this direction is to develop concepts and the vocabulary for discussing these matters.

"One needs, first of all, the right vocabulary for thinking about the phenomena that occur on levels of analysis that we are not familiar with discussing. We need appropriate conceptual resources and analytic perspectives. This is what is meant here by a ´theory´" (Stahl, forthcoming p. 5).

In line with Stahl, the objective of the JEIRP on "Conditions for productive learning in networked learning environments" is exactly to contribute to the process of establishing meaningful concepts and a conceptual framework for the understanding of conditions for productive learning in networked learning environments.

2.3   Methodology and the selection of cases

In this section we are going to describe the overall methodology and the selection of cases.

As already stated in the introduction the aim of this work in the JEIRP is not to make a comparative analysis of selected cases, but to use cases as point of departure for identifying and conceptualising core issues of relevance for networked learning environments. The development of cases was based on two main principles, leading to two fundamentally different kinds of cases.

One was to enter into the common work-space studies that were prototypical examples of research already conducted at the member institutions. They were supposed to be prototypical in the sense that they reflected the study objects, the research problems, the theoretical and methodological approaches, the methods and analytic accounts that the institutions wanted to collaborate around. Then, from a bottom-up perspective, the cases gave a concrete foundation for the discussion of more precise similarities and differences in theoretical approaches, concepts and methodologies. It was regarded as important to reach common understandings of theoretical/methodological accounts, which does not necessarily mean agreement on interpretations, but at least agreement on differences in interpretations. In doing this we aimed at picking out specific topics and concepts we wanted to focus on. The core example of this is the paper presented in Taiwan. The intention was also that the cases would be a founding element to identify common research topics to work with in the group or in different constellations within the group.

The other principle was to identify cases of studies that each member institution wanted to work with in doing new research. Also in this case the process was bottom-up. These cases should be possible to develop and adjust in a joint enterprise, to use Etienne Wengers terminology (Wenger, 1998). The ultimate goal of this was to develop a small set of joint research based design experiments, with a set of local empirical investigations. The work of refining these studies was supposed to be continued in the ERT.

The case studies, which we are going to report in the following, are based on the on-going research already conducted at the member institutions.

The study of "conditions for productive learning in networked learning environment" is based on qualitative case studies (Stake 1995; Flyvbjerg 2001). The aim of the inquiry is to understand the meaning of selected aspects of productive learning in networked learning environments and in line with a *social theory of practice* perspective (Fjuk and Berge 2004 (forthcoming); Orlikowski 2000; Wenger 1998) – to use case-studies to base the development of concepts on networked learning in practice.

Each partner has therefore brought a case study into the JEIRP. The cases were not selected in order to be representative for networked learning environments. However, they were selected because they illustrated prototypical problems and experiences within networked learning (Flyvbjerg 2001) and because they were "best" cases.

Tolsby (2005) and Stake (1995) describe such a case study, driven by specific research questions, as an instrumental case study. The aim is not to understand the particular case as such, but to get general understanding and insight into the research questions by studying a particular case.

The case studies taking together cover a wide range of core questions concerning productive

learning in networked learning environment. Based on the conceptualisation and re-conceptualisation of the cases it's expected, that the shared study within the JEIRP will bring forward insights regard theoretical, methodological and empirical validated findings regard core issues on "conditions for productive learning in networked learning environments".

The following case studies were suggested for the JEIRP[3]:
Case 1: *Facilitator's invisible expertise and supra-situational activities in a telelearning environment*
Viktor Kaptelinin and Ulf Hedestig, Department of Informatics, Umeå University, Sweden
Case 2: *Learning the Process of Programming Through ICT-Mediated Apprenticeship - An Activity Theoretical Approach*
Annita Fjuk and Ola Berge, Intermedia, Norway
Case 3: *Productive learning processes and standardisation*
Anne Rasmussen, IT-University West, University of Southern Denmark
Case 4: *Network theory and description - The Lancaster ALT Masters programme*
Chris Jones, Lancaster University, UK
Case 5: *Towards a Networked Community of Learners and Carers: The WebAutism Project*
Rachel Pilkington and Karen Guldberg, School of Education, The University of Birmingham, UK.
Case 6: *Sharing Thoughts in Computer Mediated Communication*
Lars-Erik Jonsson, Sylvi Vigmo, Louise Peterson, Annika Bergviken-Rensfeldt
IT-university, Department of Education, Gothenburg University, Sweden
Case 7: *Human Centered Informatics - The emergence of an educational Infrastructure*
Tom Nyvang and Ann Bygholm, Aalborg University, Denmark
Case 8: *eLearning in Austrian Teacher Colleges*
Michael Wagner, Donau-Universität, Austria
Case 9: *Patterns of Facilitation in distributed Problem-Based Learning – Pedagogical Approaches to Promote Active Student Participation*
Ulric Björck and Berner Lindström, IT-University of Gothenburg, Sweden
Case 10: *European and Latin American Consortium for IST Enhanced Continued Education in Environmental Management and Planning – ELAC*
Laura Zurita, Aalborg University, Denmark

Case 10, European and Latin American Consortium for IST Enhanced Continued Education in Environmental Management and Planning – ELAC, was later withdrawn due to the immature stadium of the case.

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3 Case studies

In the following, we have categorized the cases with respect to the core interest of the case. The table indicates that most cases deal with issues from traditional higher educations, which we call on-campus in this text. One third of the cases deal with continuous professional development, which we call off-campus, and finally two cases deal with informal learning. Most of the cases are related to design issues. Two cases, however, touch upon certain pedagogical approaches and another two cases deal with aspects of teachers' work.

Domain/ issue	Design	Didactics	Teacher work
Higher education (on-campus)	Case 6; Case 7; Case 8	(Case 9)[4]	Case 1 Case 9
Continuous Professional Development (off-campus)	Case 2; Case 4; Case 10	(Case 2)[5]	
Community learning (informal)	Case 3; Case 5		
Other			

The case studies are presented in the following section. The presentation is based upon the abstract for each case and some elaborated comments from the researchers. The comments concern the motivation for selecting the case, as well as its placement in a broader universe.

3.1 Presentation of the case studies

The case *"Facilitator's invisible expertise and supra-situational activities in a telelearning environment"*, has been brought into the JEIRP by Ulf Hedestig and Victor Kaptelinin from the Department of Informatics at Umeå University, Sweden. The case reports a study of a videoconference-based distributed learning environment and factors determining the success of teaching and learning in that environment. More specifically, the focus is on the role of a person with formal responsibilities of a "technician" in preventing potential obstacles to immersion and collaboration in the setting. The case study is based on a yearlong ethnographic study. The findings are interpreted as indications that "supra-situational" activities can be a major factor of successful function and development of emerging learning environments. Design implications of the study are briefly discussed.

The case is based on the assumption that learning is a social process and should be supported as such. However, in networked learning environments, support for the social context of learning is often limited to providing text-based communication tools for person-to-person communication and group discussions (e.g., online discussion forums). This support is important and often used successfully. But both participant needs in educational settings and emerging technological affordances indicate that new and more advanced types of communication and collaboration tools and systems can and should be provided (see eg. Dirckinck-Holmfeld, 2002).

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[4] The case focuses on scaffolding in relation to an explicit pedagogical approach of problem based learning
[5] The case concerns pedagogical design, however explores a certain approach to ICT-mediated apprenticeship learning. The case is therefore put in a bracket in the column on Didactics.

There are reasons for believing that network learning environments can benefit from more advanced video-based communication tools. The need to go beyond text-based communication is indicated by a growing use of desktop videoconferences in online education (Kies et al, 1997). Currently, the resolution and transmission speed constraints limit the range of possible uses of desktop videoconferences in education. However, in the future, we are likely to witness development of affordable and powerful videoconference facilities.

Understanding the conditions of productive learning in network learning environments, in which rich communication between remote participants is supported, requires an understanding of potential breakdowns and success factors in videoconference environments. To explore these issues, we selected the case of a videoconference education setting and the role of a facilitator in this setting. The case, described in the deliverable, was also presented at a conference (Hedestig, Kaptelinin, 2003) and published as a journal paper (Hedestig, Kaptelinin, 2005).

The case was selected from a variety of other similar cases. In recent years, research in technology enhanced learning at the Department of Informatics, Umeå University, has dealt with a number of issues and we could bring in a range of potential cases to the JEIRP. Our past and ongoing studies have addressed, among others, organizational issues of setting up a decentralized education program, analysis, design, implementation, use of mobile technologies, and 3D virtual learning spaces. The reasons why the videoconference setting case was thought to be particularly relevant to the aims of the JEIRP were as follows:

a) Special purpose videoconferencing settings are typically more advanced than desktop video tools. We can expect personalized, mobile solutions, such as desktop video, to reach (and perhaps eventually exceed) that level in the near future. Therefore, videoconferencing settings provide a "sneak preview" of activities that can be carried out in future networked learning environments.

b) Videoconference settings have developed over an extended period of time and accumulated substantial experience of problems and their solutions when arranging distributed communication and collaboration. In our view, this experience is important to take into account when creating more advanced networked learning environments.

c) The informant in our study was a competent technician/ facilitator of a videoconference setting, who contributed greatly to successful teaching and learning in the setting. Understanding the types of activities, strategies, and roles of that person was considered as a way to understand possible ways of successful design of videoconference environments, in which teachers are not provided with ongoing support of a technician/ facilitator.

The case is viewed as a prototypical case, which can provide insight into a new application area. The case findings are expected to provide insight into the conceptualisation of the problem area of video conferencing and the role of the "technicians" and "facilitators" for productive learning as well as to provide empirical findings which may support a further uptake and application of the tool. The case focuses on networked learning environments for on-campus students, although organised in distributed learning environments.

The case *"Learning the Process of Programming Through ICT-Mediated Apprenticeship, An Activity Theoretical Approach"* by Annita Fjuk and Ola Berge from InterMedia at University of Oslo / Telenor R & D, Norway, focuses on using activity theoretical concepts as analytical tools for improving pedagogical design of a particular course on object-oriented programming. They argue that productive learning environments must be regarded as environments in which certain pedagogical, communicative, technological conditions are incorporated with the specific knowledge domain, the objective of the central learning activity, the pedagogical approach, and the target group. Furthermore, they illustrate the power of using activity theoretical concepts – particularly contradictions – for identifying misfits and problems regarding these conditions.

The case study was chosen due to the understanding that productive networked learning environments are not solely considered in terms of the operational functionality of the information- and communication technologies (ICTs) used. Productive learning environments must be understood as environments in which certain communicative conditions are incorporated with the specific knowledge domain, the objective of the central learning activity and the pedagogical approach.

The case study aimed at examining the communicative conditions that developed in a networked learning situation resting on pedagogical ideals of apprenticeship learning. Apprenticeship learning is particularly interesting since it is theoretically grounded in different situations than networked learning situations. Theories on apprenticeship learning concern the learning of a craft in the community of practice where the work is carried out. This typically implies physical proximity between the teacher and the apprentice, situated in the teacher's workshop where the actual production takes place. An online learning situation departs from such settings with respect to two significant issues: The teacher and the learner are not physically co-located for most of the time, and learning takes place in an institutional education setting, not at the workplace. Therefore, it is not straightforward to implement principles from apprenticeship learning to network learning.

Furthermore, the knowledge domain of the study was introduction to object-oriented programming (IOOP), delivered by Aarhus University in Denmark. The learning objective of the particular course under study was on describing concepts and phenomena rather than on computer instruction or management of program descriptions. Given this objective, the learners should learn systematic ways of implementing general models and, through this, obtain a deeper understanding of the programming processes. Hence, it is important that the learners gain insight into how programmers develop their solutions from the initial problems to the final program code, that is, pragmatics of a professional programmer. In the pragmatics, we include the practical use of the tools, the tips and tricks, how to create code with low coupling and high cohesion, etc.

The case study is viewed as a prototypical case with respect to two integrated problem areas, the implementation of apprenticeship learning in networked learning and how the knowledge domain of object-oriented programming could be taught under these circumstances. The findings from the case are expecting to provide empirically based insights into the conceptualisation of the problem area of networked learning as well as the conceptualisation of new methods for object-oriented programming (IOOP). The case focuses on networked learning environments for professionals situated in distributed learning environments.

The case *"Productive learning processes and standardisation"*, which has been brought into the JEIRP by Anne Rasmussen from IT University West, University of Southern Denmark presents an introductory study of the conditions required for an expansion of computer-mediated productive learning processes in the health care sector seen from an ethical, value-rational perspective. The article attempts a critical analysis of the use of IT-systems for administration and knowledge management in Danish health care programmes for the elderly and points out the system's negative influence on opportunities for the development of skills among its users.

The purpose of this case has been to study whether an ethical perspective can highlight some of the deeper conflicts blocking the establishment of productive learning activities, and thereby inform the future design of knowledge building activities in connection to network learning environments.

Through a concrete empirical study conducted in the Danish elderly care sector, this case has highlighted how articulation of knowledge into formalized standards tends to create conflicts with the knowledge and ethos embedded in a given practice. When technology furthermore involves movement towards control and surveillance, individuals experience an inevitable loss of self-esteem and a reduced sense of responsibility in relation to their working situation.

By bringing attention to the importance of ethical considerations in connection with the overall study of productive learning, this case has been used to introduce to the Kaleidoscope network a theoretically distinct perspective on learning that differs from the perspective around which we ordinarily center our discussions. Thereby, this case has been a catalyst and enabled us to reframe discussions of our different cases in the light of ethical insights. The article provides a critical analysis of the use of IT-systems for administration and knowledge management in Danish programmes for care for the elderly and points out the system's negative influence on opportunities for development of skills. In addition, this case has pinpointed the importance of providing for design of learning environments that balance the need for standardization and at the same time provide opportunities for engaged participation and knowledge growth.

The case *"Network theory and description - The Lancaster ALT Masters programme"*, which has been brought into the JEIRP by Chris Jones from Lancaster University, United Kingdom, uses the Lancaster MSc in Advanced Learning Technology and examines some of its features in relation to the network metaphor. The Lancaster case study was chosen because it has a distinct and explicit design philosophy that contrasts with some of the current design assumptions in TEL. The case study examines the Lancaster MSc in Advanced Learning Technology and some of its features in relation to the networked learning metaphor, which the Lancaster team had argued to be a key issue. The definition sued by the course team is:
Networked learning is learning in which information and communication technology (C&IT) is used to promote connections: between one learner and other learners, between learners and tutors; between a learning community and its learning resources.

The first criterion was that this case study would cast light on the key theoretical issues identified in the JEIRP. The network metaphor was related to the theoretical framework by examining the course in terms of its own design principles, which were explicitly, articulated as networked learning. The ALT programme does not seem to fall easily into other standard design philosophies such as CSCL or Communities of Practice. Networked learning differs from CSCL and Communities of Practice in that it does not privilege either cooperation or collaboration nor does it emphasise the closeness

of community or the unity of purpose. While the course has a high level philosophy that takes into account socio-cultural theories including communities of practice, it has an orientation towards learning as taking place in relation to the individual in a social context. In particular, the context for many of the learners on this masters level programme would be their workplace community rather than a learning community. The case draws attention to this particular design focus on individual learning in a social setting and situates this in relation to the issues of indirect design, the task driven nature of the design and the level of flexibility built into the student's engagement with the course. The case is a prototypical case engaged with conceptualising networked learning based on certain principles in relation to continuous professional development at university level.

The case *"Towards a Networked Community of Learners and Carers: The WebAutism Project"* was brought into the JEIRP by Rachel Pilkington and Karen Guldberg, School of Education, The University of Birmingham, UK. The project studied in the case is set within the context of a networked learning course that offers post-experience professional training to non-traditional university students - parents and carers of people with Autistic Spectrum Disorders (ASD). The course is offered as a flexible and blended course with online module activities supported by face-to-face workshops and online tutorials. Reading material including audio-visual material is closely integrated with collaborative online discussion.

Initial evaluation of the course has shown higher than expected retention rates, a high proportion of 70%+ grades for students and excellent evaluations from students. In that sense it is a best case scenario. The main methodological focus of the more recent and ongoing research has been the application of discourse analysis to look for evidence of learner appropriation of the professional discourse of the ASD carer (one measure of learning to be a reflective practitioner in this context) and changes in the quality of collaborative activity (another aspect of learning to be a practitioner in this context). Based on an analysis of a sample of discussions, insights are gained into the progress and development of adult learning and identity in a networked learning context.

The case *"Sharing Thoughts in Computer Mediated Communication"* was brought into the JEIRP by Lars-Erik Jonsson, Sylvi Vigmo, Louise Peterson, Annika Bergviken-Rensfeldt
IT-university, Department of Education, Gothenburg University, Sweden
The case focuses on the students' textual participation in asynchronous Computer Mediated Communication in a distance education course at master level. The analysis has focused on how the students interpret the course objectives and how these are enacted in the virtual discussions using a shared document tool. The case further attempts to describe the students' own negotiation of structuring their participation. The case is an effort to cast light on the conditions of learning through engagement and participation. In other words, we wanted to better understand the conditions of collaborative learning assisted by collaborative tools. In terms of the theoretical model developed in the JEIRP, the affordances of the networked learning environment were explored. Theoretically, the case is a way to explore the concept of a community of practice (Wenger, 1998). The observed outcome suggests further investigation of the benefits and constraints while using a shared document as mediating tool for collaborative networked learning.

The case *"Human Centered Informatics - The emergence of an educational Infrastructure"* was brought into the JEIRP by Tom Nyvang and Ann Bygholm, Department of Communication,

Aalborg University, Denmark. The case focuses on ways to organise implementation of ICT in learning environments within higher education. Bearing in mind the continuous development of ICT, it also seems important to recognize that implementation of ICT is not going to be a one-time event. One of the very first steps needed in order to prepare organisations to facilitate the change processes is to actually understand what implementation of ICT in learning environments is and how it affects practice. This case explores perspectives on implementation of ICT in higher education.

The research focus on implementation of productive networked learning environments was chosen in line with the focus on conditions launched by the JEIRP. It was thus the assumption that an important condition for productive networked learning is an implementation that is efficient in terms of providing a suitable technology and in terms of supporting innovative use.

Human Centered Informatics was regarded a useful frame for this research for four different reasons:

a) In a Danish context, it is a relatively large programme with 600 students and 100 teachers
b) The programme is quite diverse in terms of subject content in the different specializations and attitudes towards the usefulness of ICT in productive learning
c) The programme is relatively productive in terms of number of students entering, passing exams and finishing with a degree
d) The programme is also productive in terms of employment rate for graduates.

All together these four reasons convinced us that Human Centered Informatics could be expected to form good practice based on the assumption that an already successful programme would also be likely to develop and implement more ICT. The diversity and size also convinced us that we could expect to see challenges and practices emerge that were sometimes driven by consensus and sometimes by contradictory perspectives which would offer us the ability to inform a broader range of organizations based on the present case study. Finally, we had access to an amount of data that convinced us that Human Centered Informatics would be a trustworthy base for a case study.

The case *"eLearning in Austrian Teacher Colleges"* was brought into the JEIRP by Andrea Bernsteiner and Angelika Lehner-Wieternik, Department of Telecommunications, Information and Media, Donau University Krems, Austria. The case investigates the situation of Austrian Teacher colleges in general and discusses the implementation of one particular eLearning course at the Teacher College Baden near Vienna. Furthermore, the case focuses on course evaluation.
The case was selected because it provides a practical example of the cycle of the implementation, execution and evaluation of a blended learning course. The context for the case is an on-campus university setting, and the case provides insight into some of the problems for blended learning, when students are used to – and have more easy access to – face-to-face communication.

The case *"Patterns of Facilitation in distributed Problem-Based Learning – Pedagogical Approaches to Promote Active Student Participation"* was brought into the JEIRP by Ulric Björck and Berner Lindström from Department of Education, Gothenburg University, Sweden
The case focuses on the role of the facilitator in distributed problem-based learning. Traditionally, attention has been put on either online courses or the traditional (face-to-face) problem-based

learning (references). The focus of the case study is the interaction between teachers and students when these roles are combined in distributed problem-based learning.

An account is presented that considers facilitation as a dynamic process. By focusing on three facilitators' discursive actions in a text-based conferencing system, this paper pays special attention to facilitators' scaffolding. Two structurally significant facilitator approaches, the active facilitation approach and the meta-commenting approach, that were studied in the six groups are presented paying close attention to how student groups have come to use the structured method of distributed problem-based learning. The active facilitation approach is characterized by a high degree of facilitator participation and procedural involvement in actively assisting the group. In the meta-commenting approach, the facilitator's actions aim at getting students active in commenting on each other's work. It appears that this latter strategy offers better possibilities for students to express their reasoning.

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3.2 Case: Facilitator's invisible expertise and supra-situational activities in a telelearning environment

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Abstract: With network learning environments being used to support full time educational programs and distributed groups of students, the role of synchronous "one-to-many" communication is likely to increase. In particular, more advanced flexible and portable videoconferencing solutions can be expected to substitute current desktop videoconferencing tools. Some of anticipated features of future portable tools can be found in current videoconference studios. The paper reports a study of a videoconference-based environment in decentralized education and factors determining the success of teaching and learning in the environment. More specifically, the focus of the paper is on the role of a person having the formal responsibilities of a "technician" in preventing potential obstacles to immersion and collaboration in the setting. An ethnographic study, conducted over the course of a year, has revealed that the contribution of this person, who should more properly be called a "facilitator", far exceeds the scope of responsibilities assigned to him and recognized by the management. The facilitator was found to possess key expertise, which was critically important for supporting interaction between remote participants at several levels: attention management, time management, acquisition of setting-specific skills, and coordination within a larger institutional context. The roles and tasks of the facilitator in the everyday functioning of the setting are described. The findings indicate that technological sophistication does not automatically result in better network learning environments. The social context of learning, supported, in particular, by the many roles of the facilitator, is a key factor of success.

3.2.1 Introduction

Making the potential benefits of technology-enhanced education come true is associated with serious challenges. According to existing literature on the topic, many attempts to implement these types of education have not been particularly successful, and a substantial fraction can be considered downright failures (see Wulf, Schnitsel, 1998; Martinez et al, 2004).

Text-based online communication, commonly employed in current network learning environments, imposes constraints on teacher's possibilities for dynamic flexible management of educational activities. The teacher misses rich non-verbal clues indicating relevant individual and group responses, such as emotional reactions, confusion, disagreement, readiness to ask a question or contribute with a comment, and so forth. Limiting communication to text-based mode can also present problems for students, as well.

There are reasons to believe network learning environment can benefit from more advanced video-based communication tools, especially integrated with text-based communication and shared workspaces. The need to go beyond text-based communication is indicated by a growing use of desktop video conferencing in online education (Kies et al, 1997). Currently the resolution and transmission speed constrains limit the range of possible uses of desktop video conferencing in education. However, in the future we are likely to witness development of affordable and powerful videoconferencing facilities.

Understanding the conditions of productive learning in network learning environment, in which rich communication between remote participants is supported requires an understanding of potential breakdowns and success factors in videoconferencing environments. To explore these issues, we selected the case of a videoconference university education setting and the role of a facilitator in this setting. The case, described in the deliverable, was also presented at a conference (Hedestig, Kaptelinin, 2003) and is expected to be published as a journal paper (Hedestig, Kaptelinin, in press).

In this paper we will mainly deal with design of learning activities and settings rather than purely technological design. This aspect appears to be relatively underdeveloped in current research comparing to technology-related issues, even though, creating appropriate educational and social contexts is apparently even more important than creating advanced technologies. High-end virtual realities can provide a remarkable perceptual presence but little or no social, cognitive, and emotional engagement. On the other hand, very basic technologies, such as simple chat facilities or instant messaging systems, can result in intensive immersion experience sustained for many hours. It appears self-evident that the use and development of technology cannot be the main goal in creating learning environments, computer-supported or not. Learning environments have to help teachers and students accomplish their meaningful goals, which goals are essentially the same in all types of environments. Therefore, it can be concluded that design of computer support for learning should be subordinated to design of teaching and learning.

The above conclusion, however, cannot be interpreted as a claim for a straightforward "waterfall" model of educational technology design, that is, an arrangement, according to which educators would compile a list of requirements and hand it over to system developers to implement, somewhere "down the river", in a system meeting these requirements. As already mentioned, successful technology-supported learning environments can only emerge as a result of bridging the gap between technology and learning activities through their mutual adjustments (see also Kaptelinin, 2002). In our view, one of the most important objectives of research in the area of Computer Support for Collaborative Learning (CSCL) should be providing an insight into how technological affordances and limitations are related to the specifics of teaching and learning. Such a research can contribute to bridging the above gap at two levels. At a more specific level, the positive and negative aspects of the use of technology in a setting can be identified and made explicit. These findings can be used to improve the setting by capitalizing upon the apparent successes and trying to eliminate the causes of discovered breakdowns. At a more general level, such a research can result in developing a concrete framework or a model helping to reach a general understanding of how educational design and technological designs are related to each other.

The study reported in this paper is an attempt to take a step towards bridging educational and technological issues. In this study we analyzed decentralized undergraduate programs delivered by a university in northern Sweden. A detailed analysis of both educational and technological issues within this context, including their development over time, combined with occasional interventions, was selected as a long-term research strategy underlying a series of related studies. In a recent study we have analyzed a videoconference setting within the decentralized program from the point of view of breakdowns caused by recurrent attempts of teachers to apply educational expertise acquired in regular classrooms in another context (Hedestig, Kaptelinin, 2002). In the present paper we report another study conducted in the same setting but focusing on factors of success rather than on breakdowns. More specifically, the paper deals with the work practice of a technician, whose responsibilities formally consisted of making sure the equipment was in working order and properly

set during videoconference sessions. However, the results of an earlier pilot study[6] conducted in another videoconference setting (Ersbjörnsson, 1997) suggested that the role actually played by a technician can be quite different from its formal description. The findings of that preliminary study indicated that a smooth functioning of the videoconference setting was only possible because the technician assumed a number of extra responsibilities, not formally required of him. The aim of the present study was to collect more conclusive data about the actual work practice of a videoconference setting technician in the context of a learning environment as a whole.

The rest of the paper is organized as follows. The next section places the study in a larger-scale research context, that is, analysis of everyday work practices of people using technology in real-life settings. Besides, the section contrasts two perspectives on studying technology in work contexts: activity theory and distributed cognition. After that a detailed description of the method and the settings analyzed in the study is given. Then the findings are presented, describing the various roles of the facilitator. The paper concludes with introducing the notion of supra-situational activities in the context of emerging learning environments and a discussion of design implications of the study.

3.2.2 Understanding work practice

In recent 10-15 years most of the research in the area of Human-Computer Interaction (HCI) and related areas has undergone a radical conceptual shift. Previously, the primary focus of researchers was on cognitive phenomena related to human interaction with technology, such as mental models, cognitive skills, or knowledge needed to complete certain tasks. This approach resulted in numerous experimental studies of human-computer interaction and a number of analytical tools for design and evaluation, such as task analysis, cognitive walkthroughs, and usability heuristics (Shneiderman 1998). Now it is widely accepted that the cognitive perspective in HCI does not provide enough support for understanding everyday practices of people who are using technology in real-life social settings (Carroll, 1991). The current conceptual trend, especially in Computer Supported Cooperative Work (CSCW), emphasizes the situated, contextualized, social, intentional nature of interaction with technology (Bowker et al, 1998).

This trend is not associated with one concrete theory. It is represented by a variety of theoretical frameworks, including (but not limited to) ethnomethodology, actor-network theory, activity theory, and distributed cognition (Hutchins 1995; Kaptelinin, 1996; Monteiro, 2000; Nardi 1996; Suchman, 1987). Even though these frameworks differ from each other, they share some key concerns. All of them are trying to provide an alternative to purely rational, explicit, normative, and pragmatic approach to understanding work and other types of human activities (e.g., Sachs, 1995). Numerous studies demonstrated that detailed analyses of what people are actually doing when carrying out their everyday activities can reveal tacit but critically important aspects of the use of technology. If these aspects are not taken into account, which is often the case, a system is likely to be difficult or even impossible to use (Bowers et al., 1995).

The study reported in this paper deals with everyday practices in a videoconference-based learning environment. The main approach used in the study was ethnography. The choice of this approach was determined by the nature of the main issue addressed in the study, that is, mutual relations between educational and technological factors in a real-life setting. We intended to provide an insight into this issue by bringing both learning and technology into the focus of a detailed analysis.

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[6] A diploma project supervised by the authors of this paper

The study also addressed a more general theoretical issue. The mixture of contextual, situational approaches currently dominating HCI and CSCW research have extended the scope of analysis to include many phenomena, which were essentially ignored by the cognitivist approach. At the same time, however, contextual approaches are often rather abstract, vague, and contradictory comparing to cognitivist models, which are typically concrete, structured, and easy to apply in systems design. In our view, contextual approaches need to be elaborated upon to inform and support system design more effectively, and it is important to make explicit and discuss the differences between these approaches. In an earlier paper (Hedestig, Kaptelinin, 2002) we discussed some of the differences and in this paper we continue this analysis by contrasting activity theory and distributed cognition accounts of a multi-actor technology-supported setting.

According to activity theory, collective activities are characterized by conflicts between individual and collective subjects. Individuals are attaining their goals, while at the same time contributing to goal-oriented activities of a collective subject, for instance, a team or an organization. The goals of a collective activity and of participating individuals can (and often do) come into conflict. The dynamics of collective activities, according to activity theory, are essentially determined by continuous processes of conflict resolution between individual and collective goals (e.g., Kaptelinin, Cole, 2002). The distributed cognition approach gives a different account of collective activities, such as ship navigation (Hutchins, 1995). According to this approach, the scope of analysis should be extended to include the system as a whole. Various components of the system, such as human beings and artifacts, contribute to functioning of the system but none (or nothing) except the system itself can be considered as having control of the collective activity.

Concerning potential factors underlying the success of teaching and learning in a videoconference setting, activity theory and distributed cognition point out to two different sets of critical issues. According to activity theory, it is not possible to avoid contradictions between individual and collective activities. The success or failure of a system depends on the success or failure of the ongoing process of resolving the above contradictions, as well as on mutual transformations of individual and collective activities. The distributed cognition approach, on the other hand, postulates that a successful system can have no contradictions at all. Individuals and artifacts can be "concerned" only with their respective subtasks, while the structure of the system as a whole can provide a coordination of these subtasks in order to attain the overall goal.

Therefore, the objective of the study was twofold. First, it aimed at understanding the roles assumed by a technician/ facilitator in a videoconference-based learning setting. Second, it intended to find out which theoretical approach, activity theory or distributed cognition, gives a more suitable account of the roles.

3.2.3   The object and method of the study

The videoconference settings analyzed in the study were set up to support distance and decentralized education delivered by a university in northern Sweden. For this purpose the university had several video studios located on campus. They had different equipment and were intended to be used for different purposes. The studios varied from a small room admitting only a teacher and a technician to a large lecture hall where not only a teacher and a technician, but also a group of on campus students could be present.
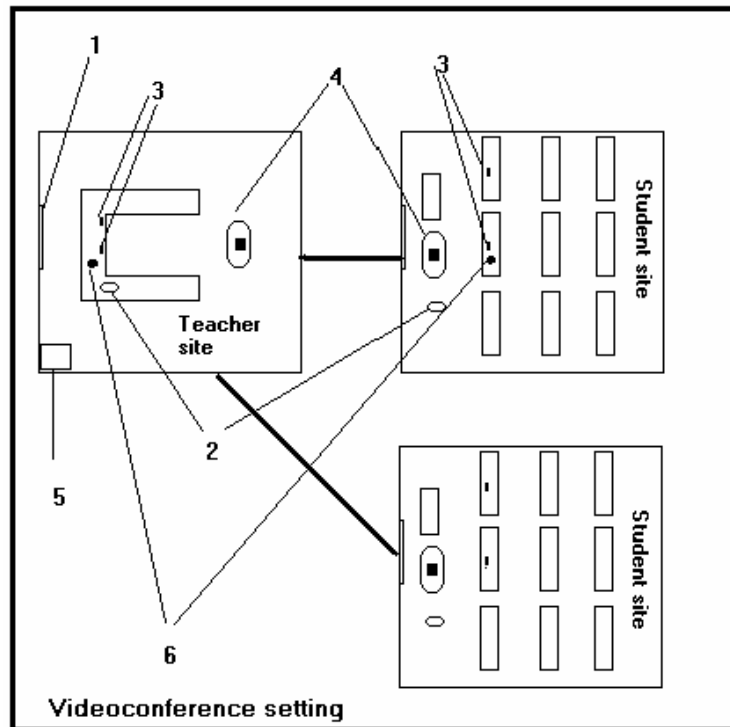
Figure 1: Typical layouts of a teacher site (studio) and student sites. The studio is equipped with traditional or electronic whiteboards (1), remote controls (2), microphones (3), cameras and TV-monitors (4), and a computer (5)

Typically, during the videoconference sessions analyzed in the study a teacher and a technician were present in a small on campus studio connected to one or more student sites, mostly located at "study centers" in other towns in the same area, that is, northern Sweden (see Figure 1). The formats of learning sessions included traditional lectures, seminars, and small group discussions, typically related to group projects.

The study employed ethnography as its main data collection method. It was conducted by one of the authors (Ulf Hedestig) during one year. The data was collected from several sources:

a) Field observations of over 100 hours of learning and teaching at three different video studio settings. The technician was the same during all the sessions, while the teachers were different, coming from different departments. The field notes taken during and after the observations were dealing mostly with interaction between teachers, students, and the technician.

b) Interviews with the technician both at work and home. At work the interviews were conducted before and after video sessions. Besides, numerous interviews and observations were conducted at home, which proved to be helpful in eliminating a communication barrier and reaching a better understanding of the technician, his opinions, reflections, and personality.

c) "Guided tours" given by the technicians each time when observations was taking place in a new setting. During the tours the technician was explaining and showing how he was working in each setting.

d) Interviews with other participants in the setting, that is, teachers and students, as well as managers.

Conducting field observations was often associated with a conflict between being a participant and an observer. Even though researcher's goal was to act as an observer, occasionally he was involved as an active participant. Situations of that type could occur haphazardly, for instance, the technician would receive a phone call in the middle of a videoconference session and without any notice would leave the remote controls to the researcher. Those situations gave the researcher an opportunity to have a direct experience of being a technician and a better understanding of interactions in the setting.

The technician we have been observing had been working at the university for about six years. During these years he was assigned to different organizational units within the university. Due to an uncertainty of university's policy regarding videoconference services, the technician's job was of a type that could be described as "seasonal": he received an hourly salary and had no job during vacations.

3.2.4   Results

The technician was regarded by the management as a person carrying out simple equipment maintenance tasks and his work description and responsibilities were defined accordingly. However, the teachers involved in videoconference sessions often saw him as a partner in the educational setting. In interviews with the teachers it transpired that the technician could play important roles in teacher's planning phase, during a videoconference session, or after a session. Many of these activities were situated and transient, they were difficult to observe because they quickly disappeared from the setting and from participants' memories. There were several reasons why the teachers were interested in involving the technician into educational activities. Most of the teachers we interviewed considered themselves novices regarding videoconference technology and its use in education. Therefore, they often felt they did not have enough control of the setting and in some cases they just delegated to the technician the responsibility for coordinating and supervising the lecture. Emerging roles of that type, resulted from explicit or implicit negotiations with the technician and a teacher, created new idiosyncratic work practices of the technician. In our study we identified the following roles that the technician assumed in the setting: a technician, a coach, a coordinator, an administrator, a teacher assistant, and a supervisor.

It should be noted that the specific roles played by the technician, as well as the degree of his intervention into the setting were highly situational and changed on the moment-to-moment basis. Generally, the technician contributed more if he thought the teacher needed help, but when a teacher was apparently able to manage all tasks on his or her own, technician's participation in a session was kept to a minimum.

