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Digital case methodology: A study of student teachers' co-construction of professional knowledge¹

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Introduction

Case pedagogy has a growing position in inquiry oriented teacher education programmes as means of bridging gaps between every-day and professional conceptions of teaching and learning and enhancing contextual and collaborative learning. Although research in the field still might be in its earlier stages, studies seem to reveal that case pedagogy has the potential to foster reflective and critical thinking, challenge technical-skill orientated teaching and stimulate situated learning (Zeichner & Wray, 2001; Lunderberg, Levin & Harrington, 1999; Morine-Dershimer, 1996; Lunderberg & Scheurman, 1997; Harrington, Quinn-Leering & Hodson, 1996; Barnett & Ramirez, 1996). While most of the studies are focusing on salient dimensions of professional learning, there is a need to deepen the understanding of collective and collaborative knowledge building when implementing case pedagogy in such a context.

In the field of computer-supported collaborative learning (CSCL) (cf. Koschman, 1996; Wasson, Ludvigsen & Hoppe, 2003) there is a growing body of research exploiting the possibilities of collaborative learning by computer technology. However, providing students with communication technology does not automatically result in collaborative learning. Like any other educational approach, CSCL has to provide a sound pedagogical context to support students' learning (Strijbos, Krischner & Martens, 2004).

In the present paper we will look at how a CSCL environment may enforce and improve collective thinking and professional reflection by the use of a cased based learning model in pre-service teacher education. The study is based on computer-supported learning resources developed by InterMedia, University of Oslo, in the *Digital Learning Case Project* (DLC)². These learning resources are based on video productions from classroom settings integrated in digital environments and framed by a set of complementary resources supporting individual and collective activities. One of these resource units, the classroom leadership case, are presented and analysed in light of the student teachers' perceptions and first hand experiences in their study. In particular we are looking at:

¹ This paper was presented at the International LETTET05 Conference: Learning Technology and Telematics in Education and Training 2005, August 3 -5, Finland. It is published in J. Enkenberg, M-B. Kentz & O Hatakka (eds). *Emerging practices in educational technology*. Savonlinna Department of Teacher Education, University of Joensuu, Savonlinna.

² The applications in DLC-project are produced by a team of researchers, producers and software programmers: Trond Eiliv Hauge, Björn Skaar, Yngve Refseth, Jan Dolonen, Turi Digernes and Silje Andresen (MA students) at InterMedia, and Andreas Lund, Alf Sjuls Hansen, Jon Magne Vestøl, Heid Leganger-Krogstad, Torgeir Christiansen, Shane Colvin at the Department of Teacher Education and School Development, University of Oslo.

- how do student teachers perceive the digital case learning resource as a means of understanding classroom leadership?
- to what extent does the digital case learning resource support collaborative learning and collective reflection?

Case learning ideas

The underlying philosophy of case based learning and case methodology in the DLC project is based on ideas implemented in a teacher education reform programme at the University Oslo during the years 2000 – 2004. Ideas and principles of case based learning as described by Shulman (1992), Wasserman (1994) and Colbert, Trimble & Desberg (1996), approaches of writing to learn (Bereiter & Scardamalia, 1987; Flower, 1990; Dysthe, Hertzberg & Hoel, 2000) and strategies of problem based learning (Koschman, Kelson, Feltovich & Barrows, 1996) have been integrated in the programme. The students are working with different types and genres of cases involving problem-based learning, individual and collective writing and discussions face to face and online. The case rationale is founded on descriptions, observations and analyses of everyday problems and dilemmas of teaching and learning in school. The cases combine use of personal beliefs and values, theoretical and practical knowledge about teaching and learning. The cases are corner stones for seminar work, group discussions and portfolio productions.

Follow-up research of the reform project, based on activity theoretical analyses (Engeström, 1987, 1999), has revealed that the cases and their intertwined learning strategies are functioning as institutional artefacts integrating knowledge from different study domains in the program (Ludvigsen & Flo, 2002; Hauge, 2002; Hauge, 2004; Hauge, 2005). The research studies point to findings of case based learning as supporting means for student teachers and teacher educators in bridging different knowledge domains.

