Dimensions of problem based learning – dialogue and online collaboration in projects

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ABSTRACT

The article contributes to the discussions on problem based learning and project work, building on and reflecting the experiences of the authors. Four perspectives are emphasized as central to a contemporary approach to problem- and project-based learning: the exploration of problems, projects as a method, online collaboration, and the dialogic aspect of students' project work. A specific focus is on how the problem- and project-based learning approach developed in Denmark historically and theoretically, and how it unfolds today discussed through a case of the Danish Master programme in ICT and Learning (MIL), focusing on changes in the roles of teachers as supervisors, and the involvement of students in course and project activities.

Keywords: Project work; Problem based learning; Dialogue; Online learning; Group collaboration; Teacher roles

INTRODUCTION - APPROACH TO PROBLEM BASED LEARNING

In this article our aim is to contribute to the approach of problem- and project-based learning in a present context and identify perspectives that are relevant to further development. As an alternative to more curriculum-oriented teaching approaches, problem- and project-based learning have developed over the last decades into an institutionalised approach (Barron et al., 1998; Kolmos et al., 2004; Olesen & Jensen, 1999). We will reflect on the history and theoretical roots of the problem- and project-based learning approach, particularly as it has developed at the Danish 'reform universities' of Roskilde and Aalborg, and we will point out

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four perspectives that seems central to the approach today. The first of these perspectives focuses on what is understood in the notion of *problem*, building on the tradition of 'problem based learning', PBL, and its development. The second perspective deals with the notion of *project* work and what constitutes the concept of 'project'; in this perspective we are building on insights from Kilpatrick, one of the first to reflect project work theoretically (Kilpatrick, 1918). The third perspective of our approach focus on collaborative *online* learning activities, as new technologies open up possibilities for student interaction across time and space; here we build on traditions of computer-supported collaborative learning, CSCL, and networked learning (Koschmann, 1996; Stahl et al., 2006). As the fourth perspective we emphasize a *dialogic* approach to communication and learning as central to working with problems and projects (Wegerif, 2013). The four perspectives outlined here does not necessarily constitute a fixed or final approach, but can be seen as our suggestion for current problem- and project-based learning in higher education. Hence, the combination of these crossing perspectives may develop, and new perspectives might be integrated over time.

THE FIRST PERSPECTIVE: EXPLORING PROBLEMS

The first perspective to emphasize as part of our approach deals with problems: exploring and working with problems as a didactic method. The tradition of problem based learning (PBL) dates back to the late 1960s and the beginning of the 1970s, where it developed especially at the universities of McMaster University, Canada; Maastricht and Twente, The Netherlands; Salford, UK; Tromsø, Norway; and Linköping, Sweden (de Graaff & Kolmos, 2003; Andreasen & Nielsen, 2013). At the time, PBL offered a new perspective to the existing teaching practice, a perspective where students gained their own experiences through working with practical cases, often based in real-life, instead of listening to teachers lecturing.

Barrett and Moore describes the PBL method by stating that "a key characteristic of PBL is that problems are presented to students at the start of the learning process rather than after a range of curriculum inputs. The PBL problem can be a scenario, a case, a challenge, a visual prompt, a dilemma, a design brief, a puzzling phenomenon or some other trigger to mobilise learning." (Barrett & Moore, 2011, p. 4). Still, in the original PBL tradition it is the responsibility of the teacher to present the problems to be dealt with and to demonstrate how students can relate curriculum and theories to praxis in a constructive way. Barrett and Moore thus explains: "It is important for us, as PBL practitioners, to continually find new ideas for selecting and designing relevant, motivating, challenging, interesting, multi-faceted and up-to-date problems for our students" (Barrett & Moore, 2011, p. 5).

Even though the teacher in this approach often selects a range of topics and problem areas that students may work with, it is also important for students to have wide opportunities to make critical choices and decisions. "The more decisions the students are able to make, the greater their motivation. Even though there are specific learning objectives, the students must have

enough freedom to get maximum enjoyment from the work. This is a very central didactic consideration" (de Graaff & Kolmos, 2003, p. 660).

The relation between students' problem-based activity and their experiences from their working life - and generally from the world outside university - is valuable, not only for the students' motivation, but also for their development of relevant competences, as pointed out by Barrett and Moore: "Employers regularly highlight the importance of key skills, which include: communications, teamwork, information literacy, critical and creative thinking, and problem solving, together with self-awareness, self-assessment, ethical behaviour, reflection, and responsibility for continuous development." (Barrett & Moore, 2011, p. 7).

THE SECOND PERSPECTIVE: PROJECTS AS METHOD

Working with problems and working with projects often have many common traits. However, where a problem based approach will often have in focus working with practice-related cases, a project-based approach will often have in focus the students' own responsibility for developing and directing their work.

The idea of using project work as a method for teaching and learning is generally attributed to the American Professor of education William Kilpatrick (see eg. Postholm, 2003, p. 39; de Graaff & Kolmos, 2003, p. 659). Kilpatrick was originally a student of educational philosopher John Dewey. In an often-referred article (Kilpatrick, 1918), he discussed the new concept of working with 'projects', which was becoming more widely used in educational contexts. What did this concept offer to the understanding of education? According to Kilpatrick, a 'project' should be defined and understood as a "wholehearted purposeful activity proceeding in a social environment" (Kilpatrick, 1918, p. 320). From this definition we can identify four characteristics of projects: To Kilpatrick, a project entails a concrete *practice* ('activity') which has a *goal* (is 'purposeful') and in which participant(s) are engaged or feel *motivated* (are 'wholehearted'), and furthermore this practice takes place in a *context* or social setting ('social environment').

To Kilpatrick, the process of 'being engaged in purposeful acts' offered an alternative approach to the education of children. Kilpatrick was critical of the established instructional practice, which he described as often consisting of "an unending round of set tasks" (Kilpatrick, 1918, p. 328) of abstract nature with only little relevance for students´ life experiences. Instead of this practice, the students would by working with 'purposeful acts' be able to find relevant meaning and thus be motivated in their learning activities. Thus, Kilpatrick's purpose was through motivation to create ownership of the specific project and engage the student in taking responsibility for the learning process.

Projects are not to be seen as one unified thing, but may take on different forms. In order to be more precise in the vocabulary of working with projects, Kilpatrick classified different types of projects: Type 1: embodying an idea in external form (eg. building a boat, presenting a play); type 2: appreciating an aesthetic experience (eg. hearing a symphony, appreciate a painting); type 3: finding an answer to an intellectual difficulty, or solving a problem (eg. why did N.Y. become bigger than Philadelphia?); and type 4: acquiring a skill or a degree of knowledge (eg. learning irregular verbs in French) (Kilpatrick, 1918, p. 332-33). These four types of projects may to some extent overlap or partly depend on each other. Relevant to the discussion of problem- and project-based learning is especially type 1 with the aim of creating a kind of product, and type 3 on investigating and solving a research question. Kilpatrick notes himself that with his definition of project types, the problem method is included as one way of working with the project method.

Kilpatrick's position, emphasizing the child's development of motivation, was later reflected by his former teacher, John Dewey. Dewey advocated the same claim that pupils ought to work on topics they are interested in, and not be limited to topics imposed by the teachers, but he was critical of Kilpatrick for focusing too much on the child in itself and the individual development of motivation. According to Postholm, Dewey would rather see project work as a joint activity involving students as well as teachers, with an emphasis on the teacher's role as an advisor that guides or directs the pupils towards a goal (Postholm, 2003, p. 39).

THE THIRD PERSPECTIVE: ONLINE COLLABORATION

Since the 1990s, students' opportunities for integrating new technologies in their problem- and