Technician

The most obvious responsibility of the technician was taking care of the technology in a video studio. It involved maintenance of the equipment and adjusting cameras and audio devices before and during sessions. Besides, the technician occasionally had to make special arrangements for teachers who had special requirements, for instance, to conduct a video session in a regular classroom. In such cases the technician moved cameras, microphones and other equipment from the studio, and established a connection between the classroom and the studio, from which the session was transmitted to student sites.

During videoconference sessions the technician continuously worked with the equipment changing camera angels, zooming, and adjusting audio volume. His role in the setting was especially evident

in cases of technical breakdowns. The breakdowns were difficult to anticipate, they could happen anytime. They could be local, that is, caused by a problem at the teacher site, or external, that is, resulting from a technical problem with the communication network or equipment at a student site. Usually the technician could only solve local breakdowns. He apparently approached them on the basis of his past experiences with similar types of problems. In case of new types of breakdowns he followed a trial-and-error approach. When external breakdowns occurred the technician communicated with telecommunication operators or study center personnel. Such communications were characterized by a noticeable switch to technical vocabulary.

Even though there was usually a close collaboration and understanding between a teacher and the technician, it was obvious that sometimes their goals were conflicting. From his own experience the technician knew that many technical breakdowns were caused by the lack of careful planning on the side of teachers. He tried therefore to encourage teachers to make careful plans before they entered the setting and this recommendation was substantiated with references to videoconference literature, which mentions careful planning as one of the most common guidelines (Diamond and Richards, 1996, Keiper, 1990). However, some of the teachers, especially those who had an experience with videoconference settings, had a rather negative attitude towards these recommendations. Their experience was that plans were seldom followed in dynamic and unpredictable videoconference settings. Problems that could happen include students forgetting the schedule, delayed breaks, or technical breakdowns that could make it necessary to revise a plan and improvise. It should be noted that despite being an advocate of thorough planning, the technician was often indispensable when something unexpectedly went wrong and helped the teacher to make an appropriate decision, for instance, to cancel the session, change the medium, or try to fix the problem right away.

Coach

Most of the teachers we studied were not frequent users of videoconference technology. For the most part, they used it only once or twice a year. Only 20% of the teachers used videoconferences more often. Therefore, it is not surprising that the technician took a larger responsibility and acted as a support person or a coach for those who did not have enough experience and skills necessary to teach in a videoconference setting. This role was manifested, for instance, in the technician's initiative to try the equipment in advance together with a teacher, pay a visit to the teacher's department and discuss possible ways of conducting a videoconference session, and encourage the teacher to think about an appropriate pedagogical strategy. Numerous examples of coaching could be observed during videoconference sessions, when it was not uncommon for the technician to whisper hints or advices to the teacher. Here are several examples from the study:

> A teacher new to videoconference settings was delivering a lecture to three student sites. After a while the teacher started to ask questions to the students. No one answered. The technician told the teacher that one always has to address a question to a specific person (a course on the Swedish Law, May 15 2000)

> During a videoconference seminar students and the teacher were interrupting each other because of time delays in audio and video transmission. The technician stopped the participants and explained what the teacher and students should do to avoid breakdowns in turn taking (a course on Gender Studies, April 20, 2000)

Technician's recommendations and guidelines came from his own experiences of managing videoconference sessions. When he was asked why he wanted to visit teachers personally and have discussions with them before sessions, the technician answered that he believed it was the only way of getting an understanding of what a teacher really wanted to do in the studio.

> There are so many ways we can misunderstand each other and especially with teachers who have never used the technology. If they do not have right expectations of the technology and how they can use it, I won't have any job in the future (Interview with the technician)

Coordinator

Another contribution of the technician was his engagement in coordination of the activities connected to the videoconference setting. For instance, it was the technician who handled reservation of both videoconference studios on campus and remote facilities at study centers. Reservation is usually seen as a trivial and routine procedure but in regard to making a reservation for a videoconference session it is definitely not the case. Such a reservation required contacts with different organizations, which had their own reservation procedures and policies. The technician had to call study centers and find out which time slots were available. Since he did not now in advance at what times remote facilities could be used he could not make a suggestion to the teacher before getting information from a study center. Then the technician would contact the teacher and ask if the suggested schedule was appropriate for him or her, otherwise negotiations had to be started over again. This activity could take days to accomplish since it involved many actors, some of which were not always available. Making reservations was not included into the formal work description of the technician and therefore he was not paid for that. However, the technician thought it was sensible for him to do that anyway. He argued that he made reservation faster than the teachers because he knew everyone at study centers, had the knowledge of what the facilities they had, and could match them to teachers' requirements.

Coordination was sometimes related to coaching, described above. In some cases the facilitator helped to coordinate a session by making a recommendation of the order, in which different activities should take place. Such recommendations were especially helpful for teachers who used many different types of technology during videoconference sessions. To decrease time delays or probability of breakdowns the technician discussed with teachers the order in which they should use tools and devices, such as power-point slides, videotape recorder, electronic whiteboard etc. Such discussions helped a teacher and the technician to coordinate their efforts during a session and avoid possible breakdowns.

The technician also helped teachers coordinate various components of their presentations, for instance, by changing slides or overheads at appropriate times. To do it the technician had to listen carefully to the teacher and understand the content. It was found that the technician made practically no mistakes when making his own decisions concerning the time and the content a slide or an overhead.

Administrator

Making reservations for videoconference sessions required keeping track of on campus video studios. The technician could not use the university classroom reservation system for this purpose because the studios were not integrated into the system. To deal with this problem the facilitator

developed his own simple reservation tool (a Microsoft Word table). This reservation tool was stored on a computer in a videoconference studio, and was used exclusively by the technician

The reservation tool supported the technician in performing one more role, the one of an administrator. He used the information that he managed with the tool for calculating how much the departments had to pay for renting video studios. On the basis of this data and information about transmission costs, faxed to the technician by telecommunication operators, he prepared reports, which passed to his managers, who would, in their turn, send invoices to departments.

Teacher assistant
A role of the technician that could be clearly seen in our observations was his direct involvement in teaching. In decentralized undergraduate programs, where teachers and course topics changed all the time, the technician was the only permanent link between the students and the university. Since the technician was present during all sessions, he was in a position to develop knowledge about the students and the courses. He learned names of the students, their communication patterns, and interpersonal relation styles in student groups. He used this knowledge to help the teacher to engage the students in educational activities. It was not uncommon for the technician to talk to students in the beginning of a session, before the session was formally started by the teacher. Since the technician knew the names of the students he could personally address them questions either connected to previous videoconference sessions or to events taking place in their town. Most of teachers were not particularly comfortable with the media and they, especially those who participated for the first time, thought that such a small talk was a good way to create an informal and relaxed atmosphere.

Courses were often delivered by teacher teams rather then individual teachers, that is, different parts of a course were given by different persons. The technician's contribution was also important for maintaining coherence within a teacher team. For instance, when a teacher team shared a course he informed each teacher what happened during previous sessions. We regularly observed the technician explaining a teacher that his or her colleague changed the deadline for examinations, the course schedule, etc. It often turned out that the teacher was not aware of the changes before the technician informed about them.

One of the reasons why the technician became directly engaged in teaching was because many inexperienced teachers had difficulties with managing the contact with the students in videoconference settings. Comparing to a traditional classroom, where the teacher has a full control and awareness of the environment, videoconference settings usually require that teacher's attention is divided, for instance between different monitors. Many teachers ended up concentrating only on the content of a session and images sent to the students, while essentially ignoring the audience. Observation of what was happening at the student sites was therefore delegated to the technician. The technician developed highly effective skills of recognizing potential communication problems on the basis of students body movements and gestures. On the basis of these non-verbal clues he would, for instance, call teacher's attention to the fact that a student had a question, or did not hear what the teacher said, or wanted to participate in a discussion, etc. Monitoring of what was happening at the student site was also of importance from a technical perspective. If in a multi-point session (when a teacher site was connected to more than one student site) communication with one of the sites was lost, the technician could quickly detect the problem by keeping an eye on monitors for incoming images.

Another way of technician's participation in a session could be observed when a teacher wanted to initiate a dialogue. Sometimes the teacher began with asking the technician questions about the content, e.g., Was it difficult to understand? Is it clear how to apply the ideas?, before addressing the questions to the students. It gave the students time to reflect and formulate their thoughts.

Supervisor
Finally, we also observed the technician acting in the role that we call "a supervisor". In most cases there were no technicians or assistants at student sites. This meant that the technician, located on campus, was the only person in a virtual learning setting, who had enough expertise to handle equipment located at other sites. Our observations revealed that the technician regularly instructed the students how to adjust audio and video to achieve optimal quality. Also, he asked students questions about technical breakdowns and gave them advice on how they could solve the problem. If a technical problem could not be fixed at the student site the technician usually took charge of the session

> During a session the technician noticed color squares started to appear on the screen and a strange echo. He realized they were the symptoms of the so-called "bit rate problem" with the communication network and immediately stopped the session and interrupted the teacher, who was not aware of the problem. The technician explained to the teacher and the students that they were going to have a technical breakdown soon and they had to follow his instructions. He told the students to re-boot the system and checked if they had his phone number in case they had any problems. Then he re-booted his system and gave the teacher a detailed explanation why he was forced to do that. (Decentralized course in Sociology March 22, 2000)

3.2.5   Conclusions
In our previous study (Hedestig, Kaptelinin, 2002) it was shown that re-contextualization of traditional teaching and learning activities in a videoconference setting is associated with numerous and diverse breakdowns, both actual and potential. Even when all technological prerequisites are in place, it is not uncommon for remote participants to have no genuine collaboration and experience a videoconference setting as a TV broadcast. The present study provides an evidence demonstrating that in real-life educational activities many possible obstacles to immersion and collaboration can be avoided. The findings described above show that successful teacher-student and student-student interaction in a videoconference setting critically depended on the expertise of a facilitator. The facilitator was the only person in the setting possessing knowledge and skills necessary to manage the attention of the students through controlling the equipment, so that the important information could be onveyed and highlighted. The facilitator understood the specific time management problems associated with videoconference-based learning and unobtrusively intervened, when necessary, to avoid such problems. The facilitator also maintained a memory of the setting. He typically was in a better position than most of the teachers to get to know the students, their communication styles in the setting, most common communication problems and the ways they can be alleviated, etc. In other words, the facilitator's contribution to the session can be interpreted as acting out a variety of roles, from a cameraman to an administrator and from a teacher assistant to a supervisor. These roles were critically important for supporting interaction between remote participants at several levels: attention management, time management, acquisition of setting-specific skills, and coordination within a larger institutional context

The highly advanced, broad, and sophisticated expertise manifested by the facilitator was not the only remarkable characteristic of his work practice. There were two other aspects, which are worth mentioning. First, most of the contributions of the facilitator to teaching and learning in the setting were beyond his formal work responsibilities. The latter basically consisted of making sure that if a videoconference studio reservation was made for a certain time, then during that time the room must be unlocked, and the equipment checked and switched on. The facilitator had every right to leave to the teacher all the problems with switching between images, time management, discussion coordination, and so forth. However, as it was revealed in the study, the facilitator did not limit himself to his formal responsibilities.

Second, the contribution of the facilitator was largely unnoticed by other participants in the setting. When the skills and efforts of the facilitator resulted in a smooth, uninterrupted communication, the teacher and the students had the luxury of being immersed in educational activities and they practically did not pay attention to how the communication was made possible. However, they became aware of the facilitator in cases when something went wrong. In other words, the better, more expert job was done by the facilitator, the less it was recognized by the participants.

The lack of recognition of the facilitator's importance for successful functioning of the setting was especially obvious among the management. Attempts to raise the status of the facilitator and make his position permanent (which was important, in particular, for maintaining the "memory" of the setting) were initially rejected on the grounds that the job only included simple servicing of the equipment and did not require any special skills.

As mentioned before, a theoretical rationale behind the study was to compare two potential perspectives on collective activities in a videoconference-based learning environment, the one of activity theory and the one of distributed cognition. According to a distributed cognition model it would be possible to consider the facilitator as a system component with a scope of control limited to a predetermined set of functions/ responsibilities. However, our data indicate that such a description would not be accurate. What looked like a system that could be represented by a distributed cognition – style model was in fact a result of an individual actor voluntarily taking the initiative of acting beyond the limits determined by the system.

In our view, an application of the distributed cognition approach to emerging types -- or genres -- of collective activities can be problematic. In collective activities that have an established tradition, such as team navigation or surgery, one can easily identify cases where rules, norms, artifacts, and the structure of a setting can be considered as taking care of some communication, coordination, or integration problems. For instance, the layout of the physical space of an on-campus education provides an affordance for the students to spend breaks in areas just outside lecture halls. Therefore, when the teacher is coming back to a lecture hall after a break he or she is immediately noticed by the students, and it sends them a signal to finish the break, too. The teacher and the students may have no awareness of establishing a communication related to informing the students that the break is over. The historical evolution of the setting takes care of that particular coordination problem. However, educational genres that have a limited history may have serious problems with dealing with coordination problems even of the trivial type described above (Hedestig, Kaptelinin, 2002).

Therefore, the findings of our study present a challenge to the distributed cognition approach. However, they cannot be easily interpreted within an activity theory framework, either. Currently activity theory-based research is focussing on either individual activities and paying only peripheral

attention to "collective subjects" (e.g., Leontiev, 1978) or on collective activities and considering individual contributions only as subordinated actions (Engeström, 1987). Interactions between individual and collective activities have been considered mostly from the point of view of learning taking place within the cycles of internalization/ externalization (e.g., Cole, Engeström, 1993) Mutual transformations of individual and collective activities have rarely become an object of study (cf. Kaptelinin, Cole, 2002).

The findings reported in this paper indicate that individuals participating in a collective activity may appropriate and strive to attain certain goals that transcend the scope of responsibilities assigned to them within the structure of the collective activity as a whole. These phenomena have not become an important object of activity theory-based research in the west, while in Russia the concept of *supra-situational* activities is playing a key role in both fundamental and applied research for several decades (Petrovsky, 1975). The ability to transcend the immediate requirements of a situation at hand and carry out supra-situational activities is considered a basic prerequisite for personal development, not limited to acquisition of knowledge and skills. In our study supra-situational activities played a more concrete and pragmatic role, preventing breakdowns in a videoconference learning environments and making collaboration possible. Therefore, for both theoretical and practical reasons the concept of supra-situational activities is worth to be explored in future activity-theory based research.

Our study did not intend to produce an evaluation of a concrete educational technology or a set of design guidelines for developing such a technology. However, the findings, in our view, have implications for design of videoconference learning environments. The implications can be summarized as follows. First, the importance of supra-situational activities, especially for avoiding collaboration breakdowns in emerging types of learning environments, should be recognized and supported by system developers. For instance, the design of environments can provide individual participants in a collective activity with a representation of the structure of the activity as a whole, so that they can more easily appropriate goals transcending their immediate situations and coordinate these goals among each other. Second, the invisible expertise and supra-individual activities of people whose contributions make successful functioning of a setting possible should become an object of detailed analysis. Understanding of these phenomena can, on the one hand, anticipate problems that are likely to occur when these resources are not available (for instance, in a situation when a desktop video supposed to be used without a designated facilitator, is employed as an educational technology), and, on the other hand, orient system development towards implementing some of the functions currently supported by supra-situational activities.

Our study highlights the importance of supporting the historical continuity of educational activities in a setting. In our case accumulation and transmission of experiences within developing practices was achieved by the facilitator, which was the only link relating otherwise fragmented episodes of teaching and learning. In addition, our case illustrates the importance of providing conditions for supra-situational activities, where participants assume roles and responsibilities transcending immediate situational requirements. Novel learning environments generate numerous potentialities for breakdowns. We can conclude that an effective short-term coping strategy is stimulating supra-situational activities. It should be added that in the long run supra-situational activities should be crystallised in technological and institutional developments.

Concerning the role of the teacher, our study indicates that in geographically distributed learning environments a variety of roles should be assumed by people who deliver courses. In more

traditional environments teachers are not always aware of certain coordination and maintenance tasks, which are carried out by other people or supported by the organization of the learning setting. In new types of environments teachers face the need to take on new roles. Our study indicated that help provided by the technician/facilitator to teachers was a key factor preventing (but not always) the teachers from resorting to a sub-optimal teaching strategy effectively inhibiting productive learning, simple lecturing without paying attention to the students. In most NLEs teachers are not provided with the type of support found in our case, which increases the chances an online course might fail (cf. Martinez et al, 2004).

Analysis of the successful support provided by the facilitator to teachers in our case allows to tentatively identify directions for providing teachers with similar help in NLEs employing desktop videoconferencing tools.

First, teachers need to develop knowledge about common problems experienced in NLEs and skills of coping with the problems. Findings of our study give some guidance on what these knowledge and skills should be. Second, the design of videoconferencing tools for NLEs should aim at making it possible for other people to support teachers before, during, and after video sessions. Such help, similar to types of support found in our case, can be provided to teachers when they start using videoconferencing, in the form of *virtual coaching*, and when there is a need and possibility for other people to assist the teacher. Third, routine tasks should be automated as much as possible. Relatively simple solutions can be used for *automatic attention management*: for instance, the outgoing image can automatically switch to presentation slides when the teacher changes a slide or deliberately indicating an area of a slide.

It should be emphasized that the proposed directions for research and development are tentative and need to be further explored in future research.

3.2.6   Acknowledgments

3.2.7   References

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3.3   Case: Learning the Process of Programming Through ICT-Mediated Apprenticeship

An Activity Theoretical Approach

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Abstract: This case description focuses on how we have used activity theoretical concepts as analytical tools for improving better pedagogical design regarding a particular course on object-oriented programming. We argue that productive learning environments must be considered as environments where certain pedagogical, communicative, technological conditions are incorporated with the specific knowledge domain, the objective of the central learning activity, the pedagogical approach and, the target group. We illustrate the power of using activity theoretical concepts – particularly contradictions –for identifying misfits and problems regarding these conditions.

3.3.1   Dimensions of productive learning

Nowadays, productive networked learning environments are not solely considered in terms of the operational functionality of the information- and communication technologies (ICTs) used. Productive learning environments must be considered as environments where certain pedagogical, communicative, technological conditions are incorporated with the specific knowledge domain, the objective of the central learning activity, the pedagogical approach and, the target group.

We consider activity theory as a powerful analytical tool for understanding such a complexity and for making new design suggestions. In this case description we show the *potential* of using this theoretical framework in a case study where the central learning activity is learning object-oriented programming. The concrete results from the analysis, and how it should inform pedagogical designs, are elaborated in Fjuk & Berge (2004) and Bennedsen, Fjuk, Berge & Dolonen (2004).

3.3.2   Background

The knowledge domain of the case study is introduction to object-oriented programming (IOOP). The objective of the learning activity is abstract knowledge and concrete skills on the *programming process*. The importance of this objective is illustrated by Caspersen and Bennedsen (2004) by making a parallel to the processes of painting:
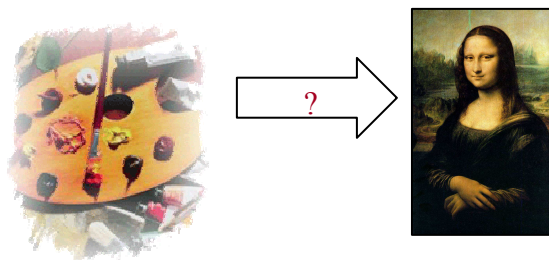

Figure 1: The absurd expectation of painting

> Suppose you attend a course in painting. The instructor briefly shows you different kinds of brushes and paint, tells you about canvas and chromatology, letting you try to use brushes and paint on a canvas for a few minutes. He next shows you a beautifully finished painting (by one of the grand old masters). Finally, he tells you to produce your own painting and bring him the finished product in a few weeks. You would think he was crazy! (Caspersen & Bennedsen 2004, inspired by Gries 1974)

Nevertheless, this is what traditionally takes place (judged by the majority of existing text books). The reality, however, is something like the situation shown in figure 2.

Figure 2: The process taking place

The process of learning to paint is a trial-and-error activity in using available tools and in being continuously guided by a more experienced peer (or master).

Transforming this metaphorical approach to programming, the focus of the particular IOOP course is on constructs for describing concepts and phenomena rather than on instructions of computers or on management of program descriptions. Given this focus the learners should learn systematic ways of implementing general models and, through this obtain a deeper understanding of the *programming processes*. Hence, it is important that the learners gain insights into how programmers develop their solutions from the initial problems to the final program code, that is, *showing pragmatics of a professional programmer*. In the pragmatics we include the practical use of the tools, the tips and tricks, how to create code with low coupling and high cohesion etc.

3.3.3   The Networked Learning Environment
Pedagogical methods/approaches
The pedagogical approach behind the IOOP course is inspired by features of apprenticeship in craft or craft like forms of production. In particular, Lave & Wenger (1991) describes how apprentice systems serve as pedagogical environments by giving examples from professions like tailors, quartermasters, butchers and alcoholics. Through various forms of organizing production, Lave & Wenger (1991) demonstrate rich relations between communities of apprentices and masters, their activities and artifacts. For example in their example connected to the apprenticeship of tailors, Lave & Wenger (1991) demonstrate how the apprentice learns a variety of techniques and develops basic interpretations of what the profession of tailors comprises. The earliest steps in the process of learning this profession were to sew by hand, to sew with the treadle sewing machine and to press clothes. This does not mean that the learning process merely is a re-production of the production processes. Rather, the

> "production steps are reversed, as apprentices begin by learning the
> finishing stages of producing a garment, go on to learn to sew it, and
> only later learn to cut it out." (Ibid, p. 72).

Theories on apprenticeship learning are, at the outset, concerned with the learning of a craft in the community of practice where the work is carried out. This typically implies physical proximity between the master and the apprentice, situated in the master's workshop where the actual production is taking place. This setting could be a blacksmith's workshop, as reported in (Nielsen & Kvale 1997), the workshop of a Gaia tailor or the bridge of a ship, shown in studies of (Lave & Wenger 1991). The IOOP case departs from such settings with respect to two significant issues: the master and the apprentices are not co-located physically for most of the time, and the learning takes place in an education institutional setting, not the workplace. It is not straightforward, then, to accommodate such perspectives on learning in the IOOP course.

This can be illustrated by a central part of the material system of IOOP: The programming environment (tool) used in IOOP, *BlueJ*, is explicitly designed for use in learning object orientation. Functionality is sacrificed for simplicity, meaning that this tool is not useful for professional software construction. Thus, a part of the material system the IOOP students becomes attuned to will not be a part of the material system in the community of practice where they will perform their profession.

One could view the IOOP participants, including the master and the teaching assistant, as the community of practice. The practice of this community could be to *learn* object-orientation; the apprentices are engaged in learning how to learn object orientation. But IOOP is also about including the students in other communities of practice, for instance the community of Java programmers. Such a community is represented by the master, the abstract constructs representing the object oriented paradigm such as the concepts *class* or *inheritance*, and boundary objects of the community such as the online Java SDK documentation or design patterns. It is this latter perspective that is predominant in the design of IOOP. But, given the reservation stated above, the pedagogical design is *inspired* by apprenticeship learning, not a direct application of it. For example, the apprentices observe the master when he carries out the practice of programming while reflecting on his actions. But they do not observe him implementing solutions to real-world problems, rather exercises that are simplifications of problems professional programmers encounter.

Target group
The target group under study was adult *part-time learners*, committed to different work organizations, families, geographical places, etc. Given this situation, the learning activities needed to be provided in a simple and flexible manner. All of the learners had access to the Internet. Their connection varied from a 128KB ISDN connection to a 1MB ADSL connection. A vital aspect of the course design was then to organize ICT-based applications that are easily accessible from the learner's PC and that provide quality with respect to the available networks.

Some of the learners had experienced object-oriented programming in their work practice. Others were rather inexperienced to the object-oriented philosophy but have programmed with help of procedural programming techniques.

This particular target group in combination with an apprenticeship inspired approach to programming, constituted a number of challenges in the course design.

Organization and Technology
The IOOP course is organized as blended learning, combining net-based activities with face-to-face seminars. This means that a variety of ICTs – services that are easily accessible from the individual's PC – have a vital position in the teaching and learning activities.

The course lasted for 15 weeks, during these 15 weeks there were *three face-to-face-seminars*; one in the beginning, one after a month and one a month before the exam. The two first face-to-face meetings lasted two days each, the last meeting one day. Activities directed towards knowledge construction on an abstract conceptual level were particularly conducted in the face-to-face weekend seminars. One example is an exercise where the students collaboratively defines core object oriented concepts and gives examples of these concepts from real life situations. Another example is the creation/abstraction of "coding patterns" (for example a general description of the implementation of an association) from several program examples. Such an approach is aimed at affording the student an understanding of the programs at the *conceptual level* instead of the "instructing the computer" level, and to show the students that programming can be done at an abstract level.

The net-based activities were organized in terms of the following aspects:
First, *pre-produced learning resources* that focuses on the processes of programming does not exist (Bennedsen & Caspersen 2004), and a core set of learning resources were needed to be designed for the particular learning objective. The learning resources found in IOOP include weekly assignments, pre-produced digital learning material, exercises and examples including program code, PowerPoint presentations and similar text-based documents. Concerning the assignments, a prerequisite for entering the exam is that the learner has passed at least 80% of the mandatory assignments. There was a mandatory assignment in most of the weeks – 12 in all. This naturally implies that the assignments have a very high attentiveness for the learners. The aim of the assignments is to afford individual knowledge concerning the syntax and semantics of Java, as well as to provide practical and hand-on skills on e.g. executions of program codes. Along with the assignments, pre-produced digital video material was designed for giving the learner hints associated with the assignments or for offering alternative explanations to the textbook. The video-material shows how the master reflects upon the problem and further how he approach it.

Furthermore, the assignments were considered as fundamental means for interaction between learner and master (teacher), and thus for legitimating the learner's actions towards the problem. As such, the apprenticeship approach implies a change *from* viewing the assignments as control / evaluation mechanisms *to* a communicative means between the master and the apprentice.

Second and in close relationship with the first challenge, the apprenticeship inspired approach requires good communicative conditions for reflection in action and for making the actions visible and as a source of identification (Nielsen & Kvale 1997). The master must be allowed to articulate and think aloud in terms of both natural and scientific language, as well as showing the pragmatics of programming. Furthermore, the learners must be allowed to *take part* in these actions collectively through dialogues and collaborative activities. Dynamically created digital material such as videos of weekly online meetings and web-based discussion forum were organized for this purpose. Concerning the former, the topics treated in these

meetings are based on the individual learner's experiences in solving the assignment, combined with her/his request. This approach denotes a particular mode of engagement and learner control, at the same time as the master legitimates and shows how programming / modeling processes associated with the weekly problem areas can be approached. The online meetings are mediated by real-time video streaming of the master's PC screen, where his usage of the various programming and modeling tools are shown. There is a corresponding audio stream, where the learners can hear how the master reason and think aloud about the problem. In order to support interactions amongst learners and between learner and master during the online meetings, a text-based chat conference in conjunction with the real-time audio- and video streams are organized. Figure 3 shows an example of the videos streaming of the master's PC screen through Windows Video Player:
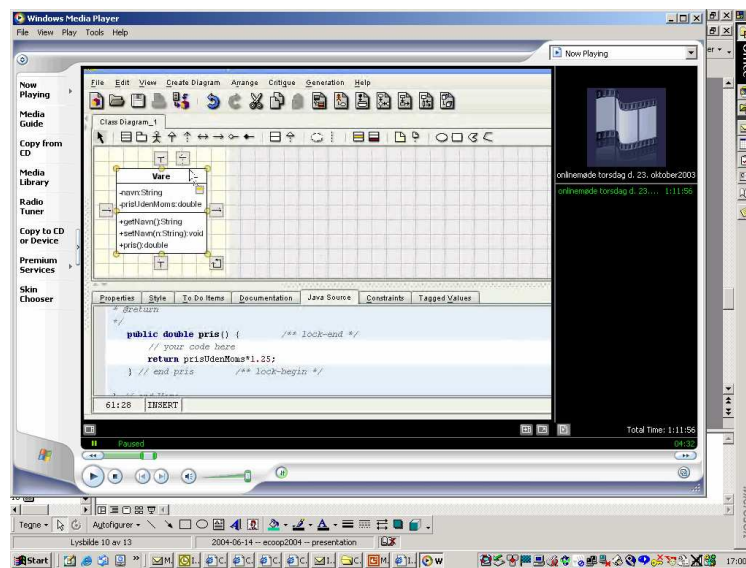
Figure 3: The master shows the process of programming by streaming his PC screen to learners

A typical on-line meeting lasted for 1½ hour starting at 8.30 pm.

3.3.4   Basic Theoretical Approaches

We consider activity theory as a powerful framework for understanding and analyzing the problem domain of learning object-oriented concepts, and for providing directions for *future pedagogical design*.

More precisely, we draw inspiration from Vygotsky's (1978; 1986) fundamental view of human development as *socially constructed*, through Leontjev's (1983) and Wertsch's (1991; 1998) emphasis on the notion of *mediated action* to Engeström's (1987; 1999) systematic implementation of what aspects that affect an individual's action as well as *types of contradictions that expand through social practice*. The theories provide insights into an understanding of the human activity in terms of a variety of *interconnected aspects*.

As systems developers, we particularly find the concept of *artifact-mediated actions* important for understanding the *incorporated role of artifacts* in networked learning environments. This means that we go beyond to solely consider the operational functionality of e.g. a particular ICT with respect to expected learner actions. Rather, we consider the

communicative, pedagogical and didactical conditions of the *constellation of artifacts* (including the ICT) with respect to the specific knowledge domain, the objective of the central learning activity, the pedagogical approach and the target group. In follows we will illustrate this argument:

A privileged issue that runs throughout Vygotsky's socio-cultural approach is the emphasis that *tools fundamentally mediate higher mental functioning and human action*. Vygotsky approached these tools in terms of how they are embedded parts of and mediate human action. The approach does not assume the solitary actor or that there is a separation between objectives and means. Rather, human action employs mediational means and the mediational means shape the actions in indispensable ways. Moreover, it is not necessarily useful to categorize mediating means into external or practical ones (technical tools) on the one hand, and internal or intellectual ones (intellectual tools) on the other. These functions and uses are in constant flux and transformation as the activity unfolds (Engeström 1999). For example, tools such as maps, a word document, mechanical drawings, etc. have not only a mental function. They continue to exist as physical means even when they are not incorporated into the flow of action (Wertsch 1998). Thus, the material properties of tools have important implications for understanding how internal processes come into existence and operate (Ibid). And, the relationship between mediational means and action is fundamental leading to the fact that analysis and design must consider the individual in her concrete situation and the mediational means employed.

The levels of human activity were theoretically developed by Vygotsky's student A. N. Leontjev. Leontjev (1983) developed a, today well known, hierarchical structure of activity. The driving force behind activity, action and operation is different, as can be seen in figure 4:

Activity   ~   Motive
    ↓ ↑   ↓ ↑

Action   ~   Goal
    ↓ ↑   ↓ ↑

Operation   ~   Conditions
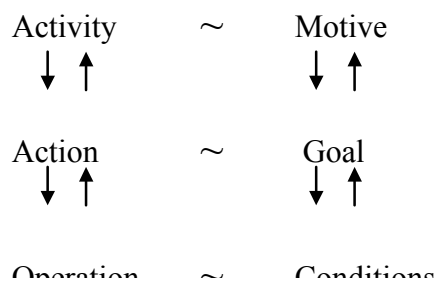
Figure 4: The internal side of an activity, along with corresponding driving forces

An activity is realized through goal-oriented processes, termed actions. An action can realize different activities as the given action may fulfill different motives. Before an action is performed, it is planned consciously. Actions are realized through operations that face conditions in the external world. Operations are typically initiated unconsciously—often even the collection of operations that accomplish the action is selected without explicit decision. The 'automatic' choice and routinesed performance are possible only for a knowledgeable and experienced person (subject). But once acquired, this ability appears as a competence for situated action. Human development is thus a process moving actions to operations, and operations into actions (e.g., instances of breakdowns). As the degree of routinisation increases, the action is moving towards operation.

Using Vygotsky's general approach of artefact-mediated actions and Leontjev's levels of human activity, provides *awareness in pedagogical designs* on the communicative and pedagogical conditions of a particular artifact. For example, consider the tool used for taking part in the on-line meetings: In the beginning of use, the use of the tool can probably involve thought and is targeted toward the object of the activity. The involvement of thought may stem from problems of using the tool, due to breakdowns, or due to unfamiliarity with the tool. After some trial-and-errors the learners, due to internalization of the tool's properties and behavior, should use the tool automatically. This is an ideal use situation, because the tool is transparent, and hence not hampers the focus of the online meetings. An other example is the weekly assignments: An assignment is an aid for through and reflection and is targeted toward the activity itself (of learning object-oriented programming / concepts). When the learner has created an understanding of the problem area (in the assignment), the assignment is more or less unconsciously guiding the course of actions.

Furthermore, the interconnected aspects of a networked learning environment are understood and analyzed in terms of possible *contradictions*. The contradictions are considered as driving forces for examining improved suggestions for pedagogical design. Contradictions are used to indicate "misfit" within or between aspects related to the learning activity as well as between different developmental phases of a single activity. Contradictions manifest themselves as problems, breakdowns, clashes, etc.

Engeström (1987, 1999) has developed a triadic model of which systematize the socially- and mediated nature of human activity.
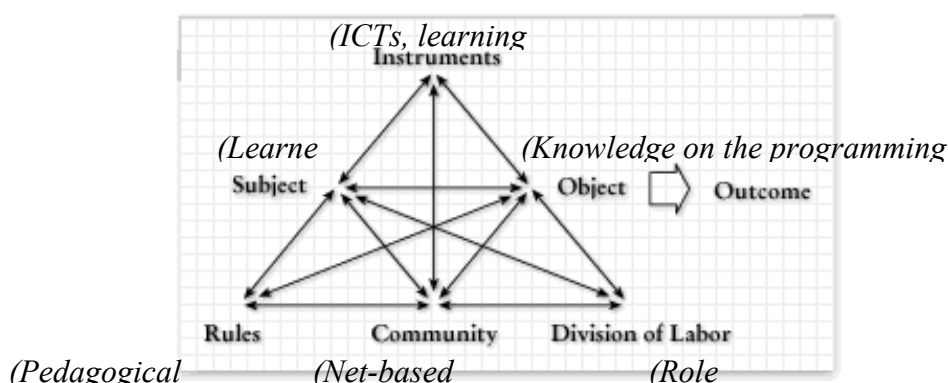
Figure 5: The structure of human activity (Based on Engeström 1987, p. 78; Based on http://www.edu.helsinki.fi/activity/pages/chatanddwr/activitysystem/)

Figure 5 illustrates the triadic model, exemplified through the case of IOOP. The objective of the learning activity refers to the knowledge domain of understanding the processes of programming (*Object* in Engeström's original model) at which the activity is directed and transformed into outcomes (such as e.g. qualified capacity to perform work), mediated by a constellation of means such as Yahoo! Messenger, Microsoft Media Player, web-based learning material, assignments, textbook, etc. (*Instrument* in Engeström's original model) The net-based learning community (*Community* in Engeström's original model) compromises the learners who share the same general learning objective, and that are socially linked by the help of various ICTs (Yahoo! Messenger, Video Media Player, etc). The individual learner's (*Subject* in Engeström's original model) relationship to the net-based learning community is mediated by the implicit regulations, constraints and principles (*Rules* in Engeström's

original model) that are found important in the apprenticeship motivated pedagogical approach. The roles (*Division of Labor* in Engeström's original model) refer to the expected tasks and commitments between the learners and masters of the community and are arguably influenced by the apprenticeship-motivated approach and what mediational means "that are available".