The DLC case learning model

The case learning model described above has been the foundation for the *Digital Learning Case Project* (DLC) launched in 2003 as a team work between researchers, video producers, designers and teacher educators at the University of Oslo (InterMedia & the Department of Teacher Education and School Development). The DLC project attempts to visualise everyday phenomena in teaching and learning in school and to establish a more complete and integrated digital learning environment for collaborative purposes. While the first case model in the teacher education programme relied on textual descriptions of phenomena in school, to some extent supplied by video films, followed up by writing tasks and discussions in the virtual learning environment (LMS)³, this second model was using video films as the prime case input in combination with an individual and collaborative task structure organised in a common virtual environment. The video films were based on script narratives of students and classroom practices in different school subjects. Seven digital case learning units have so far been developed.

³ LMS = Learning Management System (Virtual Learning Environment)

According to Strijbos, Kirschner & Martens (2004) the creation of a CSCL design requires a careful orchestration of various components likely to facilitate the attainment of the learning objectives. In creating the DLC case learning design several aspects had to be considered simultaneously in their interrelations, such as learning objectives for each of the cases, the kind of individual and collaborative learning activities best suited to attain these objectives, the types of additional learning resources supporting discussions and reflections (e.g. internet resources, study literature references, teacher supervision) and technical environment. Intentionally the whole technical and educational architecture was created to facilitate individual and collective learning and professional reflection among the student teachers.

Based on experiences with case model one the DLC design was also created as a means for enhancing new kinds of learning scaffolds. We wanted to develop new learning resources with sharp focusing points on phenomena and problems of classroom teaching, to highlight significant concepts of pedagogical content knowledge and organise the interaction patterns more clearly. This is in line with what Pea (2004) recommends as a clarification of social and technological dimensions of scaffolding. The notion of scaffolding in the actual CSCL environment is extended to include physical/technological as well as cognitive artefacts for learning. This extended meaning is significant for the understanding of computer supported learning as discussed by Davies & Miyake (2004) and Pea (2004). As a consequence the DLC – project has been created to:

- narrow and intensify situated experiences for the student teachers,
- highlight certain moments of actions in classroom teaching and learning,
- let the students work on salient and constitutive elements of teacher professionalism,
- and reinforce joint problem solving and collaboration between the student teachers.

Methodological approach

One of the DLC units: Classroom management and leadership, was tried out on a large scale for all students in a part time teacher education programme in the autumn 2004. This implies that the students worked through the application distributed locally where they were living. They were introduced for the application in a common face-to-face meeting and they were required to deliver a final group assignment at the end as a part the case work. This assignment was delivered electronically in January 2005 for responses from the teacher.

The case unit was distributed through internet with restricted access by passwords. The students got access to the application through computers with certain minimum standards and by use of the Quick time software. A small group of students without necessary broadband facilities got access to the case by a special CD-version. 158 students participated in the try-out situation, whereas 129 answered an electronic questionnaire in a virtual learning environment (It's learning). The answer rate is 75%, which is quite acceptable for the purpose of the study.

The questionnaire was constructed to assess the scaffolding qualities of the application regarding the student teachers' understanding of classroom leadership. Fixed and open answers are used in the form.

The following dimensions have been analysed:

- the authenticity of the video film
- technical structure of the application
- concept structure
- student collaboration and collegial supervision
- personal perceptions of classroom leadership skills

The students' answers have been analysed with regard to internal correlation and variance structures (by factor and regression analyses).

In addition to the questionnaire we have made a rough analysis of 26 student group assignments (two students in each group) forwarded to two seminar teachers for supervision and feedback. These assignments have been reviewed with regard to: 1) what extent they reflect substantial conceptual dimensions in the DLC application, 2) use of scaffolding functions in the application, 3) use of formal and practical knowledge and meta-knowledge (knowledge of practice).