The model suggests an opportunity to analyzing a number of relationships with a triangular structure of activity. The essence is, however, to grasp the systemic whole and not as separated connections or aspects. This is operationalised in terms of contradictions.
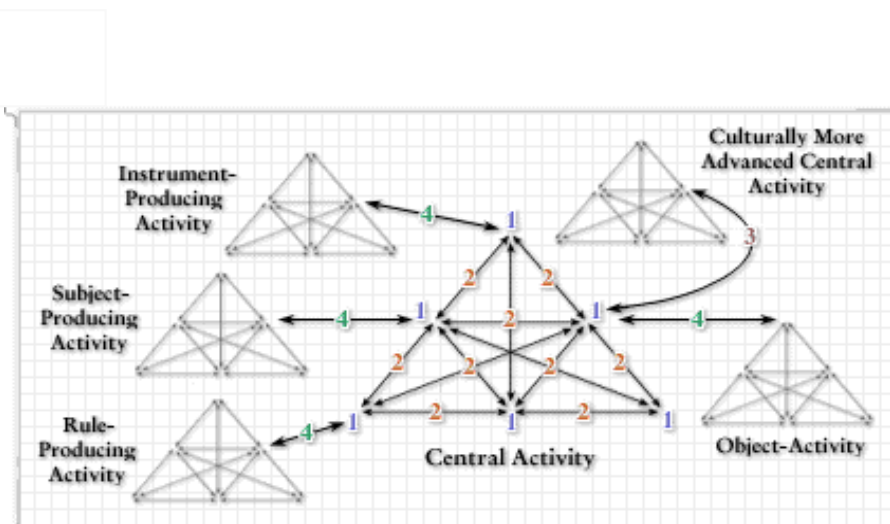
Figure 6: Levels of contradictions (Based on Engeström 1987, p. 78; Gathered from http://www.edu.helsinki.fi/activity/pages/chatanddwr/activitysystem/)

Along with the activity theoretical framework, we consider the process of identifying contradictions as an important analytical power for identifying problem areas in terms of various interconnected aspects, and for further reducing the problem areas trough a new and hopefully improved pedagogical design. According to Engeström, four levels of contradictions exist and they are depicted in figure 6.

The *primary inner contradictions* (1) are within each constituent component (inside each corner) of the central activity. Regarding the problem domain exemplified through IOOP, it becomes relevant to pose the following questions regarding primary contradiction:

1. Are there any contradictions *within* the constellation of learning resources / ICTs (e.g., Windows Video Player, Yahoo! Messenger, etc.), what impacts do they have on the individual' actions and what impact should they have on future pedagogical designs?
2. Are there any contradictions *within* the pedagogical approach (apprenticeship inspired approach), and how should they inform new pedagogical designs?

The *secondary contradictions* (2) are those between the constituents (between corners) of the central activity. Regarding the problem domain, it becomes relevant to raise the following questions:

3. Are there any contradictions *between* the pedagogical approach (apprenticeship inspired approach) and the net-based learning community (e.g. on-line meetings or other communities created by ICTs)?
4. Are there any contradictions *between* the net-based learning community (e. g. online meetings) and the individual's actions towards that community?
5. Are there any contradictions *between* the learning resources (e.g. assignments, pre-produced video material, textbook, etc.) and learning objective (knowledge on the programming processes) of the activity?
6. Are there any contradictions between the objective of the learning activity (knowledge and skills on the programming process) and the socially advanced activity of being able to do a more qualified work (e.g. becoming a better programmer / systems developer)?

The *tertiary contradictions* (3) are between object / motive of the more advanced form of central activity. In other words, the relations between the considered activity and what it could possible develop into (Bertelsen & Godsk 2004). The *quaternary contradictions* (4) are between the central activity and its neighbor activities. Regarding the problem domain, it becomes relevant to raise the following question:

7. What new designing and producing activities are transformed and outlined from the contradictions?

In analyzing the problem domain connected to IOOP, Fjuk & Berge (2004) focuses on the *primary* and *secondary contradictions* manifested in the learner's and the master's usages of ICTs and other types of learning resources. Furthermore, we concern quaternary contradictions interpreted with respect to what implications the primary and secondary contradictions have for further designs. The interested reader is welcome to read this paper for getting insights into the analytical results of using the activity theoretical approach.

Theoretically, we find some problems by applying Engeström's model as an analytical approach: The first problem is connected to a weak recognition of the dynamic structure of activity presented by Leontjev (1983). However, Leontjev's structure is to some extent presented through the concept of *inner contradictions*:

An activity itself is not only mediated by, but also develops rules (new pedagogical approaches), ICTs and learning resources as well as new roles (of learners and masters / teachers). However, the processes by which a community of individuals articulates actions and operations, and handle and develop them in the face of situated actions and contingencies, are not clearly elaborated. The evolution of collaboratively based arrangements involves actions to negotiate on perspectives and beliefs, and to handle contingencies and situated actions (Fjuk & Smørdal 2001). However, this fact can to some extent be handle by considering contradictions within each constituent component (inside each corner) of the central activity, influencing other contradictions that are leading to new producing activities.

The second problem is related to the mediation-mediation, that is, to *the duality* between intellectual tools and technical tools. Collaborative communities are created and maintained by activities conducted through actions of individuals. As such, the duality of the tools is present in upper triangle of Engeström's model. However, the model is exclusively focusing on this particular duality. The aspects of 'Rules' and 'Division of labor` may be viewed as

structures of the communicative aspect of action. To guide systems design, the duality of intellectual- and technical tools has also to be considered with respect to the two collective aspects of human activity. However, this problem can – as the first one - be elaborated through inner contradictions, and how they influence e.g. secondary contradictions. Examples are provided in Fjuk & Berge (2004).

3.3.5   Methodology

From an activity theoretical underpinning, it becomes vital to consider the learners' understanding of object-oriented concepts through insights into their *processes* of creating object-oriented models and program codes. This involves context sensitive approaches where the individual learner's actions towards co-learners, tutor and tasks can be studied and explored.

The study was carried out as a case study, during the fall 2003 semester of the IOOP course. The data was gathered by observation of online activities, including the weekly on-line meetings and postings on the discussion boards. Documents and learning resources available on the course web site was also gathered for analysis. Additionally, data was collected by observation of one weekend seminar, which included video recordings of some events, and by means of a survey carried out among the learners as a part of the regular course evaluation. Finally, in-depth interviews with 9 learners, the teacher, and the teaching assistant were carried out just after the final evaluation (exam).

In this instance of the course 22 learners attended. There were one teacher and one teaching assistant (helping with for example technical problems during the on-line meetings).

3.3.6   Final remarks

The aim of this case description has been to show how we have used activity theory as an analytical tool for improving the pedagogical designs connected to a course on object-oriented programming. We have described and discussed the core aspects of the case in terms of available ICTs and learning recourses, the apprenticeship motivated pedagogical approach, the learning objective of the learning activity, and the target group. We argue that the new pedagogical, communicative and technological conditions with respect to these core aspects of our case can be sought be using contradictions as analytical tools. In Fjuk & Berge (2004) we show how certain pedagogical and communicative conditions must be incorporated into new design and production activities.

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3.4   Case: Productive learning processes and standardisation

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Abstract: This article presents no more than an introductory study[1] of the conditions required for an expansion of computer-mediated productive learning processes in the care sector seen from an ethical, value-rational perspective. The article attempts a critical analysis of the use of IT systems for administration and knowledge management in Danish programmes for care for the elderly and points out the system's negative influence on opportunities for skills development.

Public service care for the elderly in Denmark has been undergoing change during the past decade in an attempt at quality control in focus areas such as the planning of care, time for the individual user, better management of resources and quality assurance of services provided. Tools have been developed alongside concepts of quality particularly related to practice with the aim of supporting knowledge gathering and the assurance of quality in this area. These initiatives have at the same time brought about an increase in standardisation in the description of job functions with a view to establishing a uniform basis of comparison for quality assessments. The majority of the councils in the country have introduced "*Fælles Spr*og" or "*Common Language*" (The Councils' National Assembly, 1998), which consists of a catalogue supporting an undifferentiated categorisation of the needs of the elderly in relation to an assessment of the help required and to the means by which that should be effected. The staffs involved are, then, required to develop a common conceptual apparatus using "*Common Language*". In this way councils are attempting to establish an indiscriminate starting point for the service provided in the area of care for the elderly. Staff can, for instance, have different views of what the notion of "cleaning" covers, and this can bring about variations in the quality of the service provided. Using "*Common Language*" as a point of reference provides a tool both for quality control and for the gathering of professional knowledge on a systematic basis.

In conjunction with "*Common Language*" most councils have introduced the IT care system, CARE, which is supposed to optimise opportunities to realise good intentions relating to quality development and knowledge management. In direct contrast to such intentions, however, the use of these systems raise a series of problems. The head of the Common Language Centre in the Councils' National Assembly summarised the current state of play in the area with the following comment:

> "...The question here is, however, whether many councils are unconsciously in the process of building up and locking themselves into the development of an automated factory for the service industry with detailed instruments for management and control in respect of the individual member of staff and with the Common Language as a tool used to underpin this (...). IT systems make it possible with detailed measurements of the time spent by employees with users (...). Whether this will be effective I don't know. But how is that to be measured? It may be that the lower toilet can be dealt with more

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[1] Since this article reflects work in progress, it has not been my intention to provide full-scale documentary evidence here. That will be available after completion of my studies this autumn and winter.

> quickly than Taylorian time control allows, but what if the number of
> elderly inmates requiring this particular service increases? And why
> are they in need of that form of help? Such answers are never
> provided."
> (Nielsen, 2001)

In Foucault's *Surveiller et punir* (1975) (trans. *Discipline and Punish* 1991), an interesting explanation from the viewpoint of cultural history can be found of the significance and mechanisms of surveillance, which from a bird's eye view can shed light on the reasons why the use of such systems often develops in opposition to their original intention and lapses into control and surveillance rather than promoting professional achievement and building up a body of knowledge. In his description of the mechanisms underlying the power of normalisation, Foucault established the concept of the examining citizen, whose origins he places in the 18th century. Here attention is brought to bear on the individual as an object of knowledge, which does not simply mean that the individual is subjected to examination but involves the additional establishment of disciplinary methods for the control of the individual. To an ever-increasing extent we form part of contextual frameworks in which we are submitted to examination and registration, which in turn permit the separation of the normal from the "special case". In the wake of this interest in exposing conditions relating to the individual follows the dissemination of disciplinary methods for regulating the behaviour of individuals in a manner, which is satisfactory both for society and for the individuals themselves[2]. Through his analysis, then, Foucault illustrates the circumstances that determine the power of normalisation, which will always strive for control in its promotion of the normal over the special case. It is important to stress that "the power", as such, often cannot be seen explicitly to be present and still less allows itself to be placed in physical systems or political contexts. In other words for Foucault the power is seen rather as a network of relations than as a concrete colossus.

3.4.1 Forms of knowledge and the development of learning processes through the exercise of control practice

The desire to have control of one's surroundings manifests itself in all aspects of society, including the area associated with the elderly, in which there prevails a significant need to be able to document the fact that "one is doing one's bit". From political quarters as well as from the press come frequent demands for explanations for the ways in which public funds are translated into care provision. When skills have to be deciphered and formalised into forms of care provision that lend themselves to explication, the field of practice in which skills are practised and developed becomes circumscribed by the exercise of control practice.

> "It is perhaps the adult mistrust that exists between the political
> system and the professional system based on the many individual
> cases in circulation that sets this culture of management, regulation
> and control so vigorously in motion." (Nielsen, 2001)

The above quotations raise significant ethical questions, which bear on the increased standardisation that has taken place in care for the elderly, including the greater awareness

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[2] Here we can consider in our day how our everyday behaviour is regulated by input from, for example, the Department of Health as regards dietary advice, studies on stress in schools or research findings about the significance of the breakdown of the family. The point is that the examination of the public brought about by such studies reveals substantive knowledge which subsequently enables a form of discipline (which is not necessarily explicitly proscriptive, but will often manifest itself in the form of guidelines).

among employees of the possibility of being under surveillance in relation to the performance of their work. In this context I will not go further into the question of surveillance but focus instead on the ways in which fruitful learning processes and skills development are inhibited in an organisational context which stresses the need for documentation and standardisation.

The large-scale study, ”*Den danske ældrepleje under forandring – En kontrolleret, randomiseret interventionsundersøgelse i 36 kommuner*” (“Danish elderly care in transformation – A controlled, randomised intervention study in 36 councils”) (Schultz-Larsen et. al., 2004), throws light on processes of organisational adaptation in the area of care for the elderly over a three-year period (from 2000 to 2003)[3]. The dominant processes of change during this period were marked by a change to so-called “central examination”, the introduction of IT as a tool in relation to examination, and the implementation of “*Common Language*” – the first ever set of standards for elderly care. These are all initiatives designed to ensure quality development and common forms of documentation. The organisational procedure associated with the distribution of help means that the need for provision is laid down in the framework of “*Common Language*” and is expressed in a standard form with a specification of the areas which help is to cover. Using this form as a basis, so-called “visiting notes” are regularly written, which care staff then use as a basis for action when they visit the client. These visiting notes act as a memo or a set of guidelines for the care or practical help, which has to be provided for the individual client. The degree of detail in the visiting notes is often extensive with detailed guidelines as to how help is to be provided. For example, instead of “help in the event of circulatory disturbance” there might be a detailed description of what action should be taken. At this directed level the employees own assessment of the actual situation is not brought into play. We might imagine on the face of it that working under conditions in which personal involvement in the performance of a task is restricted by having to follow a standardised list might give rise to frustration. However employees have, in fact, been found to request more thorough specifications, if the visiting note is written in general terms with a view to allowing room for the employee's own professionalism and to motivating an independent execution of professional judgement. This is underlined in the statements below, which originate from my introductory qualitative pilot study in Fredericia Council, which supplement the large-scale study described above:

> “1410 employees use the system, and they receive suggested
> guidelines, but would like to have rules (...). We can produce
> guidelines, which cover 90% of eventualities, but the remainder has
> to depend on the employee's own experience.”
> (Interviews with employees, Fredericia Council)

The overriding desire for directive job descriptions might partly be explained by the fact that employees experience lack of time for dialogue about their work:

> “(...) In the earlier days [ed.: approximately 15 years ago] we used to
> have 3 meetings during daytime alone. Here people talked about what
> they were doing and what was going on with our clients. Now we
> have visiting notes and of course we could use them as a background

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[3] The study focused in concrete terms on results and effects of the implementation of systems and tools supported by consultants. Implementation of processes for change and development supported by consultants was, therefore, undertaken in half of the councils, while the other half functioned as a control group, in that implementation here took place without consultant support. The aim of the study was the improvement of quality in elderly care.

> for a discussion of our views of care, but there is no time for this kind
> of activity. Also, if I get a visiting note written by the clients primary
> contact person, I prefer a specific description in order to be able to
> carry out the work in a way similar to the way the usual contact
> person carry out the work. Therefore, I'm dependent on detailed
> visiting notes. Earlier, when we were more employees there was
> always somebody around who knew what to do, now we are very
> dependent on the visiting notes. For instance at night shifts we run a
> tight schedule with few people who cannot possible know the needs
> of all the different clients in details. Therefore we follow the visiting
> notes very strict – they are our guarantee that we do what has to be
> done, without visiting notes we would be lost."
> (Interview with employee at nursing home in Fredericia Council)

The desire for detailed visiting notes also emphasises the adoption of the burgeoning documentation and surveillance culture in elderly care, where the ability to provide documentation for the fact that one has performed the duties one was contractually obliged to undertake is to an ever greater extent regarded as a necessity, not least with a view to countering complaints from users and politicians as financially responsible agents. Such a situation is explained in Foucault with reference to the constant presence in the individual of the consciousness of surveillance, so that surveillance itself need not, in actual fact, take place. Individuals assume henceforth, of their own volition, behaviour appropriate to the acceptance of control. The consciousness of the individual employee of being potentially under surveillance comes then to regulate behaviour.

> "(...) Employees know that as long as they carry out their work to the
> standard required, they cannot be criticised (...). If it comes to a
> dispute, there is a desire to be able to assess at what point an action
> deviated from the course agreed upon."
> (Interviews with employees, Fredericia Council)

The large-scale study of the 36 Danish councils demonstrates a similar general tendency for employees to accept registration and standardisation as positive factors. The study suggests that the original "housewife culture" is seen to be under attack from a burgeoning "medical/bureaucratic" culture[4] (Schultz-Larsen et. al., 2004, p. 9, 112). In that context *"Common Language"* is regarded as a positive initiative insofar as with this tool councils are sending a clear message about standards of quality in the organisation. This establishes the chance for transparency and clear management in the home help area. As a result employees perceive a much greater degree of clarity in the connection between the organisation's underlying set of values and its practice.

At the same time, however, an opposing tendency can be sensed in their assessment of IT, in that employees do not feel that IT always leads to an equitable distribution of service provision to the public. In the study it is noted that IT solutions and *Common Language* are not always developed "hand in hand", as planned, but rather "side by side", in particular in cases where the introduction of IT systems is not sufficiently supplemented by professional dialogue. In this way IT systems fail to become meaningful for employees and become

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[4] Future analyses based on the results of the study will attempt to explore the culture shift from a "housewife" culture through a culture of social worker prevention to the growing medical/bureaucratic culture (Schultz-Larsen et. al., 2004, p.112).

detached from practice or at the worst become scapegoats when organisational procedures break down. In such situations IT systems clearly do not support skills development and the build-up of knowledge, while it is far from evident that visible sets of values are incapable of creating a basis for skills development. This is, however, made more problematical when values are not used to make value judgements or decisions in everyday practice but function instead primarily as formulas, which enable categorisations, measurements and the maintenance of standards. In this way data is made available for knowledge exploitation at a general level, while that form of knowledge expansion, which is based upon the exercise of practical knowledge, is not incorporated.

The need to ensure across the board documentation satisfies the desire to establish control, comparable forms of care provision and resource management in elderly care. But this takes place at the expense of insight into contextual knowledge based on experience. This form of experience-based understanding is not reflected in the conceptual world of the system.

> "(...) 10-20% can be seen here, but I have so many consultancy tasks
> – indirect nursing – which are not reflected in CARE [ed. IT
> system]."
> (Nurse in Fredericia Council)

3.4.2 Forms of knowledge and skills in the area of elderly care

Professional judgement plays a considerable role in all forms of elderly care and clinical reasoning – the ability to be able to cast a glance at an elderly person and assess what needs to be done in practice is rooted in abilities which have been exercised in practice, where an experience-based understanding of what it means to exercise care is developed in the practical part of a nursing course and later in professional work. In advance of this experience-based understanding lies an understanding of abstract concepts derived from formal education (in nursing or in the area of social or health work), teaching books and classification systems.

The relation between knowledge based on rules on the one hand and knowledge based on experience on the other is defined in the Dreyfus brothers' well-known 5-stage model for skill acquisition (Dreyfus & Dreyfus, 1986). Here the learner's movement towards the expert stage is described through various developmental stages, in which the introductory stages – *novice, advanced beginner* and *competent* – are, in brief, characterised by the learner at the outset using rules that are context-free, abstract and open to generalisation in order to understand a new area, and only later bringing himself or herself into the picture. Competent practitioners, therefore, take abstract rules as their starting point but are at the same time capable of reaching an independent decision about which strategy it would be meaningful to pursue in a given situation. The higher levels of the skills model, *proficient* and *expert,* are marked by an ever-increasing level of involvement in a given situation, where development of expertise is characterised by the expert having a deep situational understanding of his area. This leads to him ceasing to make use of analytical principles and using instead tacit knowledge, when he is to translate knowledge into meaningful action in a given context. By means of experience-based knowledge the expert is in a position to act intuitively and with concentrated focus when he is confronted with a problem. In the exercise of professional judgement the development of skills moves, therefore, from rule-based behaviour independent of context to situated behaviour dependent on context. For this point of view conceptual understanding should ideally be subordinated to hands-on, experience-based understanding.

However, by focusing on standard descriptions for elderly care, the opportunity for forms of exchange of experience and of dialogue conducive to skills development, which would take their departure in concepts anchored in practice, is overridden[5]. In this way the meaning of the narrative in a language which determines situations on the basis of experience and practical use is eliminated. Instead stress is placed on communication by means of instrumental conceptual systems, in which particular attention is paid to the general traits of specific situations. In Kari Martinsen, the distinguished philosopher in the area of nursing research, we find, for example, an interpretation of the significance of the narrative in the acquisition of skills in the care area, where she emphasises the importance of the open narrative as protection against "the formulaic language of rulebook morality" (Martinsen, 2000, p.138). Through narratives we are in a position to pass on hands-on understanding and to reflect on experiences without having to force them into a template, in which reality is submitted to abstract concepts.

When rational and abstract conceptual systems are used as tools in resource management, quality control and knowledge-gathering, a barrier is placed in the way of the development of kind of dialogue which might promote skills development in the area of elderly care.

Value-rational skills
This experience-based understanding is not captured by the language used for communication about one's profession and work in elderly care. If employees are encouraged to respond to the needs of those in their care on the basis of a generalised, standardised and across-the-board formula, which looks at the needs of the individual from a generalised viewpoint and without an eye to the encounter with the person in that unique context, there will be worsening in the conditions needed for developing a differentiated working language necessary for the building of a culture whose principal values relate to care relations between people. When encounters with individuals have constantly to be assessed in relation to general, blanket registration, efforts are focused on dealing with the creation of data appropriate for documentation. To adopt the terminology of the Dreyfus brothers, we can say that what happens is that employees are restricted to the 3 lowest stages of the skills model, since the system to an overriding extent encourages the exercise of behaviour, which is rule-based and independent of context.

If, for example, we look at "visiting notes", we could easily find instances in which employees in the course of time became so well drilled that they no longer needed to consult the visiting notes but took decisions themselves on the basis of earlier experiences of similar situations and visiting notes. But here we cannot speak of training directed at expertise in the area, but rather of training in routines, in which the employee has gone through a process of

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[5] It is important to point out a nuance in my use of the Dreyfus brothers, in that their conception of the exercise of expertise makes it clear that language plays no part in the expert's performance of his work. I agree that the expert works in silence and intuitively and does not therefore reflect in the situation. But I would at the same time underline the importance of establishing the opportunity to construct space for subsequent dialogue, reflection and exchange of experience. Also, in the article *What is Moral Maturity?* (to be found on the home page of Hubert Dreyfus. Consult my reference list below for link reference), Dreyfus points to the connection between expertise and reflection in the following way: "It would be a mistake, however, to become carried away with the success of spontaneous coping as to deny an important place to deliberative judgment. Getting deliberation right is half of what phenomenology has to contribute to the study of ethical expertise. One should not conclude from the pervasiveness of egoless, situation-governed comportment, that reflection is always disruptive and always produces inferior practice. Expert deliberation is not inferior to intuition, but neither is it a self-sufficient mental activity that can dispense with intuition."

being drilled within the framework of a rigid realm of standards. Employees have, then, received a tool, or a template, for the purpose of categorising the environment with which they are confronted in their work. This does not, however, in itself stimulate the form of involvement or commitment required to develop expertise, since it becomes difficult to establish commitment in a specific situation when it constantly has to be assessed in relation to a demand for abstract documentation. In this way the rhythm of care work is fragmented and relations to the person in care are depersonalised in the formal demands of the visiting note. By breaking the flow in work rhythm, which might otherwise promote involvement in the situation, "break-down situations" are set up, in which employees are forced to step outside the situation and take on the role of observer, monitoring their own performance from a distance instead of being active and reflecting participants in the specific context[6]. By this means a new situation is created in which the performance of care work causes employees to objectify their relation to the person in their care, a relation which no longer presents itself as an aim in itself but which is instead regarded as a means to achieve an overriding aim, which concerns the ability to deliver general results capable of being documented – and assessed.

This way a context for the use of IT systems is crystallised out, which impedes conditions for reflection in practice and reduces opportunities for setting up those productive learning processes which underpin the construction of experience-based knowledge. The development of expertise and of the ability to exercise professional judgement in elderly care is instead promoted by encouraging the opportunity to exercise the form of knowledge, which in Aristotle's *The Nicomachean Ethics* is referred to as *phronesis*. In contrast to *episteme*, which relates to unchanging rational knowledge independent of context[7] (*know that*), and *techne*, which is directed towards the productive rational capacity (*know how*), Aristotle highlights *phronesis* as the form of wisdom relating to that practical and moral astuteness in action which is associated with learning incorporated into practice. This form of proficiency is not neutral but moral in its being, since it mirrors a form of reflection grounded in practice and cultivated by the employee's ability to be involved and to take a stance in any specific situation. Rather than being concerned with whether "one has done as one ought", the employee is committed to the situation and takes decisions against a background which not only involves conceptually abstract knowledge, but also draws upon experiences from previous situations. As mentioned earlier, what the Dreyfus brothers stressed as significant elements in the movement towards expertise was precisely an increasing involvement and commitment of this kind. The conceptual, fact-oriented form of knowledge, which attaches itself to the use of IT systems and administrative tools in the area of elderly care, minimises opportunities to develop skills which are rooted in practice and value-rational.

> "Our enlightenment quest to be fair through abstraction and disengage-ment may lead us to be unwise in our practice." (Benner, 2000, p.305)

3.4.3   Conclusion

This article has focused on questions, which arise when IT systems used to handle knowledge and manage resources are employed in a context characterised by the demand for documentation. Under such circumstances opportunities for skills development in elderly

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[6] This relation is also illustrated in Heidegger's concept of "throwness" (Heidegger, 1962), which reflects the fact that in our very interaction with our surroundings and with other people we are already propelled into the situation.

[7] *Episteme* corresponds to present day scientific knowledge, whose purpose it is to produce universal, invariable knowledge attained through analytical rationality.

care have from the outset little chance of success, since the development of the professionalism of employees is kept at a level of competence, which does not motivate them to become involved. In the specific situations with which employees are confronted in practice, they have primarily to relate their own observations to a generalised care template, which specifies the demands made of them in the exercise of their duties. This focus on standards and classification results in a systematisation of the knowledge area in elderly care, which involves the accumulation of data with the aim of passing on content material for statisticians, for resource management and for knowledge-gathering. But no springboard is set up for the further development of skills, since the focus on standards and classification emphasises standard performance carried out in accordance with general specifications of requirements with no eye for the value of the knowledge that resides in allowing space for reflection on practice. The systems are not, therefore, brought into play in a way which supports fruitful productive learning processes.

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3.5 Case: Network theory and description - The Lancaster ALT Masters programme

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Abstract: This case study takes the Lancaster MSc in Advanced Learning Technology and examines some of its features in relation to the network metaphor. The degree was selected because it was designed by a team that described its own design principles in terms of networked learning. The ALT programme does not seem to fall easily into other standard design philosophies such as CSCL or Communities of Practice. The particular features that this paper draws attention to are the design focus on individual learning in a social setting, the task driven nature of the design and the level of flexibility built into the student's engagement with the course.

3.5.1 Introduction – designing for networked learning

Castells (2001) writes about the relationship between emerging technologies and social forms and in particular in this context, the idea of community. Castells describes the form of networked society as one of 'networked individualism' (1996, 2001). He claims that digital networks and the Internet are especially effective at maintaining weak ties and that in relation to strong ties networks assist in their maintenance at a distance. The linkage between a networked society and forms of networked learning is still unclear, however the term networked learning has become one of several terms used to describe learning in a society dependant upon digital networks for its social organization. The Centre for Studies of Advanced Learning Technology (CSALT), which is responsible for the ALT programme, is associated with the following definition of networked learning.

> Networked learning is learning in which information and communication technology (C&IT) is used to promote connections: between one learner and other learners, between learners and tutors; between a learning community and its learning resources.

The central term in this definition is *connections*. This definition takes a relational stance in which learning takes place in relation to others and also in relation to learning resources. Networked learning differs from CSCL and Communities of Practice as it does not privilege relationships such as cooperation and collaboration or the closeness of community and unity of purpose. Unlike CSCL and Communities of Practice this definition of networked learning draws particular attention to the place of learning resources in relational terms. The idea of networked learning has been explored from this perspective by Jones (2004) and Jones and Esnault (2004).

The ALT programme, that is the focus of this case study, embodies a set of views on networked learning that have been set out in a number of documents over the years. One of these was an outcome of a two year research project 'Networked learning in Higher Education' that examined the students' experience of networked learning. One section of the final report from this project was a book written for teachers thinking of implementing networked learning "Effective networked learning in higher education: notes and guidelines" (Goodyear et. al. 2001). A section of the book provided a summary of the perceived strengths and weaknesses of networked learning under the following headings.

Claimed Strengths

- Interactive, but flexible
- Promotes active engagement
- Reflective, aiding 'deeper' processing
- Permanent record
- New opportunities for group working
- Social interaction
- Ease of access to global resources
- Under-represented groups
- Changing relationships in learning

Weakness

- Lack of expressive richness
- No immediacy
- Prolonged decision-making
- Requires technical access and competence
- A different style of communication
- Levels of discourse may be at odds
- Depersonalising effects (more analytical/judgmental)
- Need for shared goal(s) to sustain activity (Goodyear et. al. 2001)

It can be seen immediately that the strengths and weaknesses in this list are not simply features of the technologies rather they suggest a complex interaction between the technologies as they are deployed and the work of mobilizing the technologies within particular settings. I will take one example from each column to illustrate this point.

a) Permanent record

The discussions that take place within a networked learning environment can leave a more or less permanent trace. This feature can be thought of as an affordance of digital technologies. This can be contrasted to face-to-face discussions that require special measures, such as keeping minutes or recording to provide a degree of permanence. The possibility of a permanent trace is however only that, it requires the social organization of such traces to ensure that they are kept and made available to participants.

b) A different style of communication

The different forms of communication in digital networks can lead to changes in communication patterns. In asynchronous text communication the delay inbuilt to the system is often attributed as the cause of either beneficial changes, such as more considered replies, or difficulties, such as the anxiety felt when a message receives no timely response. Such patterns of communication are a complex interplay between technological features such as asynchrony and typed of text using a keyboard and social features such as the organization of the group and its interactions and the expectations people using the system have in terms of others behavior.

The ALT modules and programme

The ALT Programme is designed to allow study for a Diploma or a full Masters level degree and individual modules from the programme can be taken separately without registering for the full programme. Of the 64 students registered in the past three years 21 of these have registered for one or more modules but not for the full programme. Some of these may of course register for the full programme later but these figure give a sense of the proportions of full programme and module registrations. The programme is designed primarily for part-time study and generally takes between 30 and 48 months to complete. The minimum period of registration is 24 months but it is very rare for the programme to be completed in two years. The programme is cost-efficient at quite low numbers and the modules have recently been running with between 20 and 30 students at any one time. The modules for the ALT programme are organized in a timetable

over a two-year period and students may join the programme at the start of any module. This means that students may join the programme at three points in any one year.

Assignments are 'negotiated' individually with tutors and they generally have a strong relationship to the work setting of the participants. Assignment topics are intended to integrate the module activity and learning with the workplace and professional experience of the student. Each assignment is submitted at the end of the module and course members are expected to participate in online discussions of assignment ideas, draft assignments and associated activities. To complete the Diploma programme 108 M level credits are required, to complete the MSc 180 M level credits are needed. To pass overall in the Masters programme each module and the Final Project must be passed separately.

Assessment of the programme is by coursework associated with each module and for Masters level students a final project report. Each module is assessed independently by coursework that is equivalent to a 6,000 word assignment (18 M level credits) or a 12,000 word assignment (36 M level credits). The distinction between the assignments is considered to be qualitative as well as quantitative by the staff assessing the programme. The final project is equivalent to 18,000 words maximum. Before students can commence work on another module they must have submitted the assignment for any prior modules they have completed.

Technology
The programme has a simple web page from which different parts of the ALT programme resources and services can be reached (http://www.lancs.ac.uk/fss/courses/edres/alt/). The web page provides links to programme documentation, the university library and digital resources accessed through the library and the current and previous module discussion spaces. The discussion spaces are provided using Lotus Notes and the design is provided using a locally supplied template. Each module has a separate discussion space that is used for discussion and to post updates and materials.

There is a synchronous discussion tool, integrated in Lotus Notes, which is used in some modules as part of the module activity and student's can access the synchronous tool at any time of their own choosing. Students have also been introduced to Sametime, a Lotus Notes based environment allowing audio and video conferencing, shared documents and whiteboard. This tool has currently only been used for demonstration purposes and has not been used to support any modules.

The programme is supported by the university library and in the last year digitized texts (book chapters and online journal articles) have been provided online from the course pages and linked to from the ALT home page. Each module still provides hard copies of readings, which can include journal articles, book chapters and for some modules complete books. The provision of resources is currently under review. This has been prompted by changes in the university library infrastructure, new subscriptions and change in relative costs.

The technology is robust rather than rich. A major consideration in this regard is that it must support distance students from all over the world. The current system will allow for the loading and display of streaming media, PowerPoint presentations, still images and any file format as an attachment.

3.5.2   Recruitment to the course

Recruitment to the ALT programme and to individual modules has been primarily from staff working in post-compulsory education, training in a business environment and consultancy. The programme is aimed at people who are:

- Currently involved in the design, development, use or evaluation of ALT systems
- Involved in training, and in higher, further or adult education who want to learn more about ALT
- Is *not* oriented towards schools

The course design is explicitly devised to enable participants to study in a flexible way both in terms of time and distance by limiting face-to-face and synchronous contact. In the past three years 14 of the 64 participants have been from outside the UK. Of these 10 were from outside Europe (one of these was from Malta then an accession state) and these non-European participants were from a wide range of countries including Brazil, China (PRC), India and several middle eastern states. Of the non-European participants a significant number, approximately one half were expatriates with a European background. The work background of students who have been registered over the past three years reflect the course criteria. Approximately half (31 students) were from educational institutions, the remainder were from a variety of public bodies, including the BBC and government ministries and from private sector businesses including large corporations and small to medium size businesses. Three were independent consultants and a further two students were consultants working in small companies.

The ALT programme aims to support the continuing professional development (CPD) for busy working professionals who already have some connection to adult education and training. The structure of the programme reflects this student intake, as it is a mix of distant/independent study, social engagement supported by ICT, and non-compulsory short intensive residential periods.

> The ALT programme is seen as a place in which participant's work-related interests come together with our research-based knowledge. The goal of the programme is to find fruitful ways of combining these two. (ALT course validation documentation 1999)

The course explicitly builds on the idea that participants bring to the course valuable prior experience. The social process of the course is about an engagement with participants' experiences and the resources brought to the modules by active research staff.

3.5.3   The research

This research has taken place for the JEIRP Conditions of productive learning in networked learning environments and forms part of an internal review of the ALT programme for the course team at Lancaster. The author of this case study is deputy director of the ALT programme and research has been conducted to assist this review by Dr Maria Zenios a research assistant who also works on the ALT programme and Vanessa Watts an intern student with no connection to the ALT programme from Texas A&M, USA. The case study relies upon formal course documentation, developed for validation, accountability as part of the university and UK wide system of quality assurance, and to assist in the everyday running of the programme. Specific research has been conducted to track one module taught in 2004, ALT 04 *Learning Technology: methods of research and evaluation*, and to analyze the pattern of student intake to the programme.

3.5.4　　　Principles of the course design

The design of the ALT programme has developed over a long period and the programme has been running in a number of different forms since the late 1980s. The principles documented here are the principle identified in current course documentation but they reflect this long development and are not recent revisions of basic principles.

> Two core ideas are the 'community of practice' and 'critical reflection' (ALT Handbook p17)

This section does not cover all elements of course design and focuses on three specific items, communities of practice, critical reflection and individual learning in a social context.

Communities of practice

The idea of Communities of Practice has developed from the apprenticeship model proposed by Brown, Collins and Duguid (1989) that was later generalised by Lave and Wenger (1991) in terms of learning as legitimate peripheral participation. Communities of Practice involve a process of relatively close engagement between members of a community that is focused on the sharing of practice. Shared practice in turn requires members to have the time and space to collaborate (Lave and Wenger 1991; Wenger 1998). The idea of a Community of Practice has been translated into the ALT programme in the following way.

> A 'community of practice' is a way of describing a set of people who share work-related interests and who recognise each other as valuable co-members. Part of what we are trying to do through the ALT programme is create and support such a community in the field of ALT. (ALT Handbook p17)

The design of the ALT programme is wary of the notion that communities can be created. The programme does not seek to create a community of learners rather it tries to manage the organizational forms and tasks of the programme such that it may nurture the kinds of learning community which the programme values. The approach is an indirect approach to community. It assumes that participants have their own work based and professional communities external to the programme and that the ALT programme will be one site for community development in relation to practice rather than the core community. In this way the ALT programme resembles the idea of a constellation of practice developed by Wenger (1998).

> Some configurations are too far removed from the scope of engagement
> of participants, too broad, too diverse, or too diffuse to be usefully
> treated as a single community of practice. (Wenger 1998 p126)

In the case of the ALT programme participants are from a broad range of work and professional backgrounds and their interests are diverse. The engagement in the programme is temporary and part-time and central loyalties remain elsewhere. Wenger notes the limitation related to constellations of practice affects even small configurations such as the ALT programme and isn't restricted to large configurations. For Wenger constellations of practice are closely connected to the negotiation of boundaries and interactions among practices. Constellations are engaged in the 'export' and 'import' of practices, a process closely related to learning that is commented on further in the following section.

Critical reflection and Networked Individualism

One of the features of the course is the stress on a particular understanding of individual learning that is related to the idea of critical reflection and continuing professional development. The idea that critical reflection is related to changes in contemporary social forms is well illustrated by the work of Ronald Barnett (1997, 2000). Barnett argues for a higher education 'fit for the 21st century'. He argues that individual reflexivity is necessary for dealing with an essentially

unknowable modern world. A fundamental element of this argument is the postmodern conviction that we can have no certain knowledge of the world, and that fixed knowledge and skills become redundant or marginalized (Barnett 1997 p29).

The idea of critical reflection is one of the key ideas informing the ALT programme and reference to this idea can be found throughout the handbook.

> 'Critical reflection' is a process of recollecting and examining one's working practice, as a way of developing richer ideas about that practice – ideas that become resources for improved practice. Assignment tasks and on-line activities within the ALT programme are aimed at promoting critical reflection, sharpened by research-based knowledge. (Handbook p17)

This view of critical reflection is reflected in the course assignment marking criteria in which students have to demonstrate an ability to reflect critically on the work entailed in demonstrating their competence in the topic area covered by a module and by reflecting on what they have read, done and learned

The ALT programme does not emphasize individual learning in the classic form of an isolated learner but is interested in placing the learning that individuals do in a number of specific social contexts.

> The Lancaster University Advanced Learning Technology (ALT) programme has a strong interest in individual learning, though it is usually individual learning *in a social context*. (Handbook p7)

One of the ways the individual role is emphasized is in relation to the setting of assignment tasks:

> the individual learner's centralized role, especially in negotiation of the assignment tasks, ensures that they are pivotal in defining appropriate tasks that help the development of their working knowledge and professional practice. (Handbook p19)

The social contexts of the course include the ALT programme, both course tutors and other students, and the student's work environment and professional practice from which students are expected to draw. The relationships explicitly referenced in course documentation emphasize a form of boundary crossing in which knowledge has to be disembedded from one social setting and re-embedded in another. Discussion of this type of process can be found in both Wenger (1998) and Brown and Duguid (2001) and is related to the ideas of constellations of practice and networks of practice respectively. Wenger explicitly identifies the export of styles and discourses which, whilst not practices themselves, provide resources that can be used in the context of practice. The ALT programme makes this particular process found at the margins of Communities of Practice thinking central to networked learning.

3.5.5   Tasks and activities

The ALT programme has a pedagogic focus on the design of learning tasks. A learning task in this view is a specification for learner activity. Its design draws on what we know about how people learn, on the tutor team's knowledge of academic subject matter and/or vocational competences, and on a knowledge of the characteristics of the learners. Examples of different kinds of learning tasks might be essays, laboratory exercises, diagnostic exercises, structured discussion sessions or debates, a topic to research, an artifact to build. To be effective a task needs to be well-specified at least to the extent that the chances of a learner engaging in unproductive or unrelated activities are kept within reasonable limits. Its specification also needs

a degree of openness that will allow for any variability in the needs learners may have and to encourage a creative response.

Goodyear (Goodyear et. al. 2001) has followed the French ergonomist Alain Wisner in making the distinction between 'task' and 'activity' (Wisner, 1995). Tasks are what designers set, they are prescriptions for the work the students are expected to do, activity is what people actually do. Teachers set the tasks but learners then have to interpret the specifications of the task. The subsequent activity of students is a more or less rational response to the task when understood as a part of the student's overall context. Student constitute their setting, their own learning context out of all the other tasks they have to face, the other calls on their time, their past experiences and their of what their teachers actually value. It is to be expected that the activity is likely to be different from the task which initiated it. The ALT programme relies on students taking responsibility for their own learning and making their own interpretations of learning tasks. The programme also recognizes that the learners recruited are busy people and that learning is only one of the things they have to fit into their day.

This distinction between tasks and activities forms part of a broader design philosophy that informs the programme. The distinction between task and activity is mirrored by two further distinctions between space and place and as has already been mentioned between organization and community. Together these three distinctions are referred to as an indirect approach to learning.
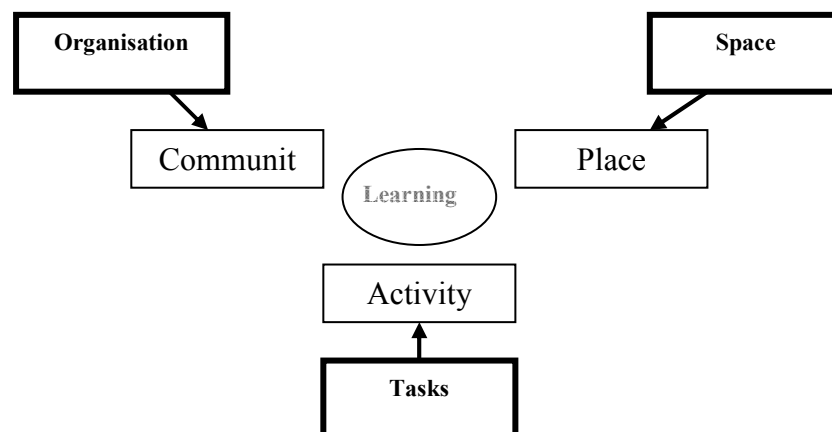

Figure 1: Design: an indirect approach (from Goodyear et. al. 2001)

The structure of the ALT programme is task driven and each module falls into three sequential phases. During the first phase students are asked to work on several short tasks individually and to post their responses into the discussion space. The design at this stage is task oriented and individual, the coordinated activity of posting contributions only takes on any collaborative aspect later when students are asked to reflect on each other's postings. Prior to the second phase there is a short two day residential. Students who attend the residential are involved in intensive face-to-face activities and develop a strong group sense. On return from the residential it is noticeable that the energy from the residential students often contrasts sharply with the students who did not attend the residential. Organisational measures to try and integrate the students who did not attend the residential are taken, videos of the residential sessions are distributed and on some modules groups containing members who have attended and others who have not have been formed to work on tasks in Phase 2.

In the second phase of activities students are told by the course tutors to expect greater online activity and the tasks assume students will engage in online discussion and in some modules some group collaboration is expected. It is nonetheless possible to complete this phase in a relatively individual way. Participation is uneven between students and in relation to the same student on different modules. The third phase of each involves students completing the negotiating with the tutors of a topic for their assignment. For those attending the residential the discussion will have begun with a one-to-one meeting with a tutor at the residential. The agreed topic and an outline are posted to the online space at the close of the second phase and students then largely work alone to produce their assignments. Interaction between students over the entire module is uneven, some participants are regular contributors in the online discussion but others are only occasional contributors. In the ALT 04 module in 2004 there appeared to be a specific problem with low levels of participation in both Phase 1 and Phase 2 tasks. The issues surrounding this were addressed at the residential and a comparison made between ALT 04 2002 and the current 2004 module. When student interaction was assessed it was not noticeably lower in volume or inferior in quality in 2004. This raises a question about the general level of interaction on the ALT programme and whether this affects the learners' experiences or programme outcomes.

3.5.6   The place of resources

One of the areas that is currently under review is the means of delivery of course resources. In the past materials for the ALT programme have been paper based for the most part and mailed to all participants. Readings generally include journal articles, book chapters and for some modules complete books. The use of paper-based resources has been maintained in recent years for a number of inter-related reasons.

- The cost of bespoke digitization and copyright clearance for digital resources has been greater than the cost of paper copies and postage.
- The problem for distance part-time students in obtaining effective off-site access to digital resources
- The problems of integrating digital resources with the existing VLE platform
- Resistance by existing students to entirely digitized materials.

In UK higher education there is an all sector agreement on copyright that means that paper copies can be made at no additional cost to the department running a programme. The cost of copyright clearance and digitization for journal articles and book chapters is still carried by the department so that it has been cost effective to retain paper distribution. There is now a centralized service Heron, originally developed as a publicly funded project by the Joint Information Systems Committee (JISC), which digitizes materials and secures copyright clearance. The materials once digitized are retained in digital form so that the cost is only borne once by the UK higher education sector. The ALT programme now provides readings using the Heron service for each module, but currently paper copies of materials are also supplied. In part this is a response to the novelty of digitized course texts and the displacement of cost onto the student for printing these materials. In the medium to long term the ALT programme will move to fully digitized materials.

For this final step to be taken a number of technological solutions still have to be found. At the moment there is no single log-in for access. Students off-campus have to use their university log-in and password to access the main ALT areas but there is a separate library log-in if materials are accessed through the library catalogue. If students wish to access materials from off-site they

are also likely to require an Athens password. The Athens password allows access to a range of digital services providing access for all UK registered students to resources including journal articles and a variety of other digital resources. A single log-in supplied as the student registers for a module or the full ALT programme is essential if the ALT programme is to move to fully digital resources.

The integration of the different aspect of the ALT programme, in particular discussion spaces and digital resource access is not a simple matter. Users of various types of VLE are well aware that the integration of some types of digital resources within the VLE remains a problem. The Lotus Notes platform used by the ALT programme is not immune to this problem.

One of the claims of networked learning is that it allows relative ease of access to learning materials and resources. The ALT programme shows how complex this relationship can turn out to be in practice. The technology does not present itself as a simple technological artifact, rather the technology is immediately a socially mediated form. Resources are enmeshed in a legal framework of ownership that has more to do with property rights than any technological imperative. Access to those materials and resources currently available for teaching and learning is not a simple matter. Some materials such as conference papers and articles appear freely on the web. These resources are often ephemeral with links moving or disappearing on a regular basis. Secure resources have to be embedded in a social and organizational infrastructure that takes on some of the roles, such as preservation, that libraries have hitherto fulfilled. When resources become organizationally supported they disappear from the Web's open access behind password protection and often hidden deep within database structures. The creation of single log-on authentication and a public 'commons' for educational materials is a political, legal and social process well beyond the control of single educational programmes.

3.5.7 Conclusions

The features of the ALT programme do not obviously match either a standard CSCL environment as they are based on a set of relationships that are not strongly collaborative though they emphasise a social view of learning. Equally the programme, though it draws on the idea of a Community of Practice, is one that consciously tries to incline students to engage with their external professional and work communities at least as strongly if not more than the programme itself. At any one point students on the modules are an uneven mix of novices and experienced participants. On average three or four new students join each module. The new students do benefit from being able to model their participation on more experienced students but as there is no fixed cohort there is only a limited chance of community development within either the module or the full programme.

This appears to fit the description of a system of weak links forming a network in which the students and tutors are engaged with each other, the course documentation and the learning resources. The MSc ALT programme has been successfully running since the late 1980s. It has had some major revisions but has been in its current form for over 5 years. The programme has had good outcomes and was explicitly mentioned in the teaching quality assessment audit of the department, which obtained a maximum 24 score in the review. The programme is cooperative in the sense that the tutors and students work together to accomplish the sequence of activities during each presentation. This clearly involves students and tutors in extensive negotiation of meaning about what the module contents are and how they can be understood. It also involves

making sense of the module documentation and what the tutors' intentions might be in organising the activities in the way that they do.

However even from this brief outline I think it is apparent that the course has a focus on flexibility and the needs of individuals in relation to their learning. The first phase asks individuals students to make sense of some of the key ideas in the module. They are asked to reflect on their prior experiences to do this and during the course of the module they are encouraged to reflect on these using the literature supplied as resources for the module. This is a largely individual set of tasks in which the students interact largely with course texts and only post their responses online. The work and professional setting of the student provides the social context for this individual activity at least as much as it is provided by the ALT programme. These relations resemble those described by Wenger as a constellation of practice and by Brown and Duguid as a network of practice (Wenger 19989, Brown and Duguid 2001). The relationships amongst students and between tutors and students can possibly be best be thought of as weak links. Participants on the course remain largely in their work place communities and they are explicitly encouraged to elaborate this experience in relation to course materials and activities.

One of the key features of the programme is the organisation of student activity through the allocation of tasks. These tasks are closely related to the learning resources supplied for each module. As distance learners the students are highly dependent upon easy access to a wide range of course and supplementary materials. The systems allowing such access are only partially under the control of the programme team. Some of the bodies supplying digital resources, such as the library, are based locally within the institution. Other suppliers are part of a national and inter-national framework supplying both infrastructure and services, for example JISC and various publishers. The nature of the supply of digital resources for teaching and learning suggests a networked understanding, as the experience of the learner and the capacity of the programme team depend heavily on a particular coming together of a set of loosely coupled elements.

3.5.8 Acknowledgements

3.5.9 References

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3.6 Case: Towards a Networked Community of Learners and Carers: The WebAutism Project

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Abstract: This project is set within the context of a networked learning course that offers post-experience professional training to non-traditional university students - parents and carers of people with Autistic Spectrum Disorders (ASD). The course is offered as a flexible and blended course with online module activities supported by face-to-face workshops and online tutorials. Reading material including audio-visual material is closely integrated with collaborative online discussion. Initial evaluation of the course has shown higher than expected retention rates, a high proportion of 70%+ grades for students and excellent evaluations from students. The main focus of our more recent and ongoing research has been the application of discourse analysis to look for evidence of: learner appropriation of the professional discourse of the ASD carer (one measure of learning to be a reflective practitioner in this context) and changes in the quality of collaborative activity (another aspect of learning to be a practitioner in this context). Based on an analysis of a sample of discussions, insights are being gained into the progress and development of adult learning and identity in a networked learning context.

3.6.1 Design

This project is set within the context of an online flexible and blended course that offers post-experience professional training to non-traditional university students – practitioners, parents and carers for people with Autistic Spectrum Disorders (ASD). For many, this course represents re-entry into formal education after many years and the course forms part of the University's strategy in widening access/participation. As the course needs to reflect the of a wide range of adult learners, the programme's pedagogy has a strong focus on the development of a sense of community, enculturing learners into a community of reflective practice by enabling and facilitating collaborative learning from each other's experience. Key design aspects include:

- A student centred approach where teaching methods are varied to meet the needs of individual students and those of the group;
- Integrated use of multimedia materials that appeal to a variety of learning styles;
- Carefully structured online study material with audio-visual clips on CD ROM;
- Authentic scenarios to stimulate reflective role-play and discussion.

This project is examining the effectiveness of the course based on triangulating data from a number of sources (including observation, survey and focus groups and supporting documentation on student progress). Initial work has shown that the course has high retention rates, a high proportion of 70 %+ grades for students, excellent testimonials from tutors and students. However despite, in this sense, being a successful course, our initial evaluation showed an overall pattern of declining contributions to bulletin board discussions between module 1 and module 2 of the course and a smaller but continued downward trend in postings between modules 2 and 3. We wanted to know what the reasons for this might be. Therefore the main focus of research currently being undertaken is on methods of sampling and analyzing the quality of interaction for learning from a very large corpus of online collaborative discussions

called 'Time to Talk' discussions. To try to answer questions relating to the quality of learning taking place interaction quality will be judged according to two measures: collaborative engagement with each other's contributions (one aspect of learning to be a practitioner in this context) and learner appropriation of the professional discourse, values and goals of the ASD carer (another measure of learning to be a practitioner in this context). Discussions will be used to gain insights into the development and progress of tutorial groups as they interact with course activities and each other. In particular, an in-depth analysis is examining:

- The ways in which the student groups develop their own and overlapping communities of engagement;
- The role of the tutor and the structure of the course itself in facilitating and developing their sense of belonging to these communities;
- Their developing use of reflective and professional vocabulary to describe their practice as part of wider investigation into student learning.

3.6.2   Basic theoretical approaches

The research makes use of socio-cultural activity theory (e.g. Engeström, 1987; Cole, 1996; Virkkunen & Kuutti, 2000) and the work of Benzie (2000), in turn based on Lave and Wenger (1991, 1998) to shed light on the ways in which the network is currently acting as a community. Based on activity theory tutorial discussion group members can be viewed as participating in overlapping activity systems and these systems can be analysed. Wenger defines a community of practice as requiring mutual engagement, joint enterprise and a shared repertoire. In other words, if the network of learners is a genuine collaborative community there will be evidence of progress toward developing shared understandings and shared repertoires – ways of doing and ways of talking that may themselves become mediating artefacts in achieving learning. The research aims to investigate the extent to which the learners within their computer mediated and e-tutor facilitated tutorial groups develop and negotiate these rules, roles, repertoires and tools and the extent to which they are felt by learners to be effective in meeting their needs. As one key aim of the course is to increase learners' confidence within the boundary communities of the wider School/Higher Education context, Special Educational Needs and relationships with service providers, the degree to which learners feel confident within, central or peripheral to these communities will also be examined.

3.6.3   Methodology

Analysis of 'Time to Talk' discussion will complement and contribute to a broader discussion of students' attitudes and position in relation to the course as a whole. Emerging themes form the discussions will therefore be triangulated with data from interviews, questionnaires, observations and tracking.

The framework for studying the Time to Talk discussion will be that of discourse analysis. Some aspects of the analysis will make use of previously developed tools (DISCOUNT) that have been developed and tested elsewhere by the authors (Pilkington, 1999, 2001; Pilkington & Walker 2003a, 2003b). Other aspects of the work, particularly work on the appropriation of reflective and professional vocabulary by learners, will be based on emerging themes and develop new analyses for this purpose (Guldberg, in preparation).

Based on previous work in the field (Kneser, Pilkington and Treasure-Jones, 2001; Pilkington and Walker, 2003) it is suggested that re-initiating (in which participant A is responded to by B who includes a reinitiating move such as a clarification question or challenge within the body of

their message that A then replies to) is indicative of both exploratory style talk (the expression of alternative viewpoints) and deeper engagement with each other's contributions. For this reason reinitiating sequences will be examined to see if there was any evidence of greater progress towards learning goals in sections containing these sequences.

The first pass discourse analysis thus involves identifying whether the message was initiating a 'new' thread of conversation or was offered as a response to an ongoing thread and whether within the body of the message a 'reinitiating' discourse move was contained – these being classified as either a clarification question or a challenge - challenges include 'yes, but' or 'no, because' style responses or 'why?' style questions. Responses that also went on to raise new initiating inquiries, were also marked. A more detailed account of the process by which such analyses are conducted is explained in Pilkington (1999).   Note, however, that it is not always straightforward to determine the threading of messages purely syntactically according to whether the participant used the 'reply to' function of the web-based discussion tool or not. In many cases participants reply to the last message in the sequence but indicate in the body of their message that the response is actually to another message by marking the response with the name of the sender of the message to which their message is a reply. Where this is clear the analysis records the alternative threading but where this is unclear or where messages are addressed to 'all' or 'everyone' e.g. opening with 'Hi all' whilst continuing the theme of the previous message, the threading as recorded by WebCT is maintained. Occasionally the message although threaded as a reply by the system is clearly a 'new' initiate on a 'new' subject and this may be recorded at the same level of the last new subject branch.

In addition to addressing the question of whether a decrease in postings over time is a cause for concern, the qualitative analysis is designed to look at the development of the learning community including: the emergence of common values or goals and a sense of common identity as and ASD practitioners; development of empathy for the person with ASD and empathetic support for each other as carers and practitioners in the field; developing criticality in the field through awareness of alternative viewpoints and inquiry/exploratory dialogue; evidence of empowerment to change practice through the network including using the network as a source of practical help and helping each other to change practice within other workplace communities.

In judging progress toward learning goals the analysis will look for sequences in which, in line with good practice in ASD guidelines, there is evidence of: awareness of alternative approaches to care; empathy with the person with an ASD and planning to meet their needs through taking their perceptions into account and planning with multi-agency co-operative working in mind. Alongside these indicators the adoption of specific lexical items (terms) also thought to suggest learning to adopt the repertoires of the ASD practitioner will be examined.

The volume of postings prohibits a detailed qualitative analysis of all the tutorial groups so sampling techniques will initially look at the mode group and later widen the analysis to look at more extreme groups . A selection of Time to Talks over a time period of 7 months in total is currently being investigated.

3.6.4   Networked learning environments
Institutional Setting/Context
The course is managed within the Continued and Professional Development programme offered by the School of Education at the University of Birmingham and leads to the award of University

Certificate (after 1 year) or Certificate of Higher Education (2 years). A University 21 partnership agreement to deliver an adapted version of this course in collaboration with Lund University is currently being negotiated and, if achieved, will help secure ongoing future international development of the programme.

Target group
- Non-traditional students - parents and carers of people with Autistic Spectrum Disorders (ASD). For many this course represents re-entry into formal education after many years of no formal study.

Technology
- All teaching materials are delivered in online Sections, with audiovisual clips (on CD ROM) attached to every Section.
- Collaborative learning takes place through WebCT bulletin board discussions.

Subject/content
- Post-experience professional training for parents and carers of people with Autistic Spectrum Disorders (ASD).

Organisation
The course is offered as a flexible and blended course with online module activities supported by face-to-face workshops and online tutorials. The flexible web-based delivery allows students to fit their study around busy lives. Collaborative discussion and learning is built into the structure of the course. Each student belongs to a regional tutorial group headed by a regional tutor. Students are assessed on collaborative learning tasks that take place through bulletin board discussions.

Pedagogical methods/approaches
- active and collaborative learning;
- conversation and practice based discussion and collaboration;
- some problem based learning in year two;
- structured and integrated e-learning environment;
- interaction between student to student, between student and tutor and between students and programme team.

3.6.5 Dimensions in productive learning
Arguably one of the most innovative aspects of this online course has been the fact that the different components of it are closely integrated with one another in the way they are presented to students. Audio and visual materials are tightly integrated with the reading material, online presentations and discussions. Each multimedia section of content follows the same generic framework (see figure 1). Online discussions are closely timetabled with and based upon the issues students have covered in course material enabling issues raised there to be elaborated in collaborative, discursive and reflective activity.
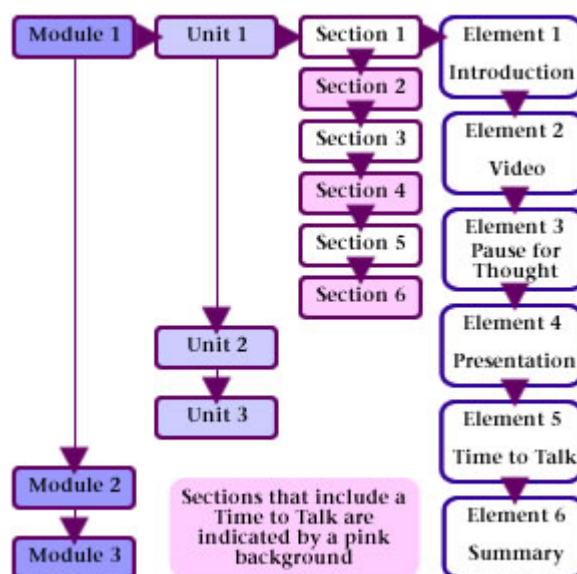
Figure 1: Guldberg (in preparation).

The close integration of content structure and discussion timetable ensure that there is always a 'critical mass' of students discussing the same topic within a given window of time. It also helps level one students set and keep a pace of study that means they are less likely to drop out or fail. In year two, the six -section unit is replaced with four less formal 'Workshops', encouraging more reflection, personal research and collaboration.

Online tutorial facilitation in 'Time to Talk' discussions adopts a light touch – the role of the tutor is to keep students 'on topic' enabling them to manage their time effectively. However, the tutor aims to maximize opportunity for students to listen to and engage with each other's experience rather than lead the discussion in a pre-set direction.

Another innovative aspect of the course is the close integration between academic, administrative and technical support teams in design, development and delivery of the course. This has contributed strongly towards the coherence of the course and its responsiveness to student needs. The coherence of further research and development will be ensured through continued participation of teacher-researchers in research and delivery.

This work is still at an early stage but initial analyses suggest that there is evidence (Guldberg and Pilkington*, in preparation*) that students belong to an overarching community of practice which could be described as an activity set (Engeström, 1999). This is the wider autism community of practice. This entails having an identity as a carer or practitioner in the field which then impacts on their sense of belonging to this particular course. Furthermore, we have identified that within this set, students belong to different subsets and they work at sharing and co-constructing shared understanding through these subsets. The students have in many ways developed their own discourse and consensus of what constitutes a good practitioner. They counter pose this with notions of 'the other'- people who do not share this understanding. Social as well as cognitive interaction with both instructors and peers appear important in participation and learning in online discussion (Garrison and Anderson, 2003). Reeves and Forde (2004) point out that an important aspect is whether the participants' status is enabling or a barrier to

changing practice. Further research will help us to investigate what is changing and for whom and how the values and experience of the course allow the students to make an impact on other activity sets (for example, schools, family and residential provision).

3.6.6   Acknowledgements

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3.7 Case: Sharing Thoughts in Computer Mediated Communication

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Abstract: This paper discusses students' textual participation in asynchronous CMC in a distance education course at master level. The analysis has focused on how the students interpret the course objectives and how these are enacted in the virtual discussions in a tool called shared document. The paper further attempts to describe the students' own negotiation of structuring their partipication. The observed outcome suggests further investigation of the benefits and constraints while using a shared document as mediating tool for collaborative networked learning.

3.7.1 Introduction

A discussion group on the Internet is normally a self-organized group sharing a common interest and exchanging news, experiences, or ideas. At the university the seminar is the principal discussion format and traditionally it is carried out face-2-face. In academic distance education using computer mediated communication (CMC) these two traditions meet.

Below the CMC in a distance education course for master's students is explored. The purpose of the investigation is to analyze the textual communication conceptually, thus adding necessary tools for future distance courses. The investigated course constitutes one part of a complete master's programme at the IT-university of Gothenburg and the investigation is delimited to one particular part of the course, the first one named "Technology transfer".

Communicating Online
In most cases CMC can be characterized as an instance of *deprivation of presence* (Dahlin, 2000, our translation). Bereft of what Swartz and Biggs (1999) call the *social abrasion* of face-to-face communication CMC must constantly lean onto other clues for a sustained participation. Moreover, when the CMC is delimited as in asynchronous to text-based communication all personal expressions are delimited to various textual traits (Giese, 1998). Therefore it can be argued that CMC and text-based communication in particular runs the risk of building up an *emotional distance* between the participants (Swartz & Biggs, 1999).

In an ethnographic study of CMC in distance education Wegerif (Wegerif, 1998) showed that success or failure in online communication was dependent on students feeling as *outsiders* or *insiders*. He also found *discourse conflicts* meaning that some participants felt inferior compared to participants who by way of frequent contributions appeared more knowledgeable. The feelings of inferiority eventually led up to silence.

As to the actual communication Sudweeks and Simoff identifies a difference between task communication and conceptual communication (Sudweeks & Simoff, 1999). Task communication deals with the explicit work to be accomplished and focuses on information content of communication, whereas conceptual communication focuses on the creation of meaning preceding the processing of information. Conceptual communication involves the

creation and prescription of shared rules to follow and involves a medium to high level of interactivity.

However, favourable structural conditions will not be a sufficient explanation of a successful participation. It is also necessary to understand how the participants manage to construct a shared purpose from their understanding of each other as well as of the task and of the cultural tools. By analyzing the concept of shared purpose from an activity theoretical perspective Tolmie and Boyle (2000) showed that shared interpretations of the task and of participant intentions were necessary conditions for the experience of a shared purpose and thus for a successful communication.

Below the characteristics of the course, which was investigated in this study, are presented.

3.7.2 Course Description

The course was presented as a web document that could be accessed from the virtual learning environment (VLE) (http://www.chl.chalmers.se/~lejon/ITU160).

When accepted and registered for the course the students get the network access and login. They access the course from the VLE, in this case named Fronter. Shortly, the VLE is built on a room metaphor. The course in question is located in the "ITU160 distans (IKT II) vt 04" (see below). When entering the room the students meet information about the room's name and a brief description of the course. In this case they also meet two thumbnails picturing the books they will need for the course. In most rooms there is a message board and a calendar. However, "room owners" (often course leaders) have the possibility to design the room as to meet the particular conditions of any course. The tools panel (on the left) contains the tools the room owner has chosen to use. In this particular course just a few tools – Participants and Archive – are located in the tools panel (Figure 1).

When a participant clicks the Archive tool, s/he will be directed to a list of folders similar to the Windows Explorer (Figure 2). In ITU160 the first folder is used for course description and administration. The folders from 2 to 6 contain the five main themes. An additional folder contains various resources (links, scanned articles, video streams, photos etc).
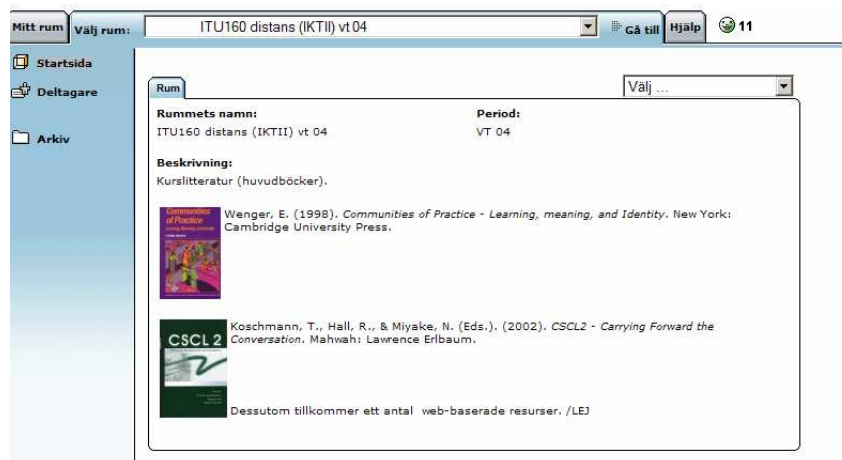
Figure 1: The opening page and the tools panel to the left of the course ITU160 distans (IKTII) vt04.

The course consists of five main themes building on two set books, Koschmann, T., Hall, R., & Miyake, N. (Eds.). (2002). CSCL2 - Carrying Forward the Conversation and Wenger, E. (1998). Communities of Practice - Learning, meaning, and Identity. Moreover, the required reading consists of a small number of online documents (Figure 2).
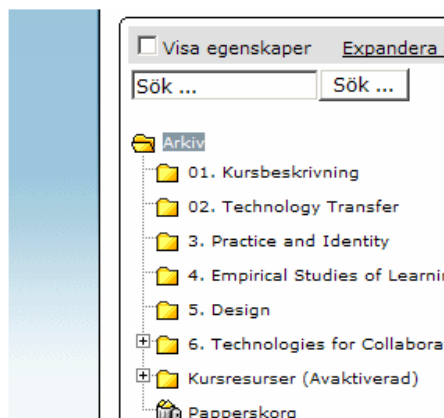
Figure 2: A list of folders constitutes the separate themes of the course.

A specific objective of the course is to involve students in the knowledge building activities with the aim of making use of students' experiences. To that aim a particular tool called the "Shared document" is used. This tool gives the participants the possibility to collaborate on the same document. The shared document tool allows participants to edit and comment their fellow participants' contributions (Figure 3).

Figure 3: The beginning of a shared document.

Course activities

Due to the conditions for acceptance all participants have previous experiences from academic studies. They also have various job experiences. The difference in age between the youngest and the oldest participant is approximately 30 years, the oldest participant being born in the end of the 40s and the youngest in the end of the 70's. From the outset 20 particpants were accepted for the course. Some of these did not show up at all and due to various private reasons some did not

finish the course. At the end of the spring term (semester) approximately half of the accepted group passed the examination.

At the time of this investigation the members of the group have studied together during two terms, have met face-2-face on at least 3-4 occasions. They feel at ease with each other.

Each of the participants was assigned to a student working team with the responsibility to lead a virtual seminar of one of the five main themes of the course. This meant among other things that they had the freedom (within reasonable limits) to customize the knowledge building activities for the entire group of participants. However, some team responsibilities such as time scheduling, themes to discuss, deadlines, cooperation strategies, types of assignments, publishing, and empirical observations were listed. A rough schedule mapping out the progression of the entire course was provided by the course leader.

The discussion in the VLE lasted from 26 January till the end of February 2004. Eleven active contributors were involved, six males and five females. Stundent A is in command – moderating the group – invites and encourages participation and informs of the intended structure – how to participate. Objectives expressed by the moderator:

We will discuss practical issues, and the shared document is directed towards creating knowledge (*kunskapa as a verb – *to knowledge – even in Swedish a non-existing verbal construction).

At the end of the period the moderator asks everybody to contribute to a finalizing summary.

3.7.3   Methods
Tracking down a text based activity system is a matter of reading transcripts. It is evident that some basic quantitative data can easily be obtained. The VLE allows for various kinds of "surveillance". In the "Digital Portfolio" tool the number and distribution of contributions can easily be tracked down. The contributions from any single participant can be collected and compared to others' and so on. However, these procedures only faintly tap the character of the participants' communicative efforts. In order to tap the character of the communication the transcripts must analyzed qualitatively.

To meet these requirements excerpts from the textual communication were analyzed. The entire written communication from the first module of the course, "Technology Transfer", was assigned to a group of four experienced distance education instructors and was analyzed from different perspectives. After an initial focus on this specific module, other course modules were brought into the analysis, to extend our focus.

The analysts met on a few occasions but most of the common work was accomplished using the same VLE as the students in the course used. A room called Jeirp Case was created in which all the material could be uploaded. One person from the staff involved in the analysis served as a coordinator taking notes during the meetings and making all material available in the VLE.

In the first meeting a divison of labour was made. The participants were assigned different tasks (writing a background, initial analysis etc). The preliminary manuscripts and the upcoming ideas were continually uploaded in the room.

It was found that analysing online was not a trivial task. First, the shared document (which the students were required to use in their course) was not used particularly frequent. Instead documents created with the most common word processor were uploaded. Eventually, the discussion tool, which allowed for threaded discussions, was more frequently used than the shared document. Second, the different analysts tackled the transcripts from their particular research perspective, which resulted in quite disparate analyses.

In sum, the analysis strategy applied in this case might be just as interesting as the result of the primary analysis. In the future it might be worthwhile investigating the research strategies applied in collaborative analyses.

3.7.4 Results

The results presented below are a corollary of the strategy used in this particular case. Thus, it is the result of four different perspectives merged into one report. Below, first a general description of the communication focusing a range of dimensions is presented and after that a conceptual analysis is presented.

General characteristics

The computer mediated communication in this specific case is characterized by social cues, debating, turn-taking, linguistics expressing ideas, suggestions, greetings, approvals, objections, negotiations of understandings of literature, theories about learning, references to studies and the individual's own experience, among these students a shared teacher focus.

After a few introductory sessions in the VLE, structures and course design are discussed and negotiated among the students, the discussion becomes denser and focused on pedagogical theories, the literature, added with recollections of personal experiences, contextualized extensions of the focus – described and defined by each group – and by the moderator.

A lot of questions are addressed and expressed, some of a more philosophical nature and as such met by individual reflections, combined with theoretical reasoning and stories originating in individual experiences. Some are not answered at all or to some only partly met in the shared document. Some questions are rhetorical.