In distinguishing between formal and practical knowledge we are using a conceptual framework according to Cochran-Smith & Lytle (1999) which they call images of teacher learning. This framework has been adopted in an earlier study of student teachers' learning portfolios in the reform programme (Hauge 2004). *The first* of these images refers to what they call '*knowledge-for-practice*', a term that often is applied to as formal knowledge and theory for teachers to use in order to improve practice. This includes the ways teachers organise their lessons and units of study, the activities and materials teachers use for various groups of students, the sequence of content matter teachers present, the methods they use etc. These approaches to teaching are mostly individualistic oriented. *The second image* of teacher learning reflects '*knowledge-in-practice*'. An alternative to this concept may be practical knowledge, i.e. knowledge that is embedded in practice and in teachers' reflections on practice. It is assumed that teachers learn when they have opportunities to examine and reflect on the knowledge that is implicit in good practice. Facilitated teacher groups, teacher communities and other kinds of collaborative arrangements that support reflection in and on practice are important in this context. The knowledge-in-practice conception is very similar to Schön's (1987) concept of knowing-in-action. *The third image* of teacher knowledge named by Cochran-Smith & Lytle is '*knowledge-of-practice*'. This is a knowledge form understood as a pedagogical act – constructed in the context of use, intimately connected to the knower and the situation, and also inevitable a process of theorising. This is inquiry oriented knowledge, where teachers connect their work to a larger context and take a critical perspective on theory and research of others (Cochran-Smith & Lytle, 1999).

The DLC unit: Classroom leadership

The digital case learning unit Classroom Leadership is build around a rather chaotic classroom episode with a group of 15 years old students in a lower secondary school. The opening scene is a video film of about 2 ½ min. It shows how the students rush into the

classroom busy talking with friends without noticing the teacher and her management. One of the students brings with her a pet rat which attracts a group of students that reinforce disorder in the classroom. Other students are opening their lap-tops without noticing the teacher.

The case unit is designed by seven steps where the student teachers start with observing a video film, then they have to reflect individually on the film episode, write an individual text, analyse the phenomenon together with a fellow student, join into a peer supervision and produce a joint group text about the case problem according to some key theoretical concepts.

Step one – introduction

This first step focuses on task clarification, aims, procedures and products. Before entering this application site the students have to be introduced for the tasks, procedures and expectations by the teacher educator in a face-to-face seminar. The teacher will not be interacting with the students while working with the application. This case work is the foundation of a group portfolio work that has to be delivered to the final exam.

Step two – watching the video film

Watching the dramatised classroom episode is the first step towards discussion and elaboration of the theme, cf. figure one.



Individuelt arbeid



Fig. 2 A video snapshot of the classroom episode

Step three – individual reflection and writing

In this phase the students have to write a short individual note based on some guiding questions. The note has to be stored for later use and the application directs the user to this work. The questions are open-ended and descriptive helping the students to write down their first thoughts and reflections. The questions points to problems of classroom management. The application is organised in a way that makes it possible for the students to rewind and play the film over again if they need to.



Fig. 2 The writing of an individual note of reflection

Step four – collaboration and sharing of ideas

In the fourth case phase the students have to organise themselves into a fellow group, making appointments of peer supervision and elaborate the case further by use of their personal experiences. This phase leads the students into two new sites describing working procedures for each of the students. The students have to make appointments about when, how and where to share ideas and advices. The application is constructed to store texts and send e-mails.

Step five – case elaboration

Phase five invites one of the students to identify him/herself with the classroom teacher in the video film and personalise his/her case writing and problem solving. Three constraints are now given to this process: 1) student A is asked to teach the class by the headteacher in the middle of the first semester. He/she has two years of teaching experience, 2) student A has to ask a colleague of him/her (student B) who he/her respect very much, for an advice and he/she has to write a note about the problem to him/her, 3) student A have to make it concrete what he/she want to discuss with student B and receive feedback on. Student A may add new elements to the classroom case already discussed so far.