Reflective learners

One of the students expresses his doubts about how participation and contribution is supported in the course structure. This student refers to the prevailing discourse as 'artificial'. The learning activity and participation is structured around groups, one member has been given the role (by the course instructor) as the teacher. This person is understood as the one who raises an issue, the other group members respond, reflect and build knowledge, which everyone can access and be part of. He sees this as a problematic structure, as it does not contribute with any driving force either to self-assess or evaluate each participant's level of understanding. Also, the possibility of extending their understanding seems, to have been visually disappeared in the virtual environment. His explanation for this to have happened, is attributed the fact that all participants have become both teachers and learning learners.

How to participate – sharing diverse perspectives
Fronter is experienced and described as a public room by one of the students. Public in this sense is restricted to include only the participants in this course and participation is referred to as having a discussion. Yet, the word 'public' is used to signal that each contribution and sharing of ideas and reflections is created after some serious consideration and concentration, both while reading and writing, according to one of the students. The other group members are given the roles of guides and as such offering clarifications of misunderstandings. There is also the opportunity of expressing opposite views, when ideas are not shared or understood the same way. Using a shared document can become too complex, the structure and initial aim and issues raised may be lost.

Keeping track of the initial discussion in a shared document
Keeping track of the issue, the point of departure set by the moderator, is sometimes lost in the debate. Yet, one of the students claims that the discussions are better than in 'real-life' debates. Intellect, and the written word meet and no other disturbing communicative signs prevent thoughts and impressions. Real-life communication is spiced with impressions, which can disturb or restrict the intended message to get through.

Critical reading
Why not send our summaries by regular e-mail? Reflection on existing contributions, raise the critical question of the possibility of summaries being the more common way of approaching the material. The artifact as mediating content but also embedding the activity as such is dependent on the chosen human activity. This student regards the learner as responsible, the artifact can mediate, but the activity is related to the student him/herself as participating and contributing. How to express critical thoughts in the debates remains an issue to be solved.

Participation and the sharing of perspectives
Participation and sharing of perspectives among and within groups, presupposes there is something to share, that sharing per se adds value and quality, which could not be as easily reached by an individual. During the sharing of views and reflections, the complexity is expressed by some students. Participation can be understood in terms of the textual mode, thoughts and reflections are represented in words. Some students are troubled and frustrated by the sense of being unable to contribute, add perspectives or share any 'new' reflections on the studied literature. This is a recurring theme throughout the various modules of the course, and seems to occupy thought and space. Some students are explicitly seeking confirmation, responses of being acknowledged, of being on the 'right' track. By being late with your contributions to the debate, it becomes harder to add anything not already expressed by someone else. Some even mention refraining from actions since what had been prepared, was already in the platform. The discussions tend to become impossible to grasp, there is a feeling of getting lost. My participation does not add anything resulting in non- or tacit participation. The sharing of perspectives tends to decrease after the initial eagerness to contribute, according to one student.

Written mode is considered as demanding
If you regard yourself as a fluent writer, you probably have the skills to re-formulate, to vary your participation. The discussion includes notions of words and synonyms as being 'used', as consumables. Phenomena from diverse perspectives, being 'forced' or adapted as a preparation for further studies within this field, are positive outcome of the effort of participation and

contribution. As being a learning community, implying the sharing of perspectives, this is the receipt you get of sharing, the sharing of perspectives and the sharing of belonging to a community.

One design and structure related solution to the problem of maintaining a meaningful discussion, is proposed and accepted as a reasonable suggestion. How to encourage the activity of debating? The textual mode is believed to restrict spontaneity compared to face-2-face communication. The proposed solution, after negotiation among the participants, is pragmatic to its nature, and stipulates a decrease in contributions regarding length and as well as being more restrictive in raising issues. Participation in the shared document has to be well structured and organized according to the students. The teacher intervenes and actively responds to this debate by mentioning difficulties with reading a long shared document and comments that asynchronous communication has certain built-in restrictions.

Conceptual analysis
The participants' textual accounts have been qualitatively analysed. Line by line (almost) the accounts have been coded for relevant themes. Thus the accounts were coded for the following themes:
- Connection
- Description
- Metacognition
- Example
- Reflection
- Conjecture/Assertion

Connection
Connection is used to when participants directly address another participant in a contribution f.ex. "*I have like /name of participant/ thought of this from another perspective*."

Description
Description is meant to denote contributions, which directly address the texts read f.ex. "Bruce presents the study of innovations in two conflicting perspectives, one innovation-centered and one social discourse centered."

Metacognition
The Metacognition category summarizes the contributions, in which the participants focus on their own activities f. ex. "*In our present situation we are both students and teachers to each others.*" These three categories can be said to have an *intrinsic* orientation as to the activity. Next three have an *extrinsic* orientation.

Example
The Example category is used to sum up examples from the participants' experiences f. ex. "*An example of an innovation that failed is the introduction of the CASH-card...*"

Reflection
Reflection then is used for very open-ended contributions f.ex. "An interesting thought is that technology sometimes estranges us from reality."

Conjecture/Assertion
Finally, Conjecture/'Assertion is a merged category sometimes representing a conclusion (assertion) but in most cases representing a conjecture sometimes ending with a question mark f.ex. "*There is no doubt that the Internet has changed our social behaviour*" or "*I think there are two kinds of innovations, those which occur more or less voluntarily and those which are pushed on to people*". "*Most people bought their mobile phone voluntarily, I think, whereas when we talk about computers in education it is different.*"

Normally an analysis of this kind would have been pursued in search for a core category with the capacity to join the entire analysis into a coherent account. In this case, however we will delimit the account to the *Metacognitive* category, which will be elaborated further below.

Metacognitive contributions online
It seems that the participants feel responsible that the contributions add to the common knowledge building. There is no need to be afraid of writing. There is also no need to worry about not being able to comment upon everything. After all, they constitute a community and it is what they accomplish together that counts. Actually, they consider themselves teachers as well as students. Sometimes they are encouraged by their fellow participants to go on writing constructive comments. Gentle warnings that they will all suffer from careless contributions are also given.

When they write their contributions in Fronter these are considered better than IRL because they all know that Fronter is a kind of public space. Together they will reach further than working one by one. And that is because they meet "intellectually" without being disturbed by distracting cues. Even though it is sometimes hard to stick to the initial topic it is still better than real-life discussions. Someone testifies that he/she learnt a lot more in the virtual seminar than in the IRL-seminar.

They also compare their way of working to the texts they study for the course. There is a similarity in the sense that their knowledge building is quite free. However they doubt that young students at school will benefit from the approach. After all, they have different objectives. School children want to get ready as soon as possible whereas they, the participants of this course, are truly interested in knowledge building.

"*Actually, we are active knowledge builders*", someone says. It seems they have reached an insight as to how they act and react to working in a CSCL environment. One of the participants wonders if they are too much influenced by the computer artifact. Moreover there are some reflections of the fact that the discussions are text-based only.

However, sometimes it might be a problem when there is too much of a descriptive account of what is in the text instead of a critical account. The advice then is to concentrate on a particular part of the text that one experiences as interesting. Besides it is not feasible anyway that they all give an account of the same part of the text. A good way is to start off with what raises one's curiosity. It might also be a problem when the text does not give very much cognitive input. In one contribution it is pointed to the problem that there are no evaluative comments and thus their cognitive level will not be challenged. Still they consider themselves involved in a learning process.

After some time the list of contributions will be somewhat difficult to overview. In those cases when there are long accounts the Shared document tool is not particularly suitable. Somebody actually says that they could just as well email each other. A suggestion is to substitute the Discussion tool for the Shared document tool thus enabling threaded discussions.

Very few technical problems seem to appear during their activity. Only one occasion one of the participants mentions a problem as to think and use the word processor at the same time. In this case s/he always uses paper and pencil before entering the text in the word processor even though it is time-consuming.

3.7.5 Conclusion

It is reasonable to question if the choice of tool, the shared document sometimes restricts a productive discussion. The participants try to handle this problem by arguing that contributions be shorter. They are also aware that they contribute in a kind of public room and some of the initially mentioned problems concerning discourse conflicts are touched upon when participants excuse themselves for not participating and when being worried about not being right. Besides, two participants contribute more frequent than the others. One of them is explicitly praised by some for clever contributions. After all, writing in public is quite demanding for some people.

One of the analysts characterized the ongoing participation as being more like cooperation than collaboration. It can be likened to a panel discussion in which participants are required to give an initial entry and then answer potential questions coming up. It seems as if some participants think that one contribution is enough (one single performance) and also that they are supposed to fit in their contribution to attain a kind of consensus. "*I did not contribute cause I had nothing to add*", someone says.

Actually, there was little criticism. What sometimes were criticized were too long contributions and therefore the participants tried to negotiate the length not to be more than fifteen lines each time. It was considered better to contribute more frequent instead of producing lengthy accounts.

More serious, still, is the view that the online discussion lacks a driving force and that it fails to extend the participants understanding. Paradoxically, though, there is a view that the online discussion is much better than discussions IRL. However, none of these views is necessarily commonly held in the group. Therefore these issues are still to be investigated.

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3.8   Case: Human Centered Informatics - The emergence of an educational infrastructure

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Abstract: Higher education needs to explore ways to organize implementation of ICT in learning environments. Bearing in mind the continuous development of ICT, it also seems important to recognize that implementation of ICT isn't going to be a one-time event. One of the very first steps needed in order to prepare organizations to facilitate the change processes is to actually understand what implementation of ICT in learning environments is and how it affects practice. This paper explores perspectives on implementation of ICT in higher education.

3.8.1   Introduction

Implementation of ICT in higher education is a complex task. Teachers and students but also management, administration and ICT support are correspondingly affected by the implementation. At the same time the importance of ICT in learning environments in higher education increases in order to meet the needs for increase in quality, efficiency, flexibility and quantity.

Research in Computer Supported Collaborative Learning (CSCL) and related subjects has already stated that ICT influences from a organizational as well as a pedagogical perspective but a deeper understanding of the implementation seems to be lacking (Collis and Moonen 2001; Dirckinck-Holmfeld and Fibiger 2002). Implications beyond the practice of the individual teacher or small group of teachers are yet relatively vague. Theories and methods explaining how to develop ICT in general seek to ensure that the products meet user demands and needs, but a focus on implementation seem to be missing (Bansler 1987; Dahlbom and Mathiassen 1993; Beyer and Holzblatt 1997). Theories and methods explaining how to develop organizations contain relevant aspects, since implementation of ICT often follows or is followed by organizational change, but they also fail to explain implementation because the perspective on ICT is insufficient (Argyris 1999; Von Krogh, Ichijo et. al. 2000).

Here implementation is defined as *the process leading from one practice to a new practice where the new practice is characterized by use of ICT*. Furthermore we want to draw on the conclusion from (Chin and Marcolin 2001). They argue that the adoption of new technology has to be studied with focus on *deep usage* meaning that implementation of ICT to be fully understood must be studied as a social process and a change in work and learning practice influenced by ICT.

This paper deals with a study of implementation of ICT in higher education at Human Centered Informatics at Aalborg University in Denmark. In the following sections we present the overall methodology of the project, the case, three theoretical perspectives that has been used to analyse and inform practice and reflections on our work towards renewed research agenda for the case and problem area.

3.8.2   Methodology

The empirical base of the project is an action research project within Human Centered Informatics, a program within the humanities at Aalborg University. We will provide a more thorough introduction to the programme and its learning environment in the next section. The project has been running for three years and we are now in the process of identifying research questions and research approach for the next stage of the project.

The aim of the action research project was twofold when it began three years ago. It aimed to develop the use ICT in teaching and learning on Human Centered Informatics. At the same time at aimed to improve our theoretical understanding of implementation of ICT in higher education.

The action research approach was chosen for several reasons. First of all it is a way of combining research and development with the researcher as active participant in the change process (Mathiesen 1973; Baskerville and Pries-Heje 1999; Chin and Marcolin 2001; Mathiassen 2002). It ensures that knowledge gained in research is used in practice. It also ensures a development of practice because the researcher takes part in driving the project forward. Another reason for doing action research is the strength lying in practitioners and researchers collaborating on a joint project. All parties bring their own knowledge and ideas into the project and that creates ownership of the change among the teachers affected by and involved in it. In this project the practitioners are both teachers and researchers at a university and are experienced in reflecting on their own practice thus it is even more important to involve them in the combined change and research process. It is also important to notice that the teachers taking part in the action research project have chosen to do so and how to do it themselves. These factors all have to be considered when the validity of the study is evaluated.

The data collection in the action research project is primarily composed of two elements: 1. log-files from the virtual learning environment, 2. course materials, structures and plans and 3. interviews with administrators, teachers and students throughout the implementation process. The interviews were carried out as semi-structured research interviews (Kvale 1996). In the analysis of the data the interviews is expected to be the most important source of information since the interviews tie information together and give room for discussion of discrepancies.

The action research project was divided in four phases moving from a small-scale study of changes taking place in one semester with few students to a full-scale change project involving the entire program. The focus and content of each of the four phases is listed in table 1.

Phase	ICT implementation	Teachers and students involved	Goal	Research method	Data
1. Fall and winter 2001-2002.	5th semester of Human Centered Informatics. Teachers free to choose technology.	6 teachers, 21 students	Document existing implementation procedures.	Pilot study of existing practice. Researcher has no part in design and implementation of ICT.	Interviews, ICT used in courses
2. Spring 2002 – winter 2003.	3rd semester of Human Centered Informatics. Teachers have to use the same technology.	20 teachers, 80 students.	Develop, use and document new implementation procedures.	Action research. The researcher takes part in design and implementation.	Interviews, ICT based infrastructures created and used, log-files.

3. Winter-summer 2003.	4th semester of Human Centered Informatics. Teachers have to use the same technology.	30 teachers, 160 students.	Develop, use and document new implementation procedures.	Action research. The researcher takes part in design and implementation.	Interviews, ICT based infrastructures created and used, log-files.
4. Summer 2003 -	All semesters and specializations of 3rd semester of Human Centered Informatics. Teachers are adviced to use the same technology.	60 teachers, 500-600 students.	Use implementation procedures.	Case study of practice.	ICT based infrastructures created and used, log-files.

Table 1: Overview of the four phases in the research and development project.

In the following section we are going to take a closer look af the context of the study and thus elaborate on the context for implementation of ICT indicated in table 1.

3.8.3 Networked learning environment for Human Centered Informatics
Pedagogical Setting, Subject and Target Group
The program offers bachelor (3 years), master level (bachelor + 2 years) and Ph.D. level (master + 3 years) education and has more than 500 students. The pedagogical foundation of Human Centered Informatics is the variant of problem based learning (PBL) called problem oriented project pedagogy (POPP). This means that students spend approximately 50% of their time of coursework and 50% on supervised group organized problem based projects.). In POPP, the students themselves in collaboration define the problems and learning goals. This is where POPP differs from traditional PBL (problem based learning) and CBL (case based learning), which are both based on predefined tasks or problems decided by the teacher, the textbook or a fixed curriculum. In POPP, the entire educational process is based on the students' focus on a scientific and social problem (inquiry), which they want to investigate. When students themselves define and formulate the enquiry, they experience conscious feeling of ownership, and they regard it as a problem, which implicitly encourages involvement and motivation. Participant control and the ownership of the problem setting are thus seen as fundamental to the students' engagement in the learning process. Participant control implies that the institution or the teacher is unable to manage the process, they can only guide the learning process, and the teachers are not supposed to project ideas on the students despite of well-intentioned purposes.

Human Centered Informatics combines subjects as communication, organization, theory and practice of learning and ICT studies to provide students with the tools necessary to be critical, but constructive, participants in the evaluation and construction of ICT and new media. One of more possible specializations within Human Centered Informatics emphasizes design and evaluation of ICT and new media for support of learning.

Technology
The primary collaborative technology used throughout the programme is Lotus Quickplace (now Lotus Team Workplace). Lotus Quickplace is a groupware system and as such it is not designed exclusively for learning support. As a piece of groupware, on the other hand, it is interesting to see the way in which it supports learning in group and project-based learning. The system primarily offers tools for asynchronous communication in relation to a shared project. The users

(both teachers, students and administrative staff) have access to: discussion forums, calendar, task lists, link libraries and document libraries. Quickplace also offers a text-based chat for synchronous communication.

The use of ICT in teaching and learning has evolved over the three years of development. ICT has helped to improve the transparency and in some cases also the quality of the programme. The project has, however, at the moment reached some of its original goals and need to launch a new research and development agenda to move the project forward. The rest of this paper discusses the background of the project, findings from the first phase and outlines the basis for a renewed research agenda for the following years.

3.8.4   Dimensions in productive implementation of ICT in Higher Education
Basic Theoretical Approaches
Research on change related to implementation of ICT roughly supports the understanding of implementation as a process with a number of interrelated sub-processes, steps or levels. Everett M. Rogers has done research in what he defines as diffusion of innovations for close to 50 years and has thus been very influential (Cooper and Zmud 1990; Rogers 1995; Zmud 2000; Gallivan 2001). He suggests that diffusion of innovations by individuals can be understood as a process of knowledge, persuasion, decision, implementation and confirmation (Rogers 1995, Pp. 161-186). Cooper and Zmud (1990) suggest a phase model with the steps initiation, adoption, adaptation, acceptance, routinization and infusion. Gallivan (2001) argues that organizational adoption and assimilation of technological innovations only can be fully understood when an organizational, a managerial and an individual perspective is combined in a study of the change processes.

To build a deeper understanding of the practice of implementation of ICT in higher education we have used three primary analytical approaches; activity theory, theory on learning in communities of practice and theory on the emergence of infrastructures. They have in different ways contributed to our understanding of the development from one educational practice to a new practice characterized by a new use of ICT. Here we want to summarize our use of the different approaches and the findings associated with them. Our most recent findings are related to emergence of infrastructures and we expect to give this field a prominent position in the next stage of the project and thus devote more space to this approach here.

Activity Theory
Activity theory can be used to understand implementation as it is defined here where change brings new tools into the work practice of an individual or a group. Yrjö Engeström and others have developed activity theory for use on pedagogical development, design of software and work practice (Engeström 1987; Nardi 1996; Engeström, Meittinen et. al. 1999). Kari Kuuti, who has participated in the development of activity theory for use in the field of human computer interaction, defines it as: "*a philosophical and cross-disciplinary framework for studying different forms of human practices as development processes, with both individual and social levels interlinked at the same time*" (Kuutti 1996, p. 41). In other words activity theory deals with subject, object, goal, group, culture, technology, change and their internal and external relations. So far we have primarily drawn on two prominent contributors to activity theory, namely Leontjev and Engeström. Leontjev builds directly on Vygotsky and developed the cultural historical psychology by describing the implications of mediation and by introducing a distinction between motive, goal and operation in human activity. Engeström builds on both

Vygotsky (Vygotsky 1978) and Leontjev (Leontjev 1983), but separates himself from them by being less oriented towards psychology and more towards what he calls developmental work.

Activity theory has been used for the reasons listed above. It presents a relatively loose framework for interpretation of organisational practice that is open for use in new fields – such as the study of implementation of ICT in higher education. So far we have used it to analyse the practice of teachers, students and administration during implementation of ICT in educational and organisational practices. It becomes increasingly clear that old practices are present in the new ones, that different goals coincide, and that a renewed use of ICT raises questions regarding the division of labour in the organisation.

In the early years of activity theory Leontjev developed the mentioned distinction between activity, action and operation to distinguish between the overall the overall structure any given human practice is placed within (activity), the everyday behaviour directed towards concrete goals (actions) and the underlying operations that are the conditions for performing actions and engaging in an activity.
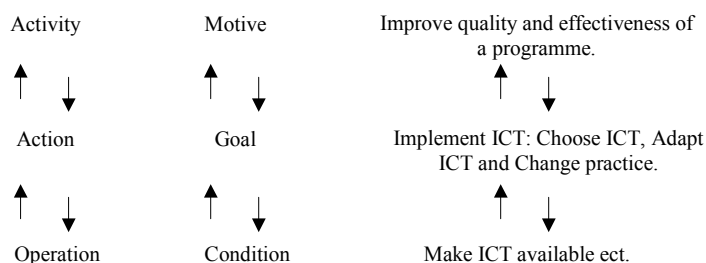
Figure 1: The levels of an activity corresponding to motive, goal and condition. At the right side examples of activity levels identified in the action research project (it is still questionable whether Improvement of quality and effectiveness really is the overall motive) (Nyvang 2004).

Building on the work of Leontjev Engeström has developed the understanding of the structure of an activity further (Engeström 1987). One of his contributions is the activity system visualized in figure 2. The activity system is composed of subject, object, community, transformation process and artifacts mediating between e.g. subject and object.
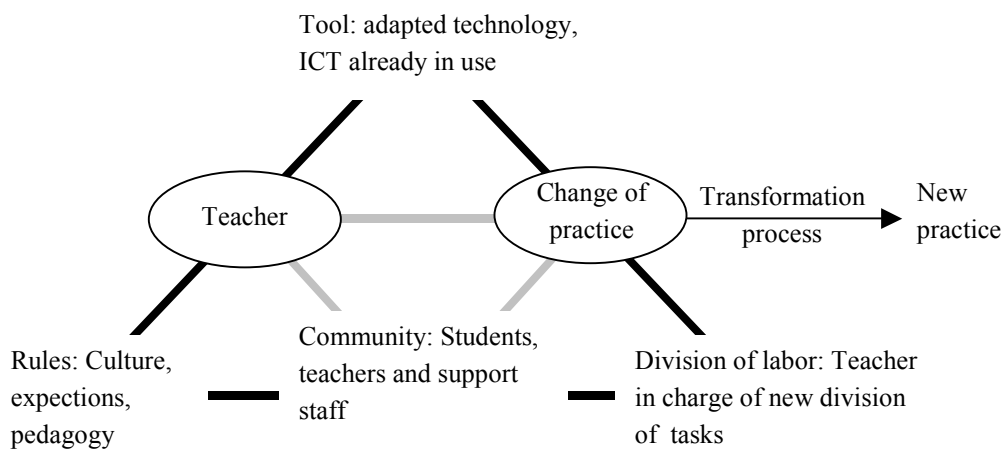
Figure 2: Activity system for change of practice with ICT. In the example here focus is on teacher activity.

Findings based on activity theory do so far focus on implementation of ICT and university teachers (we are in the process of expanding this track of analysis to include other relevant activity systems). The teachers are of course very important during the change of teaching and learning practice, but the change of practice also poses considerable risks to the teachers. To support innovation in the following phases of the action research project it is advisable to improve the support for both students and teachers in this process. To avoid loss of time and build-up of frustrations students may need introduction to the new technology and the teachers may need support for developing their use of the technology. It should also be considered whether the advantage of experimenting with more technological platforms is bigger than the disadvantage of forcing students and teachers to navigate across multiple platforms. It should also be considered that implementation of ICT in the early stages is under heavy influence by ICT already in use because it mediates an understanding of the new that is grounded in the old ICT.

Communities of practice
The second major theoretical influence on the project so far is Wenger's theory on learning in communities of practice (Wenger 1998). It can be used to understand implementation of networked ICT as a learning process in which a new practice and structure is constructed in a process of negotiation of meaning. The theory of learning in communities of practice is relevant both when it comes to explain how POPP facilitates learning and when the target is to understand the role of ICT in POPP. Our focus in this brief introduction will be on central concepts that can be used in the analysis of our case.

Wenger describes practice as *about meaning as an experience of everyday life* (Wenger 1998, p. 52). What goes on in practice is thus negotiation of meaning understood as a duality of *participation* and *reification*. Participation in the negotiation of meaning takes several forms including participation in discussions and production of contributions to the project. At the same time, documents, infrastructures for collaboration and so forth are reifications of the negotiation of meaning. A community is constituted by mutual engagement, joint enterprise and a shared repertoire (Wenger 1998, p. 73). All three dimensions are both subject to, and influence, the negotiation of meaning in the community. In POPP, mutual engagement is linked to the formation of the project group and maintenance of social relations within the group. Joint enterprise is related to the common project and negotiation of its target and content. Shared repertoire refers to shared artifacts as well as the shared academic and social history of project group members.

In short, learning is all of the above, meaning that learning at the individual level means engaging in and contributing to a community while learning at the community level is refinement of practice. This perspective has as indicated helped us to pinpoint the needs when it comes to implementation of ICT support for POPP (Dirckinck-Holmfeld 2002; Tolsby, Nyvang et. al. 2002; Nyvang and Tolsby 2004; Nyvang, Tolsby et. al. 2004).

Infrastructure
The perspective on structure or to use another term infrastructure draws on the works of Susan Leigh Star and Karen Ruhledger (Star and Ruhleder 1994; Star and Ruhleder 1996). They suggest that we interpret ICT in use as infrastructures that shape and are shaped by practice. The traditional conception of an infrastructure is something that is just there, ready-to-use, completely transparent and not to question like e.g. the water system, the electricity supply, the

railway, the mail services and the Internet. This understanding focuses on infrastructure as an object, something that is build and maintained and then sinks into the invisible background. It follows from this that the activities around the infrastructure are heavily shaped by its structure. In a way this is exactly the kind of infrastructure we want in our educational setting, something just working, supporting learning activities and communicative practice. But in order to discuss how something becomes an infrastructure, the design and re-design of infrastructure, the question of how the structure should/could be, we need to focus on the process, the infra-process instead of the infra-structure.

Following Star and Rudledger we in this paper understand infrastructure as a relational concept. *Thus we ask, when – not what – is an infrastructure* (Star & Ruhleder 1996, p. 113). Stressing the fact that it is the use context and use practice that defines whether or not a given technology becomes an infrastructure. In order to characterize the relational side of infrastructure Star & Rudledger suggest eight dimensions, that is

- Embeddedness (integrated in social structures and practices)
- Transparency (can be used without removing focus from the task)
- Reach or scope (goes beyond individual tasks or processes)
- Learned as part of membership (an inherent part of an organization)
- Links with conventions of practice (shapes and is shaped by practice)
- Embodiment of standards (builds on standards and conventions)
- Build on an installed base (must relate to existing technologies)
- Visible upon breakdown (looses transparency and is drawn in focus when it breaks down).

These dimensions are quite general, in fact they could be used to characterize very general phenomena like for instance language, which indeed is an infrastructure and, we take it, is meant to point at the ambiguity and complexity in seeing infrastructure as a relational concept. In the words of Star and Rudledger: *An infrastructure occurs when the tension between local and global is resolved. That is, an infrastructure occurs when local practices are afforded by a larger-scale technology, which can then be used in a natural, ready-to-hand fashion (p.114).* And to be sure it is not a one time, once and for all procedure it is a never-ending ongoing dynamic process. Still this focus on the relational part of infrastructure becomes even more insistently when you, like in our case, is in the process of establishing a new one.

To address the fine balance between practice and technology and to sort out the many problems arising in the emergence of infrastructure Star and Ruhleder turns to Bateson and his understanding of communicative systems. Communication in Bateson's term is an extensive and far reaching concept referring to the kinds of phenomena that cannot be understood in term of physical laws. His study of communicative behavior included problems from very different domains e.g. schizophrenia, alcoholism and the communicative system of whales and dolphins. Regardless of the particularities in the concrete problem involved Bateson focus was on understanding the general laws and patterns of communication inspired by Bertram Russell's theory on logical types Bateson has pointed out that human communication operates at several levels of abstraction. The levels are organized in a hierarchical structure such that the above level is about the sub level. The level that is about communication is called meta-communication, and the level that is about meta-communication is called meta-meta-communication and so forth. In the distinction between the content and relationship level of a message the relationship level is

about the content. The relationship or meta-communicative level is used to classify the content level of the communication, to inform on how to understand the message.

Bateson points out that there is a gulf between the metamessage and the message. A gulf that is of the same nature as the gulf between a thing and the word that stands for it, or between the members of the class and the name of the class (Bateson 2000), p. 247). Bateson's understanding of learning corresponds to his theory of communication in the sense that learning is communication and like all communicational phenomena should be understood as a hierarchy with different levels.

The number of levels possible to identify in human communication is not fixed but like Star and Ruhleder we identify three levels as relevant for understanding the problems involved in the process of creating/ re-creating an infrastructure. Level one problems appear as matter of fact problems, like not knowing how to get a user name, or publish a message in the system or not understanding what is wrong when the server go down. Level two problems are concerned with how to use the system properly, what kind of messages should be published and to whom. Thus level two is in fact concerned with classifying, with discussion and reflection about the type of problems involved in using, supporting and running the system in the use context. Level three is one step more abstract, and involve questions like what kind of learning goals we want to pursue using ICT or the general politic of the choice of platform (vendor locked or open source). We would say the issues raised on level three is concerned with the fundamental issues and values in the concrete practice, in this case the educational practice.

The importance of communication in emergence of an infrastructure is especially important when it comes to second and third order issues. To elaborate on our understanding of this communication we again turn to the work on learning in communities of practice done by Etienne Wenger. Practice is *about meaning as an experience of everyday life* (Wenger 1998, p. 52). This corresponds very well with the idea that infrastructure emerges from use in practice. It also indicates that we may have to look closer at the term community to see whether it can cast additional light on the emergence of an infrastructure. All three dimensions of a community (by mutual engagement, joint enterprise and a shared repertoire) are both subject to, and influence, the negotiation of meaning in the community. Learning at the individual level means engaging in and contributing to a community while learning at the community level is refinement of practice. In that respect it is our claim that the emergence of an infrastructure represents learning at the level of the community of users of the infrastructure.

The primary findings so far based on the infrastructural approach are discussed in (Bygholm and Nyvang 2004). It turned out that this approach was useful to pinpoint critical questions linked to the emergence of an educational infrastructure. In the following section we will take a closer look at some of the findings that derive from especially the ladder approach and try to identify springboard for a new research agenda and a new practice of implementation of ICT in higher education.

Educational Infrastructures - Findings So Far
The analysis in (Bygholm and Nyvang 2004) showed three themes of importance to the emergence of an infrastructure: Communication and media, design and support, and technology. The same analysis showed that challenges and questions to the process could be grouped in a hierarchy of access, process in context and goals and values. These levels correspond to the

levels of communication that (Star and Ruhleder 1996) extract from the work of Bateson (Bateson 2000). We have used a matrix based on the different levels of communication combined with the different processes we identified to organize the challenges and questions that arose in the implementation process (see table 1).

	Access	Process in context	Goals and values
Communication and media	Lack of ability to sign on and publish massages.	What kind of communication is relevant in which media?	What is the role of dialogue?
Design and support	Lack of single sign on.	How and on what knowledge base is the structure designed?	What characterizes a flat or hierarchical structure?
Technology	Server breaks down.	How is the server stability ensured?	Who owns, controls and has access to the source code of the software?

Table 2: Critical questions and problems linked to the emergence of an educational infrastructure in the case of Human Centered Informatics. Based on (Bygholm and Nyvang 2004).

The problems listed in the matrix above point to fact that the challenges involved in creating of a new infrastructure are manifold and of diverse nature. The problems elucidated in this study and here nicely presented as separate problems on different levels appear in real life mingled together in all sort of ways. Following Bateson's distinction between content and relationship level of a message there is a gulf between them meaning that they are of a different sort. E.g. the system administrator's office needed some information on how to handle the integration of the system and the catalogue of users. This level one problem lead to consideration on several problem of a more general kind on how to run system more safely. Which again lead to considerations on how to do this kind of experiments in a more orderly and controlled way.

But apart from being of a different sort there can also be a contradiction between the levels, which can develop a so-called double bind situation. Bateson coined the term double bind to refer to a contradiction between the content and relationship level - basically that is saying something with your words and another thing with your body/context - to explain the development of schizophrenia. Here, like Star and Ruhleder, we use this distinction to draw attention to the contradiction between different levels of problems. As examples of contradictions in our case we could mention at the one side the ideal of a communication with the student based on face-to-face dialog derived from the POPP pedagogy connected with the fact that as a teacher you maybe have eighty to hundred student and not very much time. Or the commitment to participate in experiments and technical development from the system administrator's office connected with running a system with no access to source code. These kinds of contradictions are more a rule than an exception in most organization.

3.8.5 Towards a Renewed Research and Development Agenda
In the time span of the research and development project ICT has been implemented into the educational practice of Human Centered Informatics. Activity theory has shed light on some of the challenges related to change of practice by implementation of ICT. It has helped to show the

relation between overall motives of educational practice and specific goals related to implementation processes. It has also shown the importance of the context for implementation processes. Culture, existing ICT and division of labor internally in the organization are all elements that shape the interpretation of ICT under implementation. It is thus hard to be innovative with at new technology because the old technology still shapes the understanding of possibilities offered by the new one in the early stages of an implementation process.

The theory on learning in communities of practice has in the present case shown valuable to inform practice with regards to design of ICT support for the existing tradition for problem oriented project pedagogy. The theory on communities of practice also has potential to inform implementation practice in a broader sense because of the importance rooting implementation processes in existing communities. This potential has however not been explored in this project so far.

The third perspective discussed was educational infrastructures. It dealt with infrastructures defined as a mix technology and practice that among other things is characterized by transparency and embeddedness. ICT in itself is thus not sufficient for an infrastructure – it has to be integrated in and support practice. The findings we have discussed in this paper show challenges to the emergence of an educational infrastructure. As for the solution and further work with the concrete problems elucidated in this study we would like to stress the importance of organizational structures that support not only the use of the infrastructure, but also the discussion about the proper use of the system in the context and the discussion about the goals and values.

In the follow up to the present study we want to explore the implementation of ICT in higher education further drawing on findings from all the three theoretical perspectives we have explored so far. The long-term goal is to include the potential to inform implementation practice from the three perspectives in one theoretical perspective on implementation of ICT in higher education. The short-term goal is to explore emergence of educational infrastructures further. This includes developing the categories and other findings in table 2. In that process we plan to both study and develop the use of ICT in the learning environment of Human Centered Informatics further. The aim with respect to Human Centered Informatics still is to improve quality in especially courses by increasing student and teacher reflection and by developing the collaborative practice further.

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3.9 Case: eLearning in Austrian Teacher Colleges

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Abstract: This paper looks at the situation of Austrian Teacher colleges in general and discusses the implementation of one particular eLearning course at the Teacher College Baden near Vienna. Furthermore, the paper focuses on the course evaluation and concludes with a glimpse at the development that resulted from it.

3.9.1 Context/Institutional setting

The Austrian higher educational system is currently undergoing a structural transformation. Thus the different institutions for teacher education that provide various types of academic degree programmes ranging from undergraduate to postgraduate will be clustered in Pedagogical Universities within the next few years. These will then be managed autonomously.

This transformation has an impact on the use of eLearning in Austrian Teacher Colleges. In order to cope with the transformation as well as possible, some of the Austrian teacher colleges have started to develop positioning strategies which will allow them to gain a competitive advantage within the restructuring process as well as within the future market for teacher training and education. Many of these strategies are based on eLearning approaches. While trying to optimise the use of financial resources the teacher colleges see pedagogical advantages in including ICT in the education and training they offer. The main goal is to establish a highly productive learning environment within an efficient management structure.

In this case study we look at one particular teacher college, the Teacher College Baden near Vienna. This institution has been instrumental in bringing eLearning into teacher training. It has been one of the first to move towards a virtual campus and a networked learning environment for their students. We will look at one particular course that was offered as eLearning course.

3.9.2 Implementation

In order to keep up with the development in eLearning the Teacher College Baden installed the learning platform Hyperwave e-Learning Suite (eLS) in the academic year 2001/2002.
eLS was developed at the Technical University Graz (1997-2000) and was then commercialized by Hyperwave. As eLS is an Austrian product, Austrian educational institutions have the possibility of getting a free licence for the software. In 2001 the Austrian teacher colleges got the licence and teachers of the colleges were trained in the handling of the platform.

eLS is an interactive web-based online training system for the distribution and administration of multimedia teaching material. It has a client-sever architecture with a web-based client. So students need access to the Internet and a web-browser. The platform runs on the most common operating systems such as Microsoft Windows NT and UNIX. Requirements for 150 users are the following: Pentium II 300 MHz, 256 RAM, 400 MB Hard Disk.
Furthermore, eLS is a role-based system. One of the most important features is the strict distinction between data, functionality and user interface. This fact allows the integration and adaption of the system in existing infrastructures.
eLS Architecture

eLS simulates a real learning environment. The students enter virtual course rooms in which they can communicate and learn. The architecture of eLS corresponds to a virtual academy.
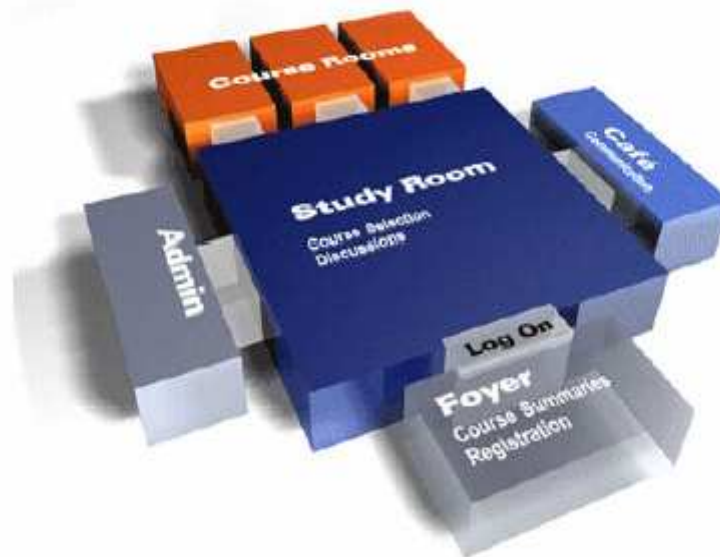

Figure 1: The structure of virtual rooms in eLS, Hyperwave Trainee's Guide, p 9.

Depending on the role of the user different rooms can be entered. The central rooms are the Foyer, the Study Room and the Course Rooms.

In the Foyer new participants are registered, there is a list of available courses, a short overview of the platform and the access to the Study Room where the log on with password and ID is carried out.
The personalized Study Room is in the centre and the most important virtual room. From there the students enter the course rooms and they can have a look at their personal statistic of the progress made. Also the trainer has access to these statistics.

In the Course Rooms the trainees have access to the course content and they can interact with the trainer and other trainees. Newsgroups and chats support the interactive dialogue between the students and the trainer.
Questions concerning the course material can be asked with the help of private and public notes. This annotation function is very helpful and one of the strengths of eLS. It also serves the further development of the course content. Furthermore, the Course Room contains the structured course material and offers access to the course library and more resources.

From the Café all forms of communication (synchronous and asynchronous – chats and newsrooms) can be entered.
The Administration Room contains a complete list of courses and trainees and is accessible by the trainer only. Here the trainer finds a number of tools that help change and restructure existing courses, and create new ones.

3.9.3 eLearning course Teaching Music and the Internet

On this platform the online-course *Teaching Music and the Internet* has been created by Angelika Lehner-Wieternik, a Music and Computer Science professor at the Teacher College Baden. The author wanted to make use of her knowledge and experience in both fields. She thought the best way to teach the topic Music and the Internet is to do it over the Internet.

Target group

The target group for the online-course are students preparing to become primary school teachers with the focus on Music and secondary school teachers with the subject Music. The students were in their fifth semester out of six. They study full time and on-campus. Their background usually is a high school degree from an Austrian high school.

There was no exam required but the students had to do several tasks and activities. The results had to be handed in at the end of the semester.

21 students and 4 interested colleagues took part. Requirements were a basic knowledge of the handling of computers and Microsoft Windows and Word. 20 people had Internet access at home, 5 used the Internet facilities at the college.

Course design

The course was designed as a blended form with three on-campus sessions at the beginning, in the middle and at the end of the semester.

During the first meeting the students registered and learned how to handle the eLearning platform eLS and its most important communication tools. After that the students could work on their own. Some students used the first meeting and started working right away, others did not and had to be reminded via email to get started some time later.

The second session in the middle of the semester was not compulsory. It served the discussion of problems and issues that came up while working on the eLearning course. Only five students attended this meeting. The reason for the low interest lies in the full-time structure of the teacher training. As the students are present at the institution every day, they have sufficient personal contact with the trainer to ask questions and discuss problems.

In the end-of-term session the works of the students were discussed and the evaluation sheets were filled in. Also, the experience the students made with the eLearning programme was discussed and offered valuable insight for the evaluation of the course.

The online-course has been designed to meet the following objectives:
- To realize the meaning of the Internet for the teaching of music
- To learn how to prepare music lessons with the help of the Internet
- To learn how to successfully plan and carry out lessons with the use of computers in class

The course consists of 30 modules, a great number of them providing different resources. Each module started with an introductory text of the topic, examples, exercises and links followed. In this way, the students were able to work on their own.

3.9.4   Evaluation

For the evaluation of the course a quantitative and a qualitative evaluation was carried out. In addition, some observations during the course and the student discussion in the end-of-term meeting gave valuable insights into the students' experience.

Observation and Discussion

One of the aspects observed is the fact that the chat tool was not accepted at all by the students. It was neither used as communication tool nor as collaboration or information exchange tool. The reason for the fact that online communication was kept to a minimum lies once more in the full time, on-campus structure of the training. There was no need to replace face-to-face communication with online communication as the students had ample opportunities to meet. In fact, the on-campus meetings were used for exchanging experience, for supporting each other. The help they gave each other during these sessions was remarkable.

In addition, it turned out that participants with no previous Internet experience (about 70%) felt they had gained knowledge mainly about the use of programmes, not so much about the content of the course. Participants with previous Internet experience, in contrast, could concentrate more on the content.

Put in a nutshell, the eLearning course was rather used for gaining experience in the handling of the computer and for dealing with the material offered. It was hardly used as a means of communication (email accepted) and collaboration.

Quantitative Evaluation

At the end of the semester a quantitative and qualitative survey among the students was carried out.
18 of the 21 students filled in the standardized written quantitative evaluation sheet. The participants rated 14 questions on a five-step-scale from *totally applicable* to *not applicable at all*. There were 7 statements concerning the handling of the eLearning platform eLS and 7 statements about the eLearning course itself.

The following three statements shall serve as examples:

Statement A: *"An eLearning system is helpful and makes work easier."*
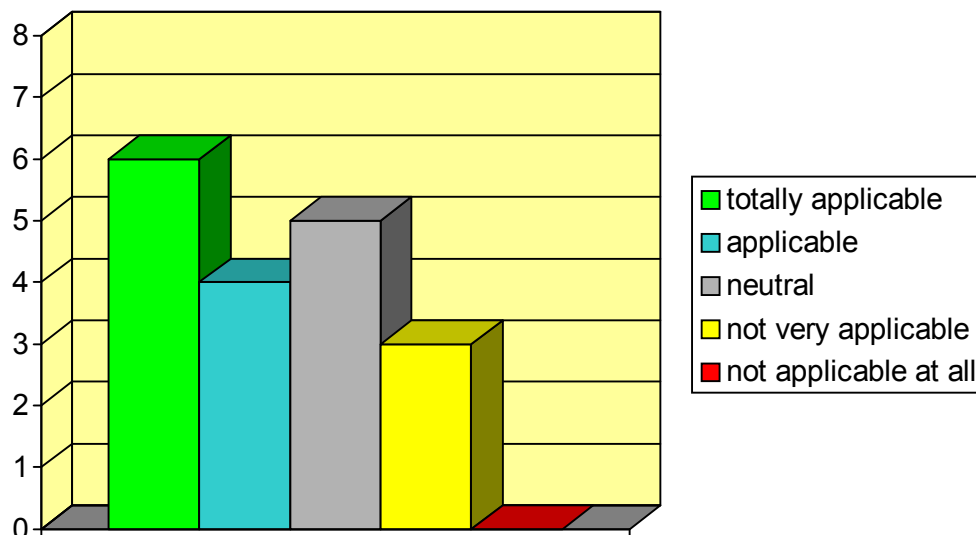
Interesting is the diversification of opinions concerning this statement. There does not seem to be a common attitude towards the issue. However, more than the half of the students (10 out of 18) agreed that this statement is at least *applicable*. The remaining students had a neutral or rather negative attitude towards the issue.

Statement B: *"I will also use eLearning in the future."* was another statement that was to be rated.
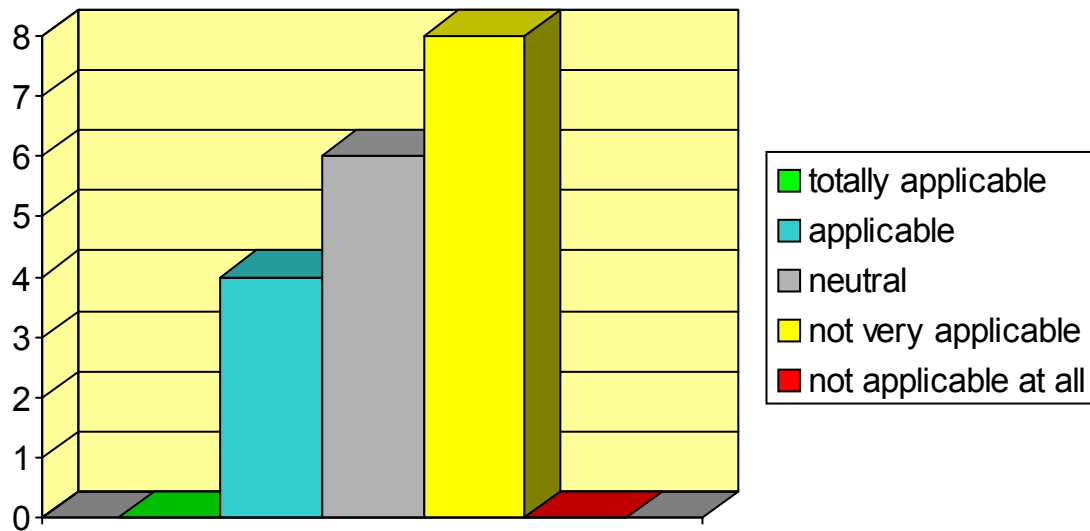
Although the students regarded eLearning as rather useful in this particular context and although they considered the course itself as very efficient and helpful, the students' attitude towards a future use of eLearning was neutral to negative.

Statement C: *"From now on I will use the internet more frequently than before."*
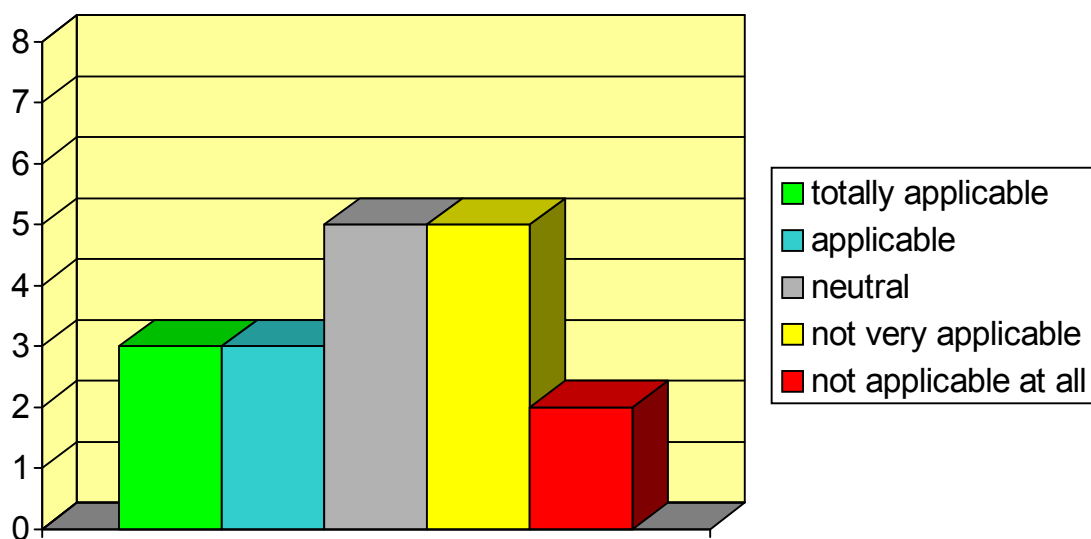
Despite the positive experience most students had made the rating of the statement is only average.

Qualitative Evaluation
In addition to the quantitave survey a qualitative survey was carried out. The students had the possibility to comment and reflect on the eLearning course and to make suggestions how to improve the course.

The comments can be summed up as follows:
Many students thought the course to be efficient and felt it supplied them with information according to the specific needs of the students. It did so more efficiently than any other traditional course they had attended.
Scepticism regarding the course was gradually replaced by a positive attitude towards the new kind of teaching. Many started to enjoy the work with the computer.
In general, the participants would recommend it to other users

However, there were also some negative aspects:
The course was regarded as time-consuming compared to a traditional off-line course.
Some students working at home complained about the higher on-line costs. It was suggested to offer the online content also for off-line use to save money.
Those using college facilities found it rather difficult to get a free computer in between courses.
Some participants suggested making the course content also available as a printable word document.

3.9.5 Final Remarks
This evaluation is not so much an analysis of a one-time research project. In fact, the results of the evaluation served for the optimisation of eLearning courses developed on the eLearning platform eLS at the Teacher College Baden.

As a consequence of the evaluation and the experience made, two new courses were developed: „Introduction to eLS" provides both interested students and teachers with the knowledge of how to handle eLS, whereas the second course, "eLearning with eLS" is aimed at teachers of the Teacher College Baden. The course is designed to show the participants ways of integrating eLearning in their own teaching. In this way, other professors are motivated to try a new way of teaching and eLearning is pushed by internal forces, from the organisation itself.

The benefit the students got from the eLearning course lies in the handling of the computer and in the intensive working on and with the resources offered. Online communication and collaboration tools are very useful in many contexts and learning situations. In this particular case, however, online communication and collaboration tools were not seen as relevant, as the students frequently met face to face.

3.10 Case: Patterns of Facilitation in distributed Problem-Based Learning – Pedagogical Approaches to Promote Active Student Participation

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Abstract: The role of the facilitator has traditionally been given a lot of attention in both online courses as well as in traditional problem-based learning. The focus of this study is the interaction between teachers and students when these roles are combined in *distributed problem-based learning*. An account is presented that considers facilitation as a dynamic process. By focusing on three facilitators' discursive actions in a text-based conferencing system this paper pays special attention to facilitators' scaffolding. Two structurally significant facilitator approaches in the six groups that were studied are presented paying close attention to how student groups have come to use the structured method of distributed problem-based learning. The *active facilitation approach* is characterized by a high degree of facilitator participation and procedural involvement in actively assisting the group. In the *meta-commenting approach*, the facilitator's actions aim at getting students active in commenting on each other's work. It appears that this latter strategy gives more possibilities for students to express their reasoning.

3.10.1 Introduction

Facilitating computer conferences involves a number of special challenges that are not present in the traditional classroom (Rohfeld & Hiemstra, 1995). Several studies have been conducted aiming at learning more about techniques and practices in on-line courses as well as in implementing group discussion in computer conferencing (Ahern, Peck, & Laycock, 1992; Romiszowski, 1995). New learning environments need especially adapted analytical ways of focusing learning issues, particularly for understanding how participatory discussions and group work could be developed and supported (McWilliam & Taylor, 1998; Owston, 1997; Romiszowski, 1995; Roschelle & Pea, 1999). Assessments and the role of new technology can influence students' orientations to a course, and day-to-day interaction in an online context is often patterned by how the participants' interpret their responsibility.

A focus towards facilitation is also a concern of recent research on problem-based learning (Johnston & Tinning, 2001; Maudsley, 1999; Neville, 1999). Two critical issues in problem-based learning are identified as: to what extent should facilitators interfere in the discussions and how should they manage group work (Silén, 1996; Wilkerson & Hundert, 1997). Most authors have agreed that the faculty should maintain a facilitative role that has elements of both the tutorial process and of tutorial learning (Neville, 1999). A potential area for new developments of both the tutor role and problem-based learning can be sought in the area of net-based education where problem-based learning is starting to expand (Cheesman & Heilesen, 1999; Hmelo-Silver, 2002). It has been suggested that this activity can be described as distributed problem-based learning (dPBL) (Cameron, Barrows, & Crooks, 1999).

In facilitating online courses, most investigations or recommendations have been directed towards presenting guidelines for mentors' actions in conferencing (Berge, 1995; Rohfeld & Hiemstra, 1995). Quite a few of these are practically oriented manuals and online guidelines about how to mentor online activities, even though more detailed approaches are starting to appear (Palloff &

Pratt, 1999). As distance education grows in popularity, more profound instructional questions are being raised about the quality of computer mediated educational programs. The importance of the role of the distance education teacher has been described and discussed in several studies, generally supportive of the teaching role in this new medium (Davie, 1989; Hara & Kling, 2000; Haughey, 1995; Paulsen, 1995). In some cases, the online format provides adequate opportunities for genuine dialogue and social interaction that are vital elements in the learning process (Berge & Collins, 1995; Muirhead, 1999, 2000). The center of study in these investigations, as well as in the present one, is the interaction between the teachers and students.

Explorations of the levels of collaboration required for successful distance education have suggested changes towards more student activity in higher education (Thach & Murphy, 1994). Both communication and technical skills for distance educators have been found to be important, although interpersonal interaction does not necessarily require highly technical real-time synchronous communication (Thach & Murphy, 1995). According to Berge (1995), the use of technology is secondary to well-designed learning goals and objectives. Regardless of the level of technology used for conferencing certain instructional tasks must be performed for successful learning. Davie (1989) agrees that the tutor needs to set and communicate the intellectual climate of the course.

Pea & Gomez (1992) suggest that individuals create, revise, and contribute not only to their own knowledge but also to that of their community. In keeping with this reasoning, the facilitator needs to create a community where all group members engage in thinking and problem solving (Collins, Brown, & Newman, 1989; Hawkins & Pea, 1987; Lampert, 1990). Several kinds of activities appear to contribute to the establishment of such a community: the teacher working on real problems; the teacher soliciting contribution to the process from the students; students taking on roles in complex problem-solving; and reflective group discussion of the process (Pea & Gomez, 1992). Many of these activities are components that also have been found crucial in incorporating problem-based learning on the Web (Bonk, Kirkley, Hara, & Dennen, 2000, April). A benefit of some online courses is claimed to be the development of flexible scaffolding for student work where the instructional design and teaching tactics surround, but do not fill in, the learning by students in a model of apprenticeship (Bonk, Malikowski, Angeli, & Supplee, 1998, April; Bonk & Reynolds, 1997).

In most studies there seems to be a general agreement on the importance of the facilitator's actions in establishing successful learning. The learning activities that the facilitator should initiate should be comprised of components of interactivity, support and modeling. Investigations also agree on the importance of communication in new learning environments, although there are several accounts of the most important communicational aspects involved in facilitating online courses. Apparently, some discursive approaches produce higher levels of student participation with a more complex interaction pattern (Ahern et. al. 1992). There is a general agreement that certain styles of teacher–student discourse are both possible and desirable within a computer-mediated discussion.

Participants in dPBL rely mainly on the written word as a means to clarify or repair social problems created by their communication. However, the meaning of a word is never neutral and it is never impersonal (Bakhtin, 1981). In addition, human communication is often not what is said but what is not said (Garfinkel, 1967). In face-to-face situations, people use many different behavioral cues such as hand gestures, facial expressions and posture to convey messages regardless of conscious intent (Goffman, 1967). These are external signs of orientation and involvement and they are

subject to ground rules of a restrictive and enabling kind (Goffman, 1971). In the online media, some of these have to take other forms. When participants engage and interact in dPBL, they employ social routines or practices that are patterned adaptations to conventional rules. In this work, an account that serves as a means to consider facilitation as a dynamic process is presented with a focus on what it means to be a facilitator in distributed PBL. Tutors can provide a kind of *scaffolding* process that enables a novice to solve a problem, or achieve a goal that would be beyond his unassisted efforts (Wood, Bruner, & Ross, 1976). By presenting three facilitators' discursive actions in a text-based conferencing system this paper focus on how facilitators use scaffolding to steer and control groups that are using dPBL.

3.10.2   Method

The basis of the analysis in this paper are facilitators' actions as documented in an online text-based conferencing system, as well as information obtained from a group interview. The analysis pays close attention to *how* individuals communicate while interacting online and presents a reflexive account – ways in which actors do such things as describe, criticize, and idealize specific situations to make sense of their social world (Garfinkel, 1967). Social facts are treated as the result of the individual situation created by a specific situation involving interpersonal communication. Group life can be seen as a process in which people, as they meet in different situations, indicate lines of action to each other and interpret the indications made by others (Blumer, 1969). Their respective lines of behavior have to be built up in the light of the lines of action of the others with whom they are interacting. The theories behind these conclusions point in the direction of making the practices of communicating and producing social practices as explicit as possible. Attempts have been made to set out an account of our own accounting practices, and the part played in them by the rhetorical functions of language in giving an articulated form to otherwise unformulated feelings (Shotter, 1993).

> Accounts are such that, in the context of their telling, they are "self-specifying" in that they work to construct or to specify further that context or setting within which, and by use of which, their telling makes sense. (p. 112)

For an understanding of *authorship* from Shotter's standpoint, there is a need for an account of people's use of language in these terms, emphasizing what might be called its formative power. This power is described as the ability of people in otherwise vague or incomplete situations to give to such situations a more determinate linguistic formulation – according to what they sense that the only vaguely specified tendencies in the situation will "allow" (Shotter, 1984). The enrichment of words by the sense that they gain from the context is the fundamental law of the dynamics of word meanings (Vygotsky, 1986). A word in context means both more and less than the same word in isolation: more, because it acquires new context: less, because its meaning is limited and narrowed by the context. The collective nature involved in the construction of meaning was not only a fundamental research concern for Vygotsky and Mead but was also one of the most interesting subjects for Bakhtin and his colleagues (Ramirez & Wertsch, 1993).

A focus on the role of language as a *mediational means* (Wertsch, 1991) for learning and communication is considered important in the analysis of the tutors' actions. By analyzing the organization of taking turns to talk, Sacks, Schegloff & Jefferson (1974) found fundamental aspects to conversation, as well as to other speech-exchange systems. In pursuit of the goals of conversation analysis, efforts are made to maintain a direct focus on the specifics of interaction that is naturally

occurring and "uncontaminated" by interventions from the researcher (Heritage, 1987). This research strategy is strongly maintained and associated with the view that social actions and the social setting to which they stand in a reflexive relationship are established in and through the details of interactions. The use of conversation analysis has successfully been used in studies of interaction in problem-based learning (Glenn, Koschmann, & Conlee, 1997, November) as well as in the study of activities taking place in virtual environments (Bowers, Pycock, & O'Brien, 1996). However, conversation analysis was primarily developed before the broader use of computer–mediated communication. An important point in this work is that computer-mediated messages are *disjointed*[15] (Davie, 1989) and *polysemic*[16] (Henri, 1992). Although this can also be true in phone conversations, a mainstay of conversation analysis research, the absence of regular turn-taking sequences as in conversations require a different approach to analyze sequences of messages. A viable alternative is the use of discourse analysis, used in classroom interaction as well as in conferencing (Rafaeli & Sudweeks, 1997; Säljö & Bergqvist, 1993; Wells, 1994). A discursive approach maintains that identifying what is culturally and contextually significant is a sociocultural process that relies on discursive resources (Säljö & Bergqvist, 1993). By studying the "never neutral" words of the facilitators this paper seeks to find issues in their interaction that form significant patterns of facilitating distributed problem-based learning.

3.10.3   Empirical data

The results reported in this paper are built on data collected as part of a two-year formative evaluation of a European Union project aimed at stimulating the development of social economy[17]. The basis for the study was the accumulation of data originating from the general curriculum at a university. Contextual data within the broader evaluative study have been collected using web questionnaires, interviews with students, telephone interviews with dropouts, and by saving the conversation carried out within the electronic conference, WEST[18].

The two courses that were studied were offered as distance education, with participants from all over Sweden. The courses have used an adapted model from original approaches in problem-based learning (Barrows & Tamblyn, 1980). Using a series of steps, such as associations, learning issues and problem statements, students participated in three major phases of action in the conferencing system, the *planning phase*, the *working phase*, and a *summation and evaluation phase*. Students were accepted to the one-year university courses mainly based on their profession, where their personal experience in social economy was considered advantageous. From studying the online communication it is obvious that teachers and students share an interest in social economy. The facilitators all had previous teaching experience in areas such as Business Management, Sociology and Human Work Science. The students, typically between the age of 35 and 55, were divided into groups of five to seven participants, with a total number of five groups. Some group members withdrew from the course. Most withdrawals were due to various external reasons, e g a new position at their workplace. Occasionally the groups were combined because too many students withdrew or the group facilitator changed. In the first course a total of 8679 messages were submitted and in the second course 11257 messages.

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[15] Students comment on each other's messages in a non-linear way that creates numerous topics being discussed simultaneously

[16] Having multiple meanings

[17] Social economy often refers to the "third sector", not government or the business sector but cooperatives and other associations.

[18] The conferencing system WEST have been updated several times since the courses and has changed name to TopClass.

Both individual interviews of students and a group interview of the facilitators have been carried out within the project. All but one of the facilitators, as well as the system administrator, was present at the group interview. This approach was chosen based on findings that interaction among interview subjects in a group interview often lead to spontaneous statements about the topic being discussed (Kvale, 1996). However, the primary data reported in here are based on the facilitative interventions in the conferencing system. Three facilitators, about the same ages as the students, were studied because they participated in both of the one-year courses. The analysis of the facilitators' discursive events has been condensed into a reflexive account.

The online characteristics are profiled below through some sequences of the facilitators' messages in the conferencing facility. A presentational problem is the disjointed nature of the messages. Davie (1989) brings to our attention some of the limits of the conferencing medium as it exists. The fact that the students in these courses comment on each other's messages in a non-linear way creates numerous topics being discussed simultaneously. Consequently, some messages as presented are somewhat isolated, although they are considered as contextually bound. The problem is that the original reference providing the context for the selected text may have occurred over one hundred messages earlier in the string or in a preceding conference, if they at all refer to something previously discussed. Nevertheless, these messages form significant parts of the facilitators' discursive events.

As a point of departure, this paper acknowledges that the facilitators' sayings in the interview and their writings in the conferences are dependent upon what the other participants in these discursive events are saying (Blumer, 1969; Mead, 1934; Mishler, 1986; Shotter, 1993).

3.10.4 Results

The results of this study provide an account of how facilitators scaffold courses using distributed problem-based learning. Descriptions of the strategies and approaches used to facilitate are presented focusing particularly on the facilitators' actions to control or steer the group's work process in the desired direction.

In the group interview, the facilitators discussed issues involving higher education and learning in online courses. To some extent, the participants moderated the discussion by letting the others know if they did not agree with what was said. The facilitators discussed the scientific level of the course and ways of leading the students to a more academic level of discourse. The potential importance of the mentor's actions is a significant issue in the facilitators' discussion.

The process of implementing problem-based learning in the online course is described as exciting and well-organized, and a new experience for most of the facilitators. The facilitators elaborated on how they have come to use problem-based learning as a structured method in the courses and how they have prepared themselves as facilitators in a way that is interpreted as more ambitious than in ordinary university courses. Their statements suggest that the educational approach, at least on a rhetoric level, has been a collective endeavor put into work by the facilitators in both of the studied courses.

All of the discursive events and practices reported share the same educational framework and computational tools. Two major pedagogical strategies or approaches have been used by the

facilitators in promoting students' participatory activities in the courses – *active facilitation participation* and *meta-commenting*.

Facilitators' active participation: Engaging in group work
Active facilitators, taking part in the groups' work characterize this approach. The rationale for a significant amount of the tutor-produced messages is to emphasize that students should follow criteria specified in the structured model. Two of the studied facilitators' actions serve as illustrations of this approach.

The facilitators take an active responsibility for the group and expresses sincere concerns about the group's progress. Often addressing the group as "we", the facilitators incorporate themselves as significant actors in the group's actions. Frequently the facilitators write about the group's process and how it is evolving, such as Chris in the message below[19].

Excerpt 1 (Course 1 Case 6)

20	Walter	I buy Elsie's suggestions for a problem statement	21.42.16
21	Chris	Where is Walter??? Does the timetable still stand? Do you think that you will reach an agreement about problem statement and learning issues and work plan within the timetable that Elsie suggested? Don't think that I underestimate your capacity, you know I am pretty new in the group and I just would like to know.	21.51.51
22	Chris	Oh, sh**, there you are!!!!!	21.52.56

Excerpt 1 illustrates a common pattern of extensive use of question marks and thus a lot of questions, all related to the work process. Inquiring about whether students are going to carry out tasks and discussions the facilitator implicitly questions the group's ability. In explicitly writing that he is not underestimating the group's capacity, he still *pays attention* to the issue of capacity. The point here is that the writings relate to the work process and to the capacity of the group, an illustration of the finding that a significant part of the discourse relates to the matter of following the time schedule as well as the structural agenda of the course. In an instrumental manner, the facilitator is keeping control of the group, making sure that the process is followed.

In another message, this facilitator urged the students to exchange experiences more actively and he tried to set a rule for the online discussion, "it should never be quiet". The perceived lack of online student interaction is related to the tempo of the course as he asks if it is too high. Writing that life "is not just the production of reports", he implicitly recognizes that it is important to produce reports. The facilitator does not reflect publicly on his own role in establishing or hindering the discussion of which he would like to see more. However, the following message illustrates that the students consider the facilitator important.

Excerpt 2 (Course 1 Case 6)

| 71 | Ann | Chris…Due to a celebrating my husband's 50th birthday last Saturday as well as this coming Saturday – I have not been able to get started with the report yet. So far I have been prompt with all my reports, so I wonder if I could get a few days of extension? Is that ok? | 18.39.41 |
| 72 | Chris | It is OK Ann, we are grown ups (at least your husband?). Just a little word of advice: it is very easy to lose tempo. | 21.02.56 |

A pretty strict standpoint on time and schedule issues is illustrated by this episode with one of the students who has previously contributed very frequently (Excerpt 2). Despite the student's perfect

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[19] All excerpts have been translated from Swedish to English by the author.

record the importance of adhering to the deadlines is stressed. The use of the phrase, "a little advice" (Excerpt 2, Line 72) could be interpreted as to mean that it is important to follow the time limits while also implying that students who do not enter their reports on time could lose track of the study pace. This short episode also illustrates how clearly issues of power surface in the participants' messages, the *student asks for permission and the facilitator makes a decision* – clearly indicating who is in charge.

The facilitative actions in this approach are often described as structure-oriented. They are aimed at following the time schedule and making the group progress within the confines of the course. The facilitators have an active role in taking part in the group's work as is illustrated below.

Preceding the messages below, one of the students has just raised learning issues in a message. The facilitator, Alan, responds, wondering whether the students have decided on a problem statement, noting that they seem to be talking about both problem statements and learning issues at the same time. Instructional guidelines are then presented, insisting that the chairman first "must present a final proposition" for a problem statement. This logistical message is followed by further instructional statements, illustrating the stress on process, time and structure.

Excerpt 3 (Course 1 Case 2)

| 98 | Alan | Associations that lead towards learning goals should be done tomorrow or on Friday. | 11.04.33 |
| 99 | Alan | The work plan must be prepared at the latest over the weekend. After that studies and writing will follow. | 11.05.52 |

Instructions are often oriented towards following the time schedule, frequently in combination with strong expressions such as "must be prepared" (Excerpt 3, Line 98–99). Messages such as these leave little room for students to take on process-leading roles in carrying out the steps of problem-based learning. The potential for students to contest such messages is also low. Messages pointing at decisions to be made from the facilitator, e. g. "give me a concrete proposal about a problem statement first", do not seem to foster group responsibility. Messages such as these are frequently followed by responses from the students that they "are late" and that they should move hastily forward (Excerpt 4).

Excerpt 4 (Course 1 Case 2)

| 100 | Carl | Regarding a cast of vote etc…. Isabel, We are a little bit late. We have not yet established a problem statement. I suggest that you as the chairman now decide which problem statement we should adopt /…/ | 11.55.47 |

Later on in this case, expressions such as "the problem statement *passed*" make the facilitator's evaluative role even more visible. The asymmetry is further emphasized and articulated in the following message by writing that a learning goal "is quite ok" (Excerpt 5).

Excerpt 5 (Course 1 Case 2)

| 143 | Alan | What does the notion of business strategy stand for and what does it hold? is quite ok as a learning goal. | 15.28.34 |

The evaluative expressions serve as illustrations of a facilitative approach that is characterized by the evaluative and correctional aspects of the facilitator's role. In continuing the previous lines of messages he presents actual suggestions for how the group could tie together the problem statement and the learning issues. This is recognized and supported by the students picking up the same wording as used by the facilitator (Excerpt 6).

Excerpt 6 (Course 1 Case 2)

148	Mary	The problem statement is quite ok. Feel that we ought to have the learning goals ready as soon as possible, and that… they should be concentrated on business strategy and marketing as several of you have proposed. We will have opportunity to discuss organizational questions in the next case?	16.22.46

For others in the group now to contest the correctional suggestions by the facilitator (Excerpt 5) is not very likely and would take more of an effort. In other cases during the courses these patterns of moving the discussion are repeated as the facilitator gives recognition to some of the students' discussions more or less smoothly establishing potentials for the students to follow specific contributions and question current definitions. These facilitative actions frequently nudge the students in certain directions creating a possibility for the facilitator to steer the group.

As was illustrated in Excerpts 1–5, most of the instructions are of a structure-oriented nature, aimed at following the time schedule and making the group progress within the parameters of the course. The facilitators' active role in the formulation of the problem statement is apparent, but more importantly, is their active role in taking part in the group's work.

A recurring topic of discussion in the courses is the final report for each case. The facilitators encourage the students to comment on each other's reports, writing that they should keep the comments short. The students sometimes comment on each other's reports in the conferencing system while one of the facilitators sends individual e-mails with comments to the students. With this approach, there is more privacy because the students do not see the facilitator's comments about the individual reports.

In general, the facilitators are closely following the discussion, commenting on issues that draw their attention. By posing questions, they monitor for the students how questions could be asked. Messages from facilitators are often supportive. This is especially apparent with the use of positive statements to encourage the students to use their own experiences e.g. "it is you who have the content knowledge". External resources are sometimes used to further assist students at the same time influencing their work plan. These external communications are often in the form of telephone conversations or e-mail messages with experts who are not participating in the course. However, the facilitative actions are in most cases exclusively directed towards the work process, such as the schedule and the structural agenda of the course. Apparently, the facilitators are confident that the students will be able to provide much of the context needed to succeed in the courses.

What has been described here as active facilitation participation is not only visible in the discursive actions of the facilitators, but also in the number of messages that they submitted during the courses. Both of the facilitators described above have submitted the most messages of the facilitators in the courses (between 14 and 32% of the submitted messages in their groups).

Taking a step back: Engaging in meta-commenting
By encouraging interaction between students the facilitative actions in the *meta-commenting approach* create the potential for the student groups to become self-sufficient. The students' responsibility for their educational progress is most important in these facilitative actions. The technique is to stimulate dialogue. In a few very long messages in each course, the facilitator elaborates his thoughts on learning and presents instructional guidelines. Except for these, which are briefly presented below, the facilitator's active participation is mostly limited to a few

supportive postings during each case followed by longer comments on the students' comments in the final phase of each case.

In the early phases of each course the facilitator makes explicit the necessity for the students' comments about one another's communications. These rather extensive instructions are not presented in the initial cases of each course, but after the students have had some experience as participants. The facilitator explain his rationale as a facilitator, especially highlighting the importance of feedback in learning by each other, a standpoint developed further below (Excerpt 7).

Excerpt 7 (Course 1 Case 3)

| 116 | John | /.../ It is often said that feedback is important and to the same extent that must be applicable between teacher and student. /…/ Regarding the work order for learning goals and associations. We will not be limited by a strict definition of PBL, instead you will need to find what works for the group. /…/ | 22.17.55 |

The facilitator's presented model of learning opens up possibilities for the implementation of a desired conduct in the group's work. Writing that "we will not be limited by a strict definition of PBL, instead you will need to find what works for the group", he invites students to take command of at least some parts of the framework, an invitation accepted by the students in both courses. In the second course, the same types of facilitative instructions and actions are used again regarding the group process.