Step six – giving advice

In step six the student adviser (B) has received an e-mail from the fellow student (A) and given him/herself the role as an experienced teacher. He/she has to answer the questions based on basic guidelines. A sub-figure on the site leads to links with guidelines and literature in the field of peer supervision. This literature is a reminder of earlier course study work in the pedagogy course.

Oppgave for den som gir råd (B):

Du mottar nå en mail fra din medstudent/kollega og går nå inn i rollen som en erfaren lærer. Ta utgangspunkt i problembeskrivelsen du har fått tilsendt fra din medstudent/kollega og gi ham/henne kollegaveiledning.

- Hvilke råd vil du gi din kollega?
- Hva mener du han/hun bør gjøre for å få et bedre grep om klassesituasjonen og løse sine problemer?

Send dine råd i form av en mail til din samarbeidspartner.



Fig. 3 Questions used for advising the fellow student

Step seven – reflections on advices

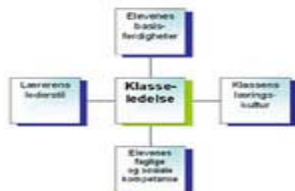
After fulfilling their case elaborations and delivering advices the two students have to write down some individual reflections about their collaborative experiences. The students have to write these notes before moving into the last collective step of co-writing.

Step eight – the writing of a joint text

In the final phase the students have discuss class management and leadership in relation to key concepts in the course study literature. The students are given some support for this discussion by use of a topic map focusing on important concepts in the field. They have to decide how to write a collective text using the digital storing functions (LMS) in the course program. The final process of the work towards a portfolio assignment will be continued in the face-to-face seminar.

Refleksjon rundt klasseledelse

Dere har nå sett nærmere på ulike utfordringer i forhold til klasseledelse. Dette er et felt som kan analyseres ut fra mange ståsted, slik som modellen nedenfor er et eksempel på.



Lag et kort felles notat (inntil 1 side) om krav til god klasseledelse med bakgrunn i casedrøftingene, kollegaveiledningen og aktuelle teoretiske perspektiver (jfr. Ogden 2001, Bergem 2000).

Velg som innfallspunkt *lærerens lederstil* eller *klassens læringskultur*.

[Gå tilbake](#)

Lag et kort felles notat (inntil 1 side)

Lagre svar

Notatet skal lagres i en felles arbeidsmappe i IT's learning og drøftes videre i seminargruppa i pedagogikk. Seminarleder gir beskjed om hvordan dette skal gjøres.

Fig. 4 The final extension process of a joint portfolio document

Results and discussions

Survey results

Table 1 gives an overview of the student teachers' opinions and assessments of the digital case learning unit. Answers are given in percent and mean values.

Table 1 Student teachers' assessment of DLC features

	Very little	Some extent	Great extent	Non answer	Mean N=129
Q1. To what extent do you think that the video case illustrates authentic situations in a classroom setting?	4.7	46.5	47.3	1.6	3.4
Q2. To what extent do you think that your work with the digital case as a whole has improved your insight and understanding of classroom leadership?	10.9	51.9	37.2	1.6	3.3
Q3. To what extent did the assignment about peer supervision improve your understanding of classroom leadership strategies?	17.8	62.8	19.4	-	2.0
Q4. To what extent did the concept map of classroom leadership offer you any help in understanding the actual problem?	27.9	49.6	20.2	2.3	1.9
	Little	Some	Great	Non answer	
Q5. How do you assess the outcome of the collaboration with a fellow student when working with the digital case?	6.2	44.2	49.6	1.6	2.4
	Good	Acceptable	Weak	Non answer	