Excerpt 8 (Course 2 Case 3)

| 315 | John | /…/In the traditional teacher role one builds the teaching by activity and demands of form. A certain activity shall be conducted (e.g. writing a report) which will be graded based upon certain rules. However, learning is not necessarily the result of this model. I believe that processing and reflection leads to learning. | 15.05.43 |

The facilitator again explain his motivation and tries to explain his approach to learning and how he anticipates that the structured approach of the course will fit with his ideas (Excerpt 8, Line 315). This is in itself a structured framework that is inflicted on the group. John tries to make visible for the students how he feels about broader issues involved in the facilitation process. By stating that "I believe that processing and reflection lead to learning" a potential is set up for the students to focus on *activity* in the course. This is further outlined in the rest of the message.

Excerpt 9 (Course 2 Case 3)

| 315 | John | In this course this takes place through reports, comments and dialogue. Thus in the evaluation, my comments will be more from the perspective of, "is active learning taking place?" | 15.05.43 |

In explaining how this should take place in the course "through reports, comments and dialogue" he is also pointing out which activities he considers important for the students (Excerpt 9, Line 315). Compared to the messages from the first course (illustrated in Excerpt 7), these instructional writings about how the facilitator wants the group to function are more specific (Excerpts 8–10).

The facilitator continues by giving feedback on the students' report writing, characterized by positive feedback in describing the students' work in the case. He emphasizes strong sides in the students' work by expressions such as "wide scope", "clear question" and posts the feedback to the conference, making it available to all of the students.

His messages not only compliment the students, the feedback is also used as a sophisticated means of steering students in certain directions. There is a stylistic dimension to the facilitator's comments that make it clear that he has read the reports. The extra effort shows that he is dedicated to provide a little bit more feedback than just an ordinary statement, even if it may involve issues that the student's could improve. For instance, the facilitator writes that a student "has a wide scope that like a brush covers huge areas". In the following example, he identifies "comments and discussion" as relevant for improvements and continues the message by describing how the suggested changes could be accomplished. In his suggestions for improvement he talks about the group as "we" and he uses a metaphor "we are not there yet". To further develop these issues, the continued message describes explicitly what he finds to be problematic.

Excerpt 10 (Course 2 Case 3)

| 315 | John | Looking at some of your comments, many of you are ambitious, /…/ What I find difficult is partly to get an overview of the comments, besides and perhaps mainly to find a clear line of though running throughout the dialogue. /.../ Therefore I have made suggestions in message 2 on what the comments ought to look like from now on. | 15.05.43 |

He continues by, yet again, emphasizing and elaborating strong sides in the students' writings (Excerpt 10, Line 315). Outlining what element he believes to be problematic, e.g. "to get an overview of all the comments", the facilitator constructs and refers to a mutual frame of reference, which is used to describe how the students could improve the group process. Implicitly, as well as explicitly, he submits that it is good for the group to work and learn together. The students are then forced to read one another's work and to comment on the reports.

The facilitator has then commented the students' comments in the online environment, a kind of meta-comments that all students are presented with, compared to having an individual comment on their paper sent to them. This approach appears to create further pressure on the group to engage in online discursive activities. In groups where this approach have been utilized the students take on responsibility for furthering the group's progress and coping with the time schedule (Björck, 2002). In this approach, with seemingly very little effort (less than 8% of the submitted messages), the facilitator makes his group work as a self-contained unit.

3.10.5   Discussion

In describing the facilitators' actions, accounts of their online activities have been presented. The role of the tutor in problem-based learning is a delicate one (Koschmann, Glenn, & Conlee, 2000) and the present analysis also shows qualitatively different approaches of tutoring in distributed problem-based learning. The process of facilitation is an ongoing accomplishment using operational structures that create a common understanding of what procedures should be used by the students participating in the courses. The actions of the members and facilitators in the groups have resulted in socially constructed roles that shape the facilitation process accordingly. The produced accounts *consider facilitation as a dynamic process* where the analytical focus is on what it means to *do* facilitation in distributed PBL.

Since the educational culture traditionally places teachers in a position of power over students the facilitation process is not the only social construct governing the actors who were studied in this investigation. Even though some of the ideas and rationales behind problem-based learning are to assign power to students, these issues of power and regulation are clearly visible in the actions of both facilitators and students. Students ask facilitators for permission and they are often seen as authorities whose facilitative actions and writings have strong influences on how the discursive

activities of the groups are shaped. However, the facilitative techniques used to set the proper conduct in the groups hold a variety of more or less subtle cues or actions.

Facilitators' active participation in making the group work can be recognized in the facilitator's relatively large proportionate share of the submitted messages. To encourage effective discussion and learner participation this approach contributes by building a setting in which learners feel comfortable and respected, something which has been found important in other investigations (Berge, 1995; Rohfeld & Hiemstra, 1995). The rationale of a significant amount of the tutor-produced messages in this approach is for the students to follow criteria specified in the structured model. Another important facilitative feature is the component of individual examination, which is represented by the tutor's practice of giving individual personal comments to the students that are not posted to the list. In that action the facilitators give feedback that only the student and the facilitator can read, creating a private relation between student and facilitator. This structure and discursive orientations has similarities with some "traditional" approaches to distance education with tasks and queries that should be sent to the teacher for correction and feedback (Eastmond, 1994; Holmberg, 1993).

A common belief is that novice students, with little experience or prior knowledge of PBL, probably benefit from knowledgeable expert tutors to provide the necessary structure or foundation for the educational experience (Neville, 1999). As students mature, in content knowledge as well as in familiarity with problem-based learning, the tutor encourages participation, allowing the students more room in deciding what and how they will learn. However, facilitating this transition is a delicate issue; directive tutoring for mature students may frustrate and antagonize such students.

One of the pedagogically significant approaches in the studied groups, *meta-commenting,* builds on the idea of letting students comment on each other's reports as a final step of distributed problem-based learning. These comments are then used as a starting point for the facilitator's feedback in the online environment, frequently leading to discussions relating to previous postings. This process requires students to read each other's work and it also presents all students with the facilitator's comments, creating a public relationship. In the groups using this approach, the students discuss the facilitator's feedback on their comments about one another's work in a fashion that resembles *reciprocal teaching* (Palincsar & Brown, 1984), a teaching method aimed at helping readers monitor and direct their reading. Initially, the facilitator scaffolds for the students how they discuss each other's papers and later on both parties engage in meta-discussions about work that they have mutually agreed upon. The similarities to reciprocal teaching are especially visible in the way that students need to interact with each other in order to accomplish the instructional and facilitative goals. In the groups using meta-commenting, student-centered activities make it possible for students to engage in dialogic encounters with written text and with others in ways that are not necessarily used in "typical academic discourse" (Wertsch, 1998).

Issues of scaffolding have come to shape significant parts of the learning activities of all groups, supporting a general belief that a great deal of development is mediated by the social context and expert scaffolding (Bruner, 1985; Palincsar & Brown, 1984; Vygotsky, 1978; Wells, 1999). In the groups using the meta-commenting approach, the students have made the structured tools of distributed problem-based learning their own and employed them without the need of a continually scaffolding facilitator (Björck, 2002). A central process in problem-based learning is that it should foster students to become learners (Wilkerson & Hundert, 1997). In situations such as those

described above, the need for continued scaffolding ceases as the group is more responsible for their own learning process.

In addition to the central aspects of scaffolding, the learning activities of the students using *meta-commenting* can often be described in terms of the participants representing each other's writings in a structured manner (Björck, 2002), closely resembling the conversational processes described by Schwarz (1993). In many messages the group participants are working towards establishing a shared meaning, an activity creating plenty of discussion. Investigations on the value of peer collaboration suggests that the presence of other students provides a natural context for elaborating one's own reasoning (Teasly, 1993), something supported by indications on the value of verbal interaction between participants in learning activities (Light & Littleton, 1993).

Other groups have also been encouraged, and from time to time directed, to give feedback on each other's reports, but their tutors have not really commented on the students' comments or implemented this facilitative feature in their semi-structured model. Students in these groups occasionally comment on one another's work. However, since the comments are not a significant part of the discourse, they are not considered as an important element of participation in these groups. The choices of commenting used by the groups influence the issues discussed, as well as the way to discuss them. When facilitators give individual feedback to students, they limit the number of readers and the public arena for further discussion – emphasizing the final and evaluative role of the teacher. This is in contrast to the meta-commenting approach, where students are able to discuss and question the tutor's public comments.

The possible difference in rationales between the tutors is not exclusive for online courses. In other investigations about facilitating problem-based learning qualitative differences have also been identified (Wilkerson & Hundert, 1997). What has been described here is how the different teaching philosophies of facilitators in the same online courses shape the actions of the group accordingly, although there are of course general differences in how the discourse and actions of different groups develops. Nevertheless, the facilitator's role in that process seems to be of great importance.

Facilitation as a Dynamic Process
Normally, when learning in problem-based learning becomes more student-centered, facilitators' roles are expanded (Boud & Feletti, 1997) to encompass a variety of roles, even if two are almost always present: the role of information disseminator and that of evaluator (Wilkerson & Hundert, 1997). Success in balancing multiple roles requires a certain degree of sensitivity on the part of the tutor to the dynamics of the group, including self-reflection by the facilitator. In addition, the tutor needs to be aware of the more or less implicit messages that are sent to the students in the production of facilitative guidelines.

Stance-indicating devices have been described as ways of conveying one's attitudes towards a proposition (Feldman & Wertsch, 1976). In the online text-based environment the participants can only use words or other means for the same purposes. Some of the actions of the facilitators illustrate this as they implicitly indicate to their readers how the facilitator views the listener or the potential content of the students' messages, e. g. not trusting students' ability to comply with deadlines (Excerpt 2). Although explicit rules are hard to pinpoint, this investigation suggests that there are indeed mechanisms such as stance-indicating devices at work in the online conversation process.

A variety of theoretical constructs have been used in recent years to describe learning activities in relatively new computer-mediated environments. The contextual and cultural history involved in the construction of these approaches differs as well as some of the theoretical standpoints. However, a similarity between investigations is the centering on the importance of the learner's activity and the more facilitative role of the teacher, which are apparent in the study of the meta-commenting approach. Although this paper acknowledges that there can be no fixed and absolute descriptions of these events, the account presented here suggests how actions and interaction from the facilitator may play a crucial role in the outcomes of distributed problem-based learning.

The teachers' strategies regarding the continued participation of course dropouts in the online discussions reveal fundamental believes in their facilitative approaches, specifically visible in the mandatory approach of continued participation in the discussion list. There is a general agreement between how the facilitators themselves describe their actions in the courses and the results of this analysis. Apparently, the pedagogical rationales for the facilitator's actions shape the educational practice in significant ways (Handal & Lauvås, 1982; Kember & Gow, 1994). There is also a tendency for the facilitators to repeat their specific approach from the first course to the next. Common patterns in their messages seem to appear in both of the studied courses, and possibly there is a development as there are more detailed messages in the second course.

Two particular approaches to the role of facilitator have been identified in this study. Each one leads to a different range of opportunities for students to publicly explain their reasoning. The *meta-commenting approach* could lead to a wider range of possibilities. This result parallels other recent studies in ordinary classrooms, placing stress on co-construction of knowledge by students engaging in joint activity together (Wells, 1989, 1999). Further investigation will be necessary to discover the extent to which classroom-based discourse strategies influence online courses. The findings of the present study suggest that a critical challenge for the tutor is to establish a natural context for all participants to elaborate their own reasoning in a public forum.

3.10.6 Acknowledgements

3.10.7 References

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4 Presentation and discussion of the Theoretical Framework

4.1 Theoretical Framework for productive learning in networked learning environments

By Lone Dirckinck-Holmfeld, Marisa Ponti, Berner Lindström, and Brian Møller Svendsen

The theoretical framework for analysing productive learning conditions in networked learning environments has been developed in an iterative process. During the JEIRP a shared set of categories was initially developed to conceptualize prototypical case studies brought into the project by each partner. Subsequently, these categories were used as a framework for the elaboration and conceptualisation of the case studies and as a focal point in the identification of core issues of and theoretical approaches to the conditions for productive learning in network learning environments. This approach made possible the integration of a number of varied cases (see above). Based on a seminar on the case studies, the theoretical framework was further refined, and the core issues to which the JEIRP partners could contribute were identified.

The work on the theoretical framework has been documented in several papers. The first draft was developed by Ponti, Dirckinck-Holmfeld et. al. 2004 as deliverable D24.2.1 for Kaleidoscope. This was later refined and accepted for presentation as a "work-in-progress" paper at the World Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education, Washington, DC, November 1-5, 2004 (Dirckinck-Holmfeld, L., M. Ponti, et al. 2004). The present version has been revised and further elaborated including comments, provided by the JEIRP partners.

The aim of the JEIRP is to develop theoretical concepts and understandings of Computer Supported Collaborative Learning (CSCL), and to build up a (shared) theoretical framework for productive learning in networked learning environments. We see this as a long-term and complex process. During the first year of the JEIRP, it was not our intention to apply a theoretical framework to and make a comparative analysis of a number of case-studies. The aim was, however, – in line with a theory of practice perspective – to use case-studies as basis for the development of concepts – and the theoretical framework for networked learning in practice. At the same time, the theoretical framework has functioned as a reification of the shared understandings, and has supported the alignment of the work of the JEIRP pointing to a set of common theoretical approaches and methodologies, core structural elements, and providing insights into various aspects of productive learning.

The theoretical framework presented below combines theoretical, methodological, design and developmental aspects in a single conceptual diagram.

Theoretical Approaches	Design *Relations between technology, pedagogy and organizational perspectives*		Methodological approaches
	Indirect Design, Affordances, Design methodologies		
Socio constructivism Cultural historical approach Situated learning & Communities of practice Experiential learning Critical pedagogy	**Productive learning:** Meaningful learning Learning through engagement and participation Learning through participation and reification Effective adaptation of knowledge Imagination and sociological fantasy Identity		Ethnography Virtual ethnography Discourse analysis Interaction analysis Phenomenography Design experiments Action oriented research

Structural elements of the networked learning environment								
Setting/ Context	Target audience	Tools	Subject	Role of the teacher	Course format	Modes of organisation	Pedagogi- cal approach	Assess- ment

Socio cultural dimensions[20] of the networked learning environment:			
Re-creation of time and space into place and place making: institutionalization and rutinization, roles, coordination work, rhythms	*Joint enterprise:* shared objectives and interests, mutual dependencies	*Mutual engagement:* accountability, trust, credibility, economy of meaning	*Shared repertoire:* historical events, stories, concepts, discourse,

Table 1: The Square of Productive Learning in Networked Learning Environments vers. III. (Further refinement of Ponti et. al., 2004)

The framework draws on theoretical perspectives and research methodologies, which are currently widely used and discussed in relation to the development of networked learning environments (Barab et. al 2004; Bygholm and Dirckinck-Holmfeld 1999 2. edition; Christiansen and Dirckinck-Holmfeld 1995; Dillenbourg et al. 1995; Dirckinck-Holmfeld and Fibiger 2002; Jones 2004;), Stahl (forthcoming). The framework may be used either for analysis or for considerations on design.

At the bottom of the table, there are nine interacting, structural components, which must be addressed when dealing with networked learning environments. We are convinced that we must

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[20] The socio cultural dimensions: Joint enterprise, mutual engagement and shared repertoires are inspired by Wenger (1998), and by the findings in the cases (Jones 2004, Pilkington and Guldberg 2004)

attend to the integration of these various components in an evolving system made up of people, technology and context. It is our thesis that the proposed framework is applicable to a variety of learning situations, in both higher education and continuing professional development, both off-campus and campus-based.

The chapter is organised around the five main areas of the framework: Design; Theoretical Approaches; Methodologies; Structural elements, Socio cultural dimensions and Productive Learning.

4.2 Design

The design context of the conceptual framework is comprised by three key dimensions:
- The complex relations between technology, pedagogy and organisational perspectives
- In-direct design
- Design methodologies

All our collected cases show a clear interest in not using technologies for the sake of technology, but for the creation of appropriate and favourable learning environments through a conscious selection, adoption, and enactment of the technology, the pedagogy, and the organization. The perspectives in the case studies are critical-constructive, and many cases (e.g. Nyvang and Bygholm 2004; Johnsson et. al. 2004; and Pilkington and Guldberg 2004) regard the use of information and communication technology as a catalyst for developing innovative pedagogical approaches and new practices. Furthermore, many of the case studies arrive to the conclusion that we can not *design* learning, however we can design *for* learning (see also Wenger, 1998). As a consequence, we have suggested the concept *In-direct design* – to design *for* learning. Affordance as a relational concept (Jones 2004; Jones, Dirckinck-Holmfeld et. al. 2004) has appeared to be a relevant concept in relation to the notion on in-direct design. Both in-direct design and affordance as relations point towards rethinking the concept of technology. How can the dialectical relation between human and information and communication technology be understood? How are these relations enacted in different institutional contexts and by different actors? The methodological frame stresses the value of practice studies and cultural historical activity studies in dialectics with action oriented design experiments (Nyvang and Bygholm 2004) in order to gain insight into how users take technology into use, and in order to understand the complexity of the learning process..

4.3 Theoretical approaches

The design of the courses and the networked learning environments described in the case studies have been largely informed by views of learning that build on a socio-cultural approach to learning, which traces back to the Russian psychologists Vygotsky (1930/1978), Leont'ev (1978), and others, and to the pragmatic and experiential learning philosophy of Dewey (1916/1966), but also to critical pedagogy (Freire 1970/1999, Negt 1974). These theories fall within the socio-cultural perspective in a broad sense, which supports the view of the learning environment as a social and cultural setting, which is part of a wider community (of school and beyond) that has its own cultural and technology mediated practices and social norms.

The theories include:
- Social constructivism (i.e. Cobb 1994)
- Cultural-historical tradition (i.e. Vygotsky 1978; Leont'ev 1978; Engeström 1999)

- Situated learning and Communities of Practice (Lave & Wenger 1991; Wenger 1998)
- Experiential learning (Dewey 1916/1966)
- Critical pedagogy (Freire 1970/1999, Negt 1974)

Except for 'critical pedagogy'[21], these theories strongly influence the computer supported collaborative learning (CSCL) research community.

These views, the 'cultural-historical tradition' and 'communities of practice', may be used to analyze the integration of networked learning technologies and the dialectical as well as the dual interplay between the learner, the technology and the context in which innovation occurs. The theories provide different tools for investigation. The concept of communities of practice provides insight into the integration of newcomers as a learning process in which a new practice and structure is constructed and emerged through a process of negotiation of meaning. Moreover, it provides insight into the social mechanism for communities of practice, while activity theory allows for an understanding of the motives and goals of the actors involved, as well as of the characteristics of the context of integration. Furthermore, the focus on contradictions within the activity system (Fjuk and Berge 2004) provides a productive point of departure for developmental work. Experiential learning and critical pedagogy are applied in cases dealing with continuous professional development and action learning (Jones 2004), and in the ELAC case dealing with capacity building through the integration of networked learning technologies and human learning.

4.4 Methods and methodologies

The term "methodology" refers to the study of methods and the philosophical assumptions underlying the case study, while the term "method" means the specific techniques for data collection under those philosophical assumptions.

The prevalent focus in the cases is on the study of specific learning environments with analytical perspectives, methods, and techniques of qualitative research. The philosophical grounds are in what is generally called "interpretive research" where the assumption is that social reality can only be understood through social constructions such as language, consciousness and shared meanings. Interpretive research does not predefine variables but explores human sense making in naturalistic settings. Based on these assumptions, the set of methodologies considered as the most appropriate for the kind of data to be collected includes:

- Ethnography
- Virtual ethnography
- Discourse analysis
- Interaction analysis
- Phenomenography
- Design experiments
- Action oriented research

The cases use a rich set of data. Videos and photos are used to document the complex work and learning situations, as well as interviews and design experiments are used to understand the

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[21] Stahl, G. (forthcoming). *Collaborating with Technology: Mediation of Group Cognition*. Boston: MIT Press, http://www.cis.drexel.edu/faculty/gerry/mit/ is among other perspectives drawing on "critical theory", especially the work of Adorno.

objectives and visions of the participants. The main techniques of data collection on relevant aspects of the learning environments include both logging and monitoring online activities as more traditional techniques such as questionnaires, interviews, focus groups, analysis of organisational documentation, analysis of interview transcripts, etc. The selected methodologies and methods represent good approaches for studying and describing the complexity and contingencies of networked learning environments in an informed and structured way.

4.5   *Structural Elements of a Networked learning environment*

The design and development of networked learning environments require careful consideration of a number of key elements, as shown in the diagram below. The cases brought into the JEIRP provide a small-scale spectrum of instructional situations that present a variety of elements including institutional context, audience, tools, subject, the role of the educator, course format, modes of organisation, pedagogical approaches, and assessment.

Elements	*Descriptive elements*				
Institutional context	University	Open University	Municipality	Intercultural group of researchers	
Target audience	Novice students	Individual professionals	Non-traditional students	Groups of professionals	
Tools	Learning Management System	Asynchronous, text-based communication	Synchronous multimedia	Open Source	
Subject	Environmental studies	Human Centered Informatics	Object Oriented Programming	Business	ICT and learning
Role of the educator	Lecturing	Mentoring	Facilitating	Discussant	
Course format	Full programme	Course module	Project		
Modes of organisation	Mixed mode	Off Campus distance learning	On-campus virtual learning	Full time	Part time
Pedagogical approaches	Problem Based Learning	Problem Oriented Project Pedagogy	Apprenticeship learning	Action learning	Networked learning /learning community
Assessment	Process oriented	Product oriented	Person solo	Person +	Group

Table 2: Elements (with examples of variations) of a networked learning environment

An appropriate integration of all elements needs to be ensured in order for the networked learning environment to be successful. Indeed, these elements have to be considered in a holistic manner as

they interplay with and influence each other. The relations and more precise interplay among the components and the variation of practice forms have to be worked out in concrete analyses.

From the collected cases, it is evident that each environment is unique and requires a specific design and realization of the networked learning environment. Given this situated uniqueness, none of the above elements can be considered an affordance or a constraint in absolute; affordances and constraints must be considered in relation to the characteristics of the specific context, the needs, the motives, the abilities of the participants, and to the kind of activity to be supported (Ponti, Dirckinck-Holmfeld et. al. 2004).

In a holistic perspective, a learning environment that supports collaborative learning integrates various technologies and spaces for acting, and allows for diverse individual and group participation as well as technical functions. In this view, technology is just one component of the setting, although particularly important because of the special features it can bring to the learning environment.

A design of an integrated networked learning environment should include an overall and holistic analysis of the structural elements, and how they relate to and influence each other.

4.6   Socio cultural dimensions of networked learning environments

The socio cultural dimensions of networked learning environments are the strings keeping the network together. The holistic interplay of the structural elements affords and constraints the enacted socio cultural dimensions by the participants. The socio cultural dimensions are manifold and may be ordered differently. Inspirations for theoretical work on the socio cultural dimensions have been found in Wenger (1998) focussing on the core dimensions: mutual engagement, joint enterprise and shared repertoire. Furthermore the process of re-creation of time and space, the institutionalization and routine organisation of the learning environment, and the concepts of place and place making are other important dimensions (Dirckinck-Holmfeld and Sorensen 1999; Ryberg and Ponti, 2004).

4.7   Dimensions of Productive Learning

Our approach to identifying the dimensions of "productive learning" is partly empirical and partly theoretical (Wenger 1998, Negt 1974, Leont'ew 1978). The dimensions we have identified so far deal with:

- Meaningful learning, closely related to the context from which meanings of learning emerge. Which means that learning has to be meaningful for the participants.
- Learning through engagement and participation, i.e. the learning environment must provide the conditions for mutuality, social resources, frameworks, trust, and engagement.
- Learning through participation and reification. This is illustrated in the Rasmussen case (2004). This case has pinpointed the importance of balancing the need for standardization and reification and at the same time provides opportunities for engaged participation and knowledge growth.
- Effective adaptation of knowledge. This has to do with effective methods for acquisition of content, the methods, conceptualization, networking, etc. (i.e. know how, know what, know why, know who) with respect to learners and situation specific objectives
- Imagination and sociological fantasy, i.e. orientation, exploration, capacity to rethink and think new, historical and social consciousness.

- Identity, - a concern that learning and identity is closely related. Learning changes who we are but identity and meaning also influence the engagement in the learning process.

More case studies may come up with new examples of learners' experiences, interpretations and enactment of productive learning from participating in networked learning environments. Productive learning is still a fuzzy concept, which needs to be further elaborated theoretically and empirically.

4.8   Discussion of the theoretical framework

The discussion of the theoretical framework is centered on three aspects:
- Links between the case study and the theoretical framework
- Contribution to the theoretical framework
- Lessons learned in relation to productive learning

In the following, we are going to present some of the statements provided by the partners reviewing the case in perspective of the theoretical framework.

Case 7

Links between the case study and the theoretical framework

Nyvang and Bygholm argue that the links between the case study and the theoretical framework are obvious. Firstly because the case study focuses on design and learning, secondly because it integrates at least two theoretical perspectives: social constructivism/communities of practice (Wenger, 1998; Wenger *et al.*, 2002) and a cultural historical approach (Engeström, 1987) that are part of the framework, and thirdly because it uses action oriented design experiments from the methodological part of the framework. It is an additional link to the framework that the case study addresses and compares two theoretical perspectives from the framework.

Contribution to the Theoretical Framework

One of the findings highlighted by Nyvang and Bygholm is the strength of multiple theoretical and methodological perspectives in the theoretical framework. The different theoretical and methodological perspectives throw light on different aspects of the implementation and design process. The social constructivist/communities of practice approach has contributed to the understanding of how to support a learning environment based on the principles of communities practice with ICT. The constructivist approach found in the perspective on infrastructures also helped to identify and categorize challenges of change. The cultural historical approach assisted in understanding the challenges to overcome when change bridges old and new practice. The analysis point to the fact that it is crucial that analysis based on the two approaches directs our attention towards different challenges thus documenting the need for a framework integrating multiple perspectives. The benefit of multiple theoretical perspectives in design based research is also supported by Bell (2004).

Nyvang and Bygholm point out that it offers a possibility of extracting guidelines and more importantly of gaining a broader insight into practice for designers – see early attempts in: (Bygolm and Nyvang, 2004; Nyvang, 2005; Nyvang *et al.*, 2004). The integration of different perspectives does however also prove a difficult challenge to research because it represents a mix of ontologies and epistemologies, which from a scientific perspective is troublesome and has to be clarified.

Lessons Learned in Relation to Productive Learning

The major lessons learned from the case study are closely linked to the categorization of the challenges of productive implementation of ICT in productive learning environments (see Nyvang and Bygholm 2004). The categorization is based on data that shows what learners and teachers need for the networked learning environment to be productive.

Case 5
What does your case address within the Theoretical Framework?
The learning design for the case study on WebAutism (Pilkington and Guldberg 2004) was inspired by socio-cultural theories of learning, particularly activity theoretical perspectives (Engeström, 1999), work on reflective practice, and the notion of communities of practice (Lave and Wenger, 1991) including work on developing safe interactive spaces, the role of the tutor as facilitator and models of developing group processes (the case would therefore complement the goals of other case studies by Rasmussen 2004; Bjorck and Lindstrom 2004; Jones 2004) analysing and conceptualising selected elements making up the learning environment.

How does your case contribute to the theoretical framework and what lessons have been learned?
There are emergent themes in group collaborative processes from the case illustrated in the productive learning matrix. In particular, the case provides an investigation of some of the *conditions for meaningful learning* and *learning through engagement and participation*, the processes of *developing group identity* and *effective adaptation of knowledge*. The work contributes directly to a methodological approach based on *discourse and interaction theoretical perspectives*. Results suggest a model of group development that can be tested in other contexts and has implications for identifying indicators or discourse markers associated with effective collaboration in online dialogue.

Through detailed discourse and interaction analysis (Pilkington and Guldberg 2004) were able to show that discourse markers previously found to be good indicators of engagement through evidence-based discussion were good indicators here. However, other patterns of interaction were also productive and moreover might be pre-requisite for evidence-based discussion. These might be missed as indicators of effective collaboration since they can appear monologuous in character (e.g. lack nesting replies). Moreover, some tasks were more productive than others and *affordances* of online tools interacted with tasks. For example, some tasks allowed students to quickly arrive at consensus or directly encourage more social and affective communications. Others were more contentious and leaned toward making meaning through conflict resolution. As supported elsewhere, synchronous discussions suit brief exchanges and need to be managed within a tight timescale to ensure sufficient flow of responses if they are to resemble face-to-face discussions.

In further examination of these interactions, we found evidential support on the development as a learning community and as a *community of practice*. Analysis of discussions confirmed a developing sense of *identity* in the group. A 'staged process' emerged in which students approach *meaning making* through first developing a sense of identity. Once this identity is established and a *safe interaction space* achieved, more challenging (evidence-based reasoning) can emerge and the group is able to define at least some common values through processes of conflict resolution. Thus, a different balance between cognitive and affective content issues and dialogue markers emerge at different stages of group development giving rise to different indicators of effective collaboration. Affective issues include the *development of trust* and the importance of group cohesion (see also Rasmussen, 2004) as well as empathy and awareness of one another's needs and perspectives. Thus,

the case study found evidence that *social as well as cognitive interaction with instructors and peers is important in becoming an online community of practice and both are affected by the choice of task and tools*.

These findings were also in line with the findings from the case study of Jones (2004).

Case 4
What does your case address within the Theoretical Framework?
The case study (Jones 2004) most explicitly deals with the *theoretical approaches* of communities of practice and learning from experience. The network metaphor is argued to be more inclusive than the ideas of either communities of practice or CSCL. Indeed communities of practice are argued to be special cases of the more general phenomenon of networks of practice. In terms of experiential learning the case study draws on a course that includes the participants experience of their own workplace. Tasks and activities, including assessments are explicitly designed to include elements brought in from the students' direct experience external to the masters programme.

The use of task and related activity as a driver for the course was an element that the case study identified as a particular case of what was more generally described as *indirect design*. In other cases different elements of a learning environment were identified as allowing only indirect access for the designer of a course to influence the learner's activity. The case study drew attention to the designer's control of task but indirect influence over the activities that the students undertook. This aspect of the Theoretical Framework was identified in the early stages but it was only during the process of revealing the various case studies that the general case was fully elaborated.

A particular approach to engaging the student is adopted by the course design and the paper argues that this design approach is related to broad theoretical issues such as the development of networked individualism as a dominant form of sociality in contemporary society. The social contexts of the course include the masters programme, the work environment and the individual's professional practice. The relationships envisaged between these different contexts constitute a form of boundary crossing in which knowledge has to be dis-embedded from one social setting and re-embedded in another. Wenger in his discussion of communities of practice explicitly identifies the export of styles and discourses which, whilst not practices themselves, provide resources that can be used in the context of practice. The ALT programme makes this particular process found at the margins of Communities of Practice thinking central to course design.

The case study does not directly address *methodological* issues in terms of how to research this type of course or learning environment. It takes a general case study approach and does not deploy any of the named methodological approaches from the framework. To develop the case further work would require both ethnographic work online and face-to-face and the use of phenomenographic methods for interview data collection and analysis.

The case study draws attention to some significant *structural elements*. The case study examines the nature of continuing professional development and the ways in which this has influenced the design of the programme and the social dynamics of the programme. The nature of a student cohort composed of mature, busy professionals is quite different to a programme that caters for young undergraduates without a great deal of life experience. Real world experience, external to the course, supplied by the students is central to the learners experience in this programme.

A second structural element relates to organisational levels of design and the place of technology in design. This element was addressed through an examination of the place of digital resources within the course design and the relationship of this element to structural questions, such as the role of the tutor and organisational questions.

Socio-cultural elements were most directly addressed in relation to the question of indirect design. The idea of space being constituted into place by the social activity of participants was paralleled in this example by the way in which the learners constituted tasks into activities. The case study drew attention to an earlier framework developed by Peter Goodyear (2001) that suggested a general account of the socio-cultural understanding of indirect design.

The element of *productive learning* addressed by this case study was the ways in which learners drew upon their work and professional experiences and engaged in designed tasks to produce outputs for either discussion or assessment. This involved learning through participation, through the production of assessed artefacts and the adaptation of knowledge in one arena, i.e. work or the programme of study and its re-articulation into the other.

Does your case add/contribute to the Theoretical Framework – and if so, how?
This case contributed most strongly to the framework in terms of *indirect design* and to the understanding of the socio-cultural influences on the process involved in moving from reifications, designs, plans, technologies, organisational structures etc to participation in terms of the lived experience of the participants of the programme, both the tutors and students.

The case study also contributed to a more detailed understanding of how the networked learning idea could be applied and how it might differ from and compliment more common ideas applied to design in TEL such as communities of practice.

Lessons learned from the case in relation to "productive learning"
A key lesson learned was in relation to the immature social, organisational and technological setting for the deployment of digital resources for teaching and learning in networked learning environments.

Case 3
Contributions to the theoretical framework
The case (Rasmussen, 2004) was a very important eye opener for the JEIRP community as it brought attention to the importance of ethical considerations in connection with the overall study of productive learning. This case was used to introduce to the network a theoretically distinct perspective on learning including the knowledge form of phronesis (Aristotle 2000; Rasmussen 2004; Flyvbjerg 2001), i.e. the knowledge of ethical judgments imbedded in practice. Thereby, this case has been a catalyst and has enabled us to reframe discussions of our different cases in the light of ethical insights. This case has pinpointed the importance of providing for design of learning environments which balance the need for standardization and at the same time provides opportunities for engaged participation and knowledge growth.

Lessons learned from the case in relation to "productive learning"
From a theoretical point of view, the foundation of this case within the field of ethics and learning has allowed us to further clarify how concepts of standardization and surveillance influence the design of productive learning environments. The majority of our cases deal with the idea of

communities of practice and learning from experience. As such, this particular case has enabled us to discuss the implications of standardization as a kind of reification that, when used constructively, gives form to and organizes knowledge construction and thereby functions as a platform for our participation in negotiation of meaning. In order to avoid chaos, any community of practice rely on products of reification in the form of reflections of practice translated into procedures, abstractions and different kinds of tools allowing us to navigate and participate in practice. On the other hand, if the balance tips over and reification dominates, the degree of formalization will evidently lend itself to the development of an instrumental practice where standardization might obscure the ability to develop situated, experienced-based skills in the field of a manifold practice. When learning environments are supported by a didactical design where reification is maintained through a high degree of standardization followed by little overlap to participation, knowledge production falls short of capturing much of the knowledge embedded in a given community of learning, and, in practice, these systems live their own lives. This point is reflected in the case which points to didactical pitfalls when designing for productive learning processes. Through this case, we have been able to clarify how standardization and surveillance might lead to the loss of ethos in learning processes.

Case 6
Links between the case study and the theoretical framework
In the case "Sharing Thoughts in Computer Mediated Communication" from Gothenburg University, the relation to the theoretical framework is obvious. The case is clearly situated within a "communities of practice" perspective. The design of the study was first of all inspired by the theoretical position held by Etienne Wenger (1998, 2002) whose book was studied in the course.

As to the design of the course, the designer controlled what tasks should be done and how they ought to be carried out. On the other hand, the students were quite free to create their own knowledge in collaboration with peers. In terms of the theoretical framework, we have designed for learning but not the actual learning, i.e. *in-direct design*.

Data in the case study were produced by way of textual contributions. Methodologically, the case draws on ethnography, discourse analysis, and virtual ethnography.

The study can also be analyzed according to the "elements of the networked learning environments" described in the model. It is situated in the university context targeting non-traditional students using a learning management system. The subject area is ICT and learning and the educator has the role as a facilitator. The actual case deals with a course module organized as part time distance studies. The pedagogical approach can be described as aiming for the creation of learning communities. However, assessment is individual even if process oriented.