Q6. How do you assess the progression of the content matter in the digital case?	29.5	58.9	10.1	1.6	1.8
	Little	Good	Very good	Non answer	
Q7. How do you assess the value of the technological solution as a mean of assisting discussions about classroom leadership?	22.5	54.3	22.5	.8	2.0
	Bad	Have to be improved	Good	Non answer	
Q8. How do you assess the relation between the digital case and the final writing assignment about classroom leadership?	3.1	38.8	57.4	.8	2.5
	Weak	Good	Very good	Non answer	
Q9. How do assess your own skills as a classroom leader?	12.4	79.1	5.4	3.1	1.9
	Satisfied	Have to be improved	Have much to learn	Non answer	
Q10. How do you assess your needs to learn more about classroom leadership?	0.8	57.4	41.9	-	2.4

Table 1 describes a differentiated picture of the student teachers' experiences and opinions of the digital case application. In general the answers seem to support an impression of the application as supportive for discussions and elaborations of classroom leadership problems. This is the case for the majority of the students when assessing different aspects of the application. However, it is quite clear that some of the sub-tools or functions need to be further improved as scaffolding structures. This regards at least the concept map model and the peer supervision model. The progression of the content matter in the case as a whole also needs to be reconsidered and clarified according to responses from one fourth of the students. As a general impression the digital video case seems to be accepted by the students as a stimulating starting point and reflection basis for the work with the material.

The differences in the answer patterns in table 1 may be further clarified by looking at correlations and variances between items and individuals. Factor analysis of the answers for all items reveals one significant common factor explaining 26% of the total variance. This means that there is a common answer pattern across many of the items, i.e. students who assess the digital resource positive as a whole also assess the many sub-functions to be positive. There is reason to believe that the different components of the application support each other when students move through it.

When looking at how the students assess their own skills as classroom leaders, table 1 shows that only a small portion of the students are reporting these to be weak. The majority report that their qualifications are good or even very good. However, all of them confess that they need to learn more. Linear regression analyses based on this self-

reporting reveal that students who are open for deepen their understanding of classroom leadership also are inclined to assess the digital learning resource more positive than other students. (Significant Beta values varies between 0.17 – 0.26 on different aspects, explaining 19 – 24% of the total variance.)

In summarising these findings we may say that the student teachers' opinions about the DLC application to some extent are depending on their classroom leadership orientation. Students who look at themselves as qualified leaders seem to appreciate the application more than others. The analyses give no support to the belief that the collaborative tasks in the application can be looked upon as decisive for the students' understanding of classroom leadership.

In the open answers to the questionnaire the students have given a lot of good advices for further improvements of the application. In general the majority of the students are positive to what they have been trough, but they seem to agree on that the application need be revised with regard to some instructional parts, the structure of collaborative work, clarification of the concept mapping procedures and the users access to additional learning resources. Also technical problems are mentioned.

Student assignments

When writing the case assignments the students had to follow a common core of guidelines related to the use of formal knowledge and conceptual base in the DLC application, and they had to formulate an inquiry based question for their problem solving.

The 26 student group assignments were sorted in three main categories according to how they were constructed by the use of three different knowledge forms: formal knowledge, DLC content knowledge and practical knowledge. Most of the assignments are placed in a *main group A*: Heavy use of formal knowledge. A *main group B* comprised assignments with a mixed use of the different knowledge forms. *Main group C* is a group of assignments utilising practical knowledge quite extensively as the main base for writing. The amount of assignments in these three main categories are distributed as in a 5 : 3 : 2 proportion. One representative assignment in each of the groups is selected to illustrate the qualities.

Group A – assignment

The students in this group start their assignment with a short description of the case problem without any reference to DLC interactions or explanation of how they had developed their understanding of the case. Their research question is based on two premises: The classroom teacher has a weak competence in classroom management and his/her students are badly motivated for learning. The paragraphs that follow in the assignment are constructed by use of formal theory related to reference books in the education course. In many ways the rest of the assignment text is very much a paraphrase of theory in their study literature combined with some alignments to the actual case problem. The student teachers' way of handling the leadership problem is quite normative and it is heavily based on advices given in classroom management literature. Meta-perspectives are missing and there are very few references to what the students have done in the DLC case.