Contribution to the theoretical framework
Generally, the case contributes to the body of knowledge of learning in networked environments. However, the framework was unknown to us at the time of the study and therefore we will present some ad hoc experiences. Meaningful learning through engagement and participation does not appear as a result of available technological resources. For instance the "shared document" used in the course module was not used particularly frequent; threaded discussions were more frequently used. The contributions in the shared document appeared to become too complex. We also noticed a reluctance to express critical thoughts (at least to other course participants). These issues all address the concept of "affordances" which need to be further investigated.

Lessons learned in relation to productive learning

Basically, text-based contributions tend to be cognitively biased. Therefore we need to find a balance between plain, everyday "talking" and very strict reasoning. The very formal contributions (as well as lengthy contributions) tend to have negative effects on some participants making them feel inferior or having nothing to add.

The role of the teacher and facilitator needs to be further investigated (see the case of Björck and Lindström, 2004). In the course module described in the case study, the teacher was rather passive assuming that the students would then be more active. Even if this was achieved, it was still a problem to advance the contributions to a higher cognitive level. Here, we need to find the balance between teacher and facilitator input and student contributions. This is not just an issue of quantity but rather an issue of what kind of teacher contributions are productive.

The problem of the facilitator was also addressed in the Kaptelinin and Hedestig-case (2004).

Case 1

How does the case address the theoretical framework?

One of the key aspects of productive learning, identified in the theoretical framework (Dirckinck-Holmfeld et al, 2004) is "Learning through engagement and participation." The lack of engagement and participation as a serious problem for online learning has been a recurrent topic in research and development of networked learning environments.

For instance, a recent paper describing "lessons learned from an unsuccessful online course", Martinez et al (2004), presents an analysis of an online course developed within the European project MAMUT. The course was considered unsuccessful and among the six main conclusions regarding the criteria that successful online courses should meet, the authors indicate the following ones: "In e-learning, continuous student-teacher interaction and immediate feedback are needed in order to avoid the students' sensation of isolation and loneliness" (p. 15). And, "facilitators in virtual learning environments need to be trained in, among other areas, written communication and social interaction skills" (p. 15).

Therefore, forms and strategies of providing continuous feedback and ensuring social interaction are key conditions of successful online education and, particularly, in productive learning. Dealing with these conditions was the main way our case addressed the theoretical framework developed within the JEIRP.

Does the case contribute to the theoretical framework?

First of all, we believe the framework is a useful tool for orientation and coordination. It helps situate our research within the studies conducted by other partners and identifies actual and potential links between our studies.

The main theoretical approach employed in our research was a cultural-historical approach (in a broad sense, including activity theory). The applications of this approach highlighted two concepts originating from cultural-historical psychology: *developmental transformation of educational practices* and *supra-situational activities*. These concepts, in our view, provide theoretical support for understanding productive learning as "learning through engagement and participation."

The application of ethnography indicated that it is a powerful research methodology, even though its proper application requires considerable investment of time and effort.

Our study indicates that network learning environments are not static. They undergo both long-term developmental transformations and dynamic re-arrangements "on the fly." Therefore, the environments cannot be designed in a traditional sense. Setting up configurations of resources creates pre-requisites for development. It is extremely important but does not determine the environment. The environment is also designed by the participants who carry out their activities there (cpf. also the discussion on design as emergent structures in the concluding chapter (Jones, Dirckinck-Holmfeld et. al 2004).

Lessons learned

In regard to specific sections of the theoretical framework, Kaptelinin and Hedestig present the following findings.

The study highlights the importance of supporting the *historical continuity* of educational activities in a setting. In our case, accumulation and transmission of experiences within developing practices were achieved by the facilitator, which was the only link relating otherwise fragmented episodes of teaching and learning. In addition, our case illustrates the importance of providing conditions for *supra-situational activities*, where participants assume roles and responsibilities transcending immediate situational requirements. Novel learning environments generate numerous potentialities for breakdowns. We can conclude that an effective short-term coping strategy is stimulating supra-situational activities. It should be added that, in the long run, supra-situational activities should be crystallised in technological and institutional developments.

Concerning the role of the teacher, the study indicates that, in geographically distributed learning environments, *a variety of roles* should be assumed by people who deliver courses. In more traditional environments, teachers are not always aware of certain coordination and maintenance tasks, which are carried out by other people or supported by the organization of the learning setting. In new types of environments, teachers face the need to take on new roles. Our study indicated that help provided by the technician/facilitator to teachers was a key factor preventing (but not always) the teachers from resorting to a sub-optimal teaching strategy effectively inhibiting productive learning, simple lecturing without paying attention to the students. In most networked learning environments teachers are not provided with the type of support provided in our case, which increases the chances risk that an online course might fail (cf. Martinez et al, 2004).

Analysis of the successful support provided by the facilitator to teachers in the case allows a tentatively identification of directions for providing teachers with similar help in network learning environments employing desktop videoconferencing tools.

First, teachers need to develop knowledge about common problems experienced in network learning environments and skills of coping with the problems. Study findings offer some guidance to what these knowledge and skills should be. Second, the design of videoconference tools for network learning environments should aim at making it possible for other people to support teachers before, during, and after video sessions. Such help, similar to the types of support found in the case, can be provided to teachers, when they start using videoconferencing, in the form of *virtual coaching*, and when there is a need and possibility for other people to assist the teacher. Third, routine tasks should be automated as much as possible. Relatively simple solutions can be used for

automatic attention management: for instance, the outgoing image can automatically switch to presentation slides when the teacher changes a slide or deliberately indicating an area of a slide.

It should be emphasized that the proposed directions for research and development are tentative and need to be further explored in future research.

Case 2
How does the case address the theoretical framework?
The case by Fjuk and Berge (2004) also uses activity theory as the theoretical approach. Activity theory is used as an analytical framework for analysing the data material and for examining the communicative conditions that developed in the learning situation based on the pedagogical ideals of *apprenticeship learning*. Activity theory has helped us to look for conditions manifested in *dependent activity systems and contradictions*.

The course was a part of the MS program in Software Construction. 22 learners participated in the course during this semester. Most of the learners were committed to a daily work situation for which the course content was significant. All the learners had programming experience from their daily work, although this was not necessarily resting on an object-oriented perspective. The course started with a weekend seminar (on campus) in the end of August 2003. It concluded with the final exam in late January 2004.

Since the online meetings constituted the core of the apprenticeship approach, they became the basis of our analysis. The data was gathered through *online observation*, where the researchers were present in the shared space, but did not participate in the interactions. Furthermore, recordings of the audio- and video streams from the teacher and logs of the corresponding Instant Messaging (IM) sessions constituted the basis of *interaction analysis*. This latter approach provides us with possibilities to focus on the temporal organisation of dialogues and actions but also on how the technological artefacts were used to operationalise certain actions.

In-depth interviews with nine learners were carried out subsequently to the final exam. The interviews lasted approx. 30 minutes each. A one-hour interview with the teacher was conducted at the outset of the semester, and a 90-minute interview was conducted at the end of the course. The learners' and the teacher's talks as well as the observation notes constituted rich supplements to the analysis of selected transcripts of the recordings.

Lessons learned
The findings from the case study as well as findings from follow-up studies and experiments (connected to the particular course) are reported in a number of articles. For example Bennedsen, Berge and Fjuk (*forthcoming*) propose that the primary and critical communicative condition for successfully approaching collaboration in apprenticeship learning is a pre-*prepared, individual suggestion for a solution*. A shared artefact constitutes an important communicative instrument for establishing productive, collective activities online. However, the success of this condition depends on an open and legitimating social interaction style to reduce the risk of developing a pattern of monologue. The authors advise that future course design must carefully integrate this condition and its requirement. In addition, attention to supporting the teacher's awareness information regarding the learners' level of knowledge and progression is critical when approaching apprenticeship learning online. This requires certain meta-communication by the teacher in terms of questions, pauses, and exercises. Other work conducted, as reported in Bennedsen (*forthcoming*), found that

abstract and ill-structured problems were collaboratively solved online. When it came to actual programming, this was conducted more efficiently by the individual student off-line.

Case 8
The case brought into the JEIRP by Bernsteiner et. al. (2004) is dealing with e-learning in teacher training has especially been addressing how to familiarize the future teachers with the Internet as a learning and teaching tool/medium.

Lessons learned
The lessons learned from the case in relation to "productive learning" was that the students did not use the collaboration and communication tools provided by the learning platform. The analysis points out that problems were discussed face-to-face as the students and the teachers met daily. The learning platform was mainly used as an information resource tool. Based on the case study, the lessons learned are that communication and collaboration tools only make sense when face-to-face communication is not possible.

Summing up
The discussion of the theoretical framework has been centred on three aspects:
- Links between the case study and the theoretical framework
- Contribution to the theoretical framework
- Lessons learned in relation to productive learning

The theoretical framework has aligned the work of the case studies and provided theoretical as well as methodological tools for studying conditions for productive learning in networked learning environments. Especially, activity theory and the theory of community of practice have provided insightful concepts and methodological approaches, which interact and assist in the process of analysing and in the concretization of practice. The case studies focused on various aspects of the structural and social-cultural elements of the networked learning environments. The case studies complement each other and, as such, they provide insight into different aspects of the conditions for – as well as various dimensions of productive learning.

Furthermore, the case studies have contributed to further development of the theoretical framework e.g. the notion on indirect design, technology affordance, ethics and phronetic knowledge, enabling place-making and a continued discussion on network and / or communities of practice as the unite of analysis. In the following chapter, we are going to discuss and elaborate these problem areas. Finally, the case studies also pointed at issues, which should be further explored. These have been discussed in wp 24.4 (Ponti, M., Lindström, B., et.al. 2005), and will be dealt with in the European Research Team (ERT) on "Conditions for Productive Learning in Networked Learning Environment". Based on the case studies in JEIRP, we have gained a step forward in the formulation of specific design experiments where similarities and differences may be investigated more closely as well as selected aspects in the case studies may be further explored in a shared analysis of the case studies (or new case studies).

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5 Conceptualisation of core issues on conditions for productive learning in network learning environments ("State of the Art")

By Chris Jones, Lone Dirckinck-Holmfeld and Berner Lindström

In the final chapter, we provide a discussion of the "state of the art" identifying the "vacuum" in a European setting and justifying the need for theoretical work on selected issues. The chapter is based upon the paper "CSCL - The next ten years – a view from Europe" written by Chris Jones, Lone Dirckinck-Holmfeld, Berner Lindström and was accepted as a plenary paper at the premier international conference within the field, CSCL Computer Supported Collaborative Learning 2005: The Next 10 years, Taipei, May 30 – June 4, www.cscl2005.org. Furthermore, we have been invited to submit a journal-length version of the paper to be reviewed for the inaugural volume of ijCSCL, the International Journal of CSCL (see ijCSCL.org). This peer-reviewed journal will be published by Springer (formerly Kluwer Academic Publishers).

The paper is our contribution to the milestone M1 "State of the art", where we review some core concepts and issues related to conditions for productive learning in networked learning environments – especially from the perspective of computer supported collaborative learning. The paper is based on the discussions and the work in JEIRP, building on the case studies and the symposium papers for the CSCL SIG conference in Lausanne 2004 and previous work in the European network E-QUEL, a network on e-quality in e-learning.

The paper concludes the work of the JEIRP identifying and reviewing core issues, and contributing to the theoretical conceptualising of core principles within networked learning from the perspective of computer supported collaborative learning.

5.1 CSCL The next ten years – a view from Europe

Based on the paper (Jones, Dirckinck-Holmfeld et. al. 2004) and based on the outcome of the case studies in the JEIRP "Conditions of productive learning in networked learning environments", this chapter will review some foundational issues that affect the progress of CSCL. The chapter does not aim to be comprehensive or summative in its review of the state of the art in CSCL rather the chapter provides a view of current issues and perspectives for CSCL from a European perspective. In particular we examine the terms technology, affordance and infrastructure and propose a relational approach to their use in CSCL. Following a consideration of networks, space and trust as conditions of productive learning we propose an *indirect* approach to design in CSCL.

Computer Supported Collaborative Learning is an emerging field of research and interest still struggling within itself and arguing over its very name (Koschmann, 1996, 2001,Strijbos, Kirschner and Martens 2004). However, seen from a sociology of knowledge perspective CSCL is a scientific field and a scientific community with conferences, journals and educational programs. Due to the very nature of the object of research: Computer Supported Collaborative Learning, it's an interdisciplinary field drawing on various disciplines such as learning, anthropology, psychology, communication, sociology, cognitive science, media and informatics.

We argue that despite the variations in topic and method what knits the field together and what makes it special is the integration of the four key concepts: computer, supported, collaborative, and

learning. However, in some of the recent work reflecting on CSCL there is a questioning of the necessity for integrating technology into CSCL:

> "CSCL research has the advantage of studying learning in settings in which learning is observably and accountably embedded in collaborative activity. Our concern, therefore, is with the unfolding process of meaning-making within these settings, not so-called "learning outcomes". It is in this way that CSCL research represents a distinctive paradigm within IT. By this standard, a study that attempted to explicate how learners jointly accomplished some form of new learning would be a case of CSCL research, even if they were working in a setting that did not involve technological augmentation. On the other hand, a study that measured the effects of introducing some sort of CSCL application on learning (defined in traditional ways) would not". (Koschmann 2001 p. 19).

Strijbos, Kirschner and Martens (2004 p1, p 246) make a somewhat different point, but they also take a nontechnological stance. For these authors the emphasis in CSCL is on learning and the weakness in CSCL is in learning and educational design. Unlike Koschmann we think it is necessary and challenging to keep technology within our focus. Unlike Strijbos et al we see the technological aspect deeply integrated in a socio-cultural theoretical approach to the understanding of collaborative learning. The technology has to be taken seriously because this is precisely what makes this research area special. In our opinion it is where CSCL has something profound to contribute to the field of learning.

Much of the research that has taken place within CSCL has focused on the micro level of collaborative learning, on the collaborative learning in single groups. Supplementing these approaches, we would like to argue for more focus on the meso-level of collaborative learning:

- On how to design for collaborative learning in organisations, school settings, and in networked learning environments
- On what the conditions are for collaborative learning in these settings
- On how the technology and infrastructure affords, and mediates the learning taking place

In this way we would like to throw light on the field of CSCL from the lenses of educational research, human centred informatics and social sciences. In doing so:

"One needs, first of all, the right vocabulary for thinking about the phenomena that occur on levels of analysis that we are not familiar with discussing. We need appropriate conceptual resources and analytic perspectives. This is what is meant here by a ´theory´" (Stahl, forthcoming p. 5). In the following, we are not providing a theory, however in line with Stahl, we would like to contribute to the process of establishing a meaningful conceptual framework for the understanding of conditions for productive learning in networked learning environments. To understand the new emerging practices and contribute to the productive development of them, we must develop conceptual tools. This is even more necessary because of the interdisciplinary nature of the field. Integrating concepts from different disciplines involves a cost in terms of the intellectual work necessary to ensure that the historically embedded meaning travels with the concepts, and that the concepts are rethought and integrated in the perspective of the new practices and the insights from neighbouring

disciplines. The general theoretical framework adopted in this work can be described as sociocultural in a broad sense and it draws on the works of Vygotsky (1978), Engestrøm (1987), Lave & Wenger (1991), Wenger (1998), Giddens (1984), Castells (1996/2000), and Dewey (1916). Because these traditions are in some ways contradictory, with regards to epistemology and methodology, there has to be profound work and discussion., both on ways to solve these contradictions and if it's productive to try to solve them.

In the following sections we will be dealing with some of the key theoretical concepts which have emerged from the work in two European projects and networks, E – QUEL, (http://www.equel.net/), and Kaleidoscope, a European Union Network of Excellence (http://www-kaleidoscope.imag.fr). We will focus on two sets of issues: firstly, technology, affordances and infrastructure and secondly on networks, space and ethics. These have emerged in our work as crucial to understanding the conditions for productive learning in networked learning environments.

5.1.1 Technology, Affordances and Institutions

We argue that the concept of technology and the relation between the design of technology and the use of technology is crucial within the CSCL community. Vygotsky's socio-cultural approach is deeply accepted and even taken for granted in the CSCL community (Vygotsky 1978, Cole 1996, Kaptelinin, Danielsson and Hedestig 2004). Both the material and symbolic properties of tools are seen as having important implications for understanding how internal processes come into existence and operate (Fjuk, and Berge 2004). In order to understand these processes, Fjuk and Berge argue, that analysis and design must consider the individual learner in her/his concrete situation and the mediational means employed. A similar position on the necessity of studying practice is elaborated by Orlikowski (2000). Orlikowski suggests making an analytical distinction between the use of technology, what people actually do with technology, and its artifactual character, the bundle of material and symbolic properties packaged in some socially recognizable form (ibid. p. 408). Through a theoretical and empirical analysis she demonstrates that the same artifact used in different institutional contexts and by different actors, enacts very different actions.

Theoretically, these different processes are explained by Orlikowski using structuration theory (Giddens, 1984), and she makes a distinction between two discrete approaches (op.cit pp. 405):

a) which posits technology as embodying structures (built in by designers during technological development), which are then appropriated by users during their use of the technology

b) a practice-oriented understanding where structures are emergent. Structures grow out of recursive interactions between people technologies and social action in which it's not the properties of the technology per se which structure the practice. Rather it is through a recurrent and situated practice over time, a process of enactment, that people constitute and reconstitute a structure of technology use. (Orlikowski op. cit. p. 410).

The practice-oriented structurational approach to technology (b) suggests that the technology embodies particular symbolic and material properties, but the technology in itself is not a structure, which determines the use and the users. Rather the opposite, the structure – understood as resources and rules - is instantiated and emerges through the users' responses and enactment in relation to the technological artifact. However we would go on to argue that Orlikowski may present too strong a contrast between the approaches summarized above in a) and b). Seen from the practice of design,

technologies do indeed embody features and properties and they also carry meaning having been designed with certain purposes in mind, embedding certain understandings of communication, interaction and collaboration. Furthermore as Stahl (2005, forthcoming) formulates the question, though the designs carry meaning, and the tools have been designed with certain purposes in mind, how the users respond to or enact the technology cannot be predicted and it is in and through practice that the structural features will emerge.

Another way to deal with this question is to examine how we conceptualize technology. In her paper, Orlikowski counter poses technology thought of as:

    a) "an identifiable, relatively durable entity, a physically, economically, politically, and socially organized phenomenon in space-time" – technological artifact

    b) "a repeatedly experienced, personally ordered and edited version of the technological artifact" – technology in use (op. cit p. 408)

She makes it clear that this distinction is analytic rather than ontological in character but our work leads us to question the usefulness of this distinction in relation to certain kinds of technology. In particular we wonder whether the Web or Internet can usefully be thought of as technological artifacts. We would support the general position that Orlikowski seeks to maintain but we are concerned that conceptions that apply the metaphor of artifact to large, complex and composite forms such as the Web and Internet are in danger of reifying a deeply reflexive phenomenon. In important ways the Web and Internet do not fully conform to Orlikowski's criteria. Though relatively durable they are constantly in flux, though organized they show an uncommon selforganizational capacity. We suggest that the idea of technology and in particular technological artifact is an area ripe for further CSCL research, especially in relation to large scale and composite technological forms such as the Web and Internet.

Affordance
 The concept of affordance has been central to thinking about technology within the CSCL tradition and beyond. It has recently been applied to technology in the sense that:

> "technologies possess different affordances, and these affordances constrain
> the ways that they can possibly be' written' or 'read'." (Hutchby 2001 p. 447)

Affordance used in this way allows for the possibility of technologies having effects and the idea that particular technologies can constrain users in definite ways. The idea has its origins in the work of Gibson (1977) who was interested in the psychology of perception. Affordances in Gibson's view varied in relation to the user but they were not freely variable, the affordances of a rock differed from those of a stream, even though different animals might see the affordances of each differently. The Gibsonain view is strongly relational and differs in significant ways from the later application of the idea of affordance by Norman (1990) and Gaver (1996). These authors have an essentialist and dualist approach in which technologies possess affordances and users perceive them. All three authors have recently been reviewed by Kirschner, Strijbos and Martens (2004) who emphasize the distinction added by Norman between an affordance as a property possessed by an entity and an affordance as it is perceived. Kirschner, Strijbos and Martens (2004) suggest that educational researchers and designers are not dealing with the affordances of technologies themselves; instead they are dealing with the perceptible (Gaver 1996) or the perceived (Norman 1990).

Kirschner, Strijbos and Martens (2004) propose a six-stage model for a design framework based on affordances. This sophisticated and detailed model categorizes affordances as educational, social and technological. They define educational affordances as "those characteristics of an artifact that determine if and how a particular learning behavior could be enacted within a given context." (op.cit p. 14). Social affordance is defined as "properties of a CSCL environment that act as social-contextual facilitators relevant for the learner's social interaction." (op.cit p. 15). Technological affordances, after Norman (1990) are "perceived and actual properties of a thing, primarily those fundamental properties that determine how the thing could possibly be used." (op.cit p. 16). All three definitions rely upon an essential reading of affordance, on the properties and characteristics of CSCL environments, artifacts and things, even if the affordance relies on being perceived.

The view of affordance that we have begun to consider and would propose to the CSCL community is one that returns to a Gibsonian view and treats affordance as a relational property. In this way of thinking about affordances properties exist in relationships between artifacts and active agents, which would include animate actors and following Callon and Latour inanimate actants. This view is non-essentialist, non-dualist and does not rely on a strong notion of perception. Affordances in this view could be discerned in a relationship between different elements in a setting whether or not the potential user of an affordance perceives the affordance.

In educational settings we are likely to be concerned with reflexive social relationships. A relational view of affordance would suggest that we could analytically discern features of the setting apart from the perceptions of particular groups of users. Any actual group of users would have varied understandings and draw out different meanings from the setting but designers can only have direct influence over those abstract elements, that may become affordances in the relationship between the designed setting and the participants. An example of such relational thinking can be found in Kreijens and Kirschner (2004). They point to the affordance of proximity in encouraging face-to-face interaction and they point to the need for teleproximity in computer networks. The affordances of both proximity and teleproximity rely on the relationship between participants rather than being a feature of any particular participant or a feature of the digital or real environment.

Infrastructure and institutions
Implementation of CSCL in higher education is a complex task involving management, administration and ICT support as well as teachers and learners. Research in CSCL recognises that influences on practice arise from an organizational as well as a pedagogical perspective (Collis and Moonen 2001; Dirckinck-Holmfeld and Fibiger 2002). Nyvang and Bygholm (2004) draw on the works of Star and Ruhleder (1996). They suggest that we interpret ICT in use as infrastructures that both shape and are shaped by practice and go on to propose that we understand infrastructure as a relational concept. "Thus we ask, when – not what – is an infrastructure" (Star & Ruhleder 1996, p. 113). This understanding of infrastructure has strong resonance with the earlier accounts of technology and affordance and we would suggest that the infrastructure for CSCL is a location in which these general issues find focus for research.

In a recent case study of a Masters level program Jones (2004a) argues that obtaining a single login to enable all students on a distance taught program access to digital resources is a multi-level problem. The required digital resources are enmeshed in a legal framework of ownership concerned

with property rights. Access to the materials and resources available for teaching and learning is not a simple matter as some of the materials are ephemeral with links moving or disappearing on a regular basis. Secure resources have to be embedded in an institutional and organizational infrastructure that takes on some of the roles, such as preservation, that libraries have hitherto fulfilled. This institutional support may be external to the university and even the educational sector, as with government, NGO and corporate supplied materials. When resources become organizationally supported they often disappear from the Web's open access behind password protection. The creation of a single log-on authentication for staff and students and a public 'commons' for educational materials is a political, legal and social process well beyond the control of single educational program.

We have argued that technology, affordance and infrastructure are terms that the CSCL community may need to revisit. We have suggested that all three may be better understood using a relational perspective. We have also set out a number of ways in which we think this approach may lead to new research directions. The idea of technology and in particular the idea of technological artifact is an area ripe for further CSCL research as we argue technology and the affordances that may emerge in its use are factors that require investigation at a more macro level than has been usual in CSCL.

5.1.2 Conditions for Productive Learning

Castells (2000) writes about inclusion/exclusion in networks, and the architecture of relationships between networks, enacted by information technologies, which configure the dominant processes and functions in our societies. Castells describes the network society as one of 'networked individualism' (Castells 2001p129 ff). On the one hand the new economy is organized around global networks of capital, management, and information, whose access to technological know-how is at the roots of productivity and competitiveness. On the other hand he claims that the work process is increasingly individualized:

> "Labour is disaggregated in its performance, and reintegrated in its outcome through a multiplicity of interconnected tasks in different sites, ushering in a new division of labour based on the attributes/capacities of each worker rather than the organization of the task" (ibid. 502).

This general trend raises fundamental questions about the relationship between the networked society and the organization of learning environments within formal education. We believe it is a significant question for CSCL whether the designs of networked learning environments have to reflect the trend towards 'networked individualism' or whether CSCL may serve as a counter practice offering opportunities for developing collaborative dependencies in networked learning environments.

The idea of networked learning has developed some force within European research, expressed in a number of publications and a series of international conferences. One definition of network learning from this tradition is that:

> Networked learning is learning in which information and communication technology (C&IT) is used to promote connections: between one learner and other learners, between learners and tutors; between a learning community and its learning resources (Jones 2004 a p. 1).

The central term in this definition is connections. This definition takes a relational stance in which learning takes place in relation to others and also in relation to learning resources. Networked learning differs here from CSCL and Communities of Practice in that it does not privilege relationships such as cooperation and collaboration or the close relations of community. Unlike CSCL and Communities of Practice this definition of networked learning draws particular attention to the place of learning resources and peer learners in relational terms (For further elaboration of this view see Jones 2004, Jones 2004 b and Jones and Esnault 2004).

European research and practice has been heavily influenced by Communities of Practice thinking and other learning environments for professionals have built more explicitly on ideas of communities of practice and the pedagogical principles of collaborative learning. For instance in the form of problem and project based learning, encouraging and expecting students to work together (See for example Dirckinck-Holmfeld, 2002, Fjuk and Dirckinck-Holmfeld, 1997). The concept of communities of practice is most commonly associated with Wenger (1998). For Wenger, networks are not necessarily in opposition to the ideas of communities of practice. Wenger suggests that a network with strong ties resembles a community.

> "Communities of practice could in fact be viewed as nodes of "strong ties" in interpersonal networks" (1998 p. 283)

However, he also stresses the difference in purpose:

> "…but again the emphasis is different. What is of interest for me is not so much the nature of interpersonal relationships through which information flows as the nature of what is shared and learned and becomes a source of cohesion – that is, the structure and content of practice" (ibid p. 283).

In other words, Wenger is not only concerned with the flow of information between nodes, he also emphasizes the differences in what flows across the network. Communities of practice are characterized by three related structural properties, that of a shared enterprise, mutual engagement, and a shared repertoire (Wenger 1998 p. 72 ff), while networks are characterized as interconnected nodes (Castells 1996/2000) or the connections between learners, learners and tutors, and between a learning community and its resources (Jones, 2004 a p.1) As such networked learning is concerned with establishing connections, and relationships whereas a learning environment based on communities of practice is concerned with the establishment of a shared practice.

In some learning environments this is dealt with as a combination of the networked perspective and community of practice, in the sense that the individual learner is supported in relating learning to his / her work practices, which are seen as the primary community of practice (Jones 2004 a). However in other learning environments, different means are used such as team based project work in order to design for, and establish true interdependencies and mutual engagement between participants (Dirckinck-Holmfeld, Sorensen, et al. 2004).

The notion of networked learning and its practical application to the design of networked learning environments resonates strongly with a relational approach and raises several questions:

- Should researchers in CSCL serve as critical opponents to the overall trends in the networked society andstand up against "networked individualism", or should the design of CSCL and education reflect these trends?

- Which models, networked models or community of practice models, are more productive with respect to the learning of the individual participant and under what conditions? Is it, for example, more productive for busy professionals to be organized through a pedagogical model based on relatively weak ties or is it more productive to be organized in a pedagogical model facilitating the development of strong ties?

Space and place in networked environments

Several authors have in recent years pointed to the need to distinguish between space and place in computer networked environments (see for example Goodyear et al 2001, Jamieson et al 2000, Ryberg and Ponti 2004). Goodyear et al (2001 Part 8) claim that that we should not try to design the elements that are most closely involved in learning itself. They argue that it is appropriate to try to design learning spaces (the physical learning environment, including all the artifacts which embody 'content') but they point out that we should expect students to customize these designed spaces to make their own 'local habitations' or 'nests' (Nardi & O'Day, 1999; Crook, 2001). More generally they argue for a distinction to be made between space, understood as a relatively stable and potentially designed environment and place, understood as contingent and locally inhabited.

The distinction between space and place is connected in significant ways to the earlier discussions of technology, affordance and networks. Participants in a computer network are simultaneously situated at a real point in time and space and displaced from that in a space configured through the network. Ryberg and Ponti (2004) are interested in the development of social context in networked environments. They comment on Lash (2001) who argues that networks are non-places.

> "Technological forms of life are disembedded, they are somehow 'lifted out'. As lifted out, they take on increasingly less and less the characteristic of any particular place, and can be anyplace or indeed no place.… The Internet is a generic space. It is no particular space. Indeed, networks are themselves by definition lifted-out spaces." Lash (2001 p113)

The question Ryberg and Ponti ask is:

> "If networks are non-places, with no context at all, how can we create a social context to support interaction and sociability?" Ryberg and Ponti (2004 p2)

The distinction between space and place is fundamentally rooted in the shift toward networked environments and is one example of a set of problems in which designers only have an indirect control over the intended outcomes of their design. It is also related to the notion of space as produced through interactions between individuals and institutions, rather than thinking of space as simply given. Overall we argue that the notion of space and place is a problem area that could have a major significance for CSCL and practical implications in terms of design.

Ethical Dimensions of CSCL

Collaboration is not simply a technical, pedagogic or pragmatic concern. Collaboration includes an ethical dimension both in terms of the rationale for its use and in terms of the conditions for its success. The question, 'why collaborate?' cannot simply be answered by measures of success such as learning outcomes or considerations of alignment with economic goals. Collaboration has an ethical dimension that speaks to the ways in which we choose to structure our social lives. Too often collaboration is reduced to narrow concerns that ignore this ethical choice. This can lead to those involved in a CSCL environment not appreciating the rationale behind activity and comparing it unfavorably with individualized and transmissive methods that flow from different ethical positions.

In terms of the considerations for the successful use of CSCL the question of trust is perhaps central. Trust has been identified as an ethical question at the heart of communication:

> "Regardless of how varied the communication between persons may be, it always involves the risk of one person daring to lay him or herself open to the other in the hope of a response. This is the essence of communication and it is the fundamental phenomenon of ethical life."(Løgstrup, 1997, p. 17).

Rasmussen (2004) has argued from this position that this:

> "is not a question of a concept of trust which stands or falls on whether or not it is honoured. It is a matter of the simple form of trust expressed by the fact that we cannot avoid surrendering to each other." (Rasmussen 2004 p4)

Furthermore Rasmussen argues that this ethical demand can only be honored spontaneously. As soon as we begin to think about whether we are really acting as we ought, the focus moves away from acting exclusively in relation to the other person and towards ourselves. This ethical requirement for spontaneity can come into conflict with the demand for self-reflection. In educational terms we often require our students to be critically reflective in relation to their own work and the work of others. The question then arises as to how this might affect trust in CSCL environments. In so far as we require actions which are engaged in as a duty these actions may loose an element that is central to trust and as a consequence to collaboration. If free communication relies upon spontaneous action and the ability to lay oneself open to others how far does the planful nature of many CSCL environments and the pedagogic requirement for reflection affect collaboration and communication, and how might we design CSCL environments to reflect this ethical concern?

A second area of ethical issues affecting the conditions for productive learning arises around surveillance and control. Writers from a Foucauldian tradition point to CSCL environments as environments in which participants are aware that their actions are under surveillance (see for example Land and Bayne 2002, Rasmussen 2004). Surveillance comes from other participants in an equal power situation and often from others who are in a position of actual or potential control. Land and Bayne point out that for the tutor as constituted in the discourse and practices of computer mediated environments they are both 'seers' of their students and 'seen' by their managers in an increasing process of accountability in education. This would suggest that participants would generally conduct themselves in accordance with the perceived norms of the environment and attempt to conceal actions that step outside of the accepted norms.

An example of how issues of trust impact on learning in networked environments can be found in the work done by the moderator in networked learning environments. Salmon (2000) argues that successful learning is the result of networking, but it is crucial that networking occur within a safe space. Part of the moderator's role, according to Salmon, is the creation of this safe space, and addressing any concerns or fears that the learners may have. Trust is a central element in the provision of both a safe environment for learners and the conditions for communication and collaboration. An interesting research question for CSCL might be how the condition of trust affects different types of relationship. It is by no means obvious that the weak links identified in network analysis are any less dependant upon trust, indeed the maintenance of weak links may require a high degree of trust just as much as the strong links of community and collaboration require high degrees of trust.

5.1.3 Future perspectives for CSCL

Throughout this paper we have tried to indicate where we believe our reflections point us in terms of future topics and issues for CSCL research. Overall we have argued for a relational approach to our understanding of technology, affordances and infrastructure and we wonder if a network metaphor and an ethical dimension to our approach may be necessary. We indicated that the question of how technologies simultaneously embed constraining features, and express relatively fixed properties, including design intentions and are also brought into use contingently in ways related to and reconfigured by users with differing intentions in a variety of settings, draws us towards what we describe as a relational approach to technology and its affordances and an indirect notion of design. Technology within the CSCL tradition has had a relatively narrow focus that places in the background issues concerning the politics, policies, institutions and infrastructures in which the processes of CSCL take place. We would argue for a greater focus on what we call the meso-level of collaborative learning. We would include in this the way in which many of the aspects of the settings in which CSCL is enacted are beyond the direct control of the individuals and groups involved. We suggest that the concept of technology itself and in particular the use of the term technological artifact is an area that requires further attention in CSCL research and we point in particular to the Web and Internet as large scale and composite technological forms through and in relation to which CSCL now takes place. The past ten years have seen CSCL move on from an environment in which the Internet was a minority concern and the Web only an emerging form to a time when the Internet is becoming ubiquitous and the Web a basic platform.

Our research points us to a number of ethical questions related to our approach to technology. To how the condition of trust affects different types of relationship, including the weak links identified in network analysis and the strong links of community and collaboration. We wonder whether the designs of networked learning environments have to reflect the trend towards 'networked individualism' or whether CSCL researchers might choose to act as a counter practice by offering opportunities for the development of collaborative practices. We ask whether CSCL should privilege certain models of learning, for example networked learning or communities of practice, and whether such models are more productive with respect to learning and under what conditions that might occur. We point to the example of continuing professional development for busy professionals and wonder if organization using a pedagogical model based on relatively weak ties or one based on the strong ties in a community of practice is more appropriate. We argue that these are choices that need to be made on the basis of CSCL research, which can provide good criteria for selection.

The approach to technology outlined above points to the need for what we label indirect design so that we can design for learning. The relational view we have of technology and its affordances suggests that designers have limited direct control over how their designs are enacted. How learners respond to, understand and enact in relation to any design is a complex, structuration process which has to be studied in practice. Examples of such studies have been given throughout this paper and in our review of the case studies and theoretical work we had undertaken it became clear that there was an underlying common theme in relation to design. In order to plan and design for learning in CSCL environments some degree of predictability of response to the design is required.

Our research showed how contingent factors necessarily reduced design capacity in this critical regard. We focused on exactly what we understood to be available in terms of design as predictable aspects for planning. We suggest that designers within CSCL need to concentrate less on the material aspects of the designed artifact and more on the relationships that surround the enactment of the design and the mobilization of technologies and artifacts in that enactment. This approach might also suggest a flexible approach to design in which designed artifacts are thought of as shells, plastic forms that incline users to some uses in particular but are available to be taken up in a variety of ways and for which the enactment of preferred forms depends upon the relationships developed in relation to the design.

5.1.4   Acknowledgements

5.1.5   References

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