Group B – assignment

The chosen assignment in this group has a good structure, a clear research question and combines different knowledge forms: formal, personal, practical and DLC related knowledge. The research question illuminates how two student teachers reflect meta-cognitively on the case problem by use of relevant theory. They are asking how a teacher can act constructively for enhancing conditions for learning and motivation, and improving student – teacher relationships. The student teachers discuss the case problem in light of one main theme – classroom leadership, and they use five categories chosen from a reference book outside the core study literature in their analyses. The research question and case problem is elaborated in a convincing way. The DLC support structure is not very visible in their writing, but the students seem to have internalised some key knowledge exposed in application.

Group C – assignment

This assignment opens up with two research questions focusing on how a teacher may create a good learning environment for his/her students, and how a teacher may establish order and confidence in his/her teaching. Then the student teachers move to the study literature to legitimate their questions. After that they move back again to the DLC case video film. They make their own interpretation of the teacher figure in the video and question what really went wrong for this particular teacher. They discuss this problem by use of their own experiences in teaching and by formal knowledge. Their personal practical knowledge seems to be their strongest resource for problem solving. The support components in the DLC application are not very visible except for video film itself. The focus point of discussions is fading away as their writing develops and the conclusions are not very clear with regard to problem solving.

Looked upon as a whole the three group assignments differ in writing style, structure and content matter, and they reflect different approaches to the understanding of professional knowledge according to Cochran-Smith & Lytle (1999). The assignment of Group A follows in many ways a traditional academic style of writing by presenting theory and advices given from authorities in education, while the assignment of Group C is the opposite – relying very much on personal practical knowledge. The Group B assignment expresses the most autonomous approach to the task by integrating different forms of knowledge along a meta-cognitive line of discussion. The DLC content knowledge is not utilised very explicit in any of the assignments, but seems to be best internalised in Group B.

Discussion

The present follow-up study of the DLC application reflects a mixed picture of the tool qualities and the student teachers' appraisal of the learning opportunities. The students' assessments confirm a need for further revisions of conceptual as well as technical dimensions of the application. Nevertheless, the students have found the DLC application interesting and motivating for the study of classroom management and leadership considered in general.

The students have been exposed to a product still under development. The first version of it was only composed of video films that could be used as an added resource in the

education course model. The second version is an integrated environment composed of various learning resources and a framework for student collaboration. This integrated educational and technological environment is not yet fully developed as a free 'plug-in solution' to other technological tools or educational environments. It has to be used as part of a planned educational course structure. In this particular case the course teacher decided to use the application as a starting point for a case writing integrated in a learning portfolio system. The study reveals that this interconnection or alignment has to be developed further to better enhance the students' learning.

When looking at the DLC application in particular, the study has revealed that the application has been supportive for students' collaboration and learning about classroom management and leadership. However, students who tell that they are confident as classroom leaders are also more inclined to appreciate the DLC qualities for further learning about leadership. In other words different groups of students with regard to leadership confidence seem to utilise the technical and social support structure differently.

The analyses of the final student assignments delivered for further feedback from the teacher clearly demonstrate different task expectations and traditions of academic writing among the students. Three categories of assignments have been found corresponding to different knowledge orientations to teaching and learning among the students. About half of the group of students has written their assignments in a traditional way by using formal knowledge. The DLC application and its conceptual structures are not very visible in their reflections. About two third of the group have been using the DLC content actively in writing their case assignments. This is done together with alternative theory input and by use of their own practical knowledge. The last part of the students, about 20%, has primarily based their case assignments on their own personal practical knowledge supplied with references to theory and concepts in the DLC application.

The intention of the DLC design has been to narrow and intensify situated learning episodes that can be used in teacher education. The application should also bring forward to the students some significant concepts concerning classroom management and leadership, and it should strengthen problem solving and collaborative activities among the students. The follow-up study seems to confirm that these intentions have been active during the students' work on DLC, however there is still a need for further revisions and clarifications of the interactive trajectories supporting the students' learning activities.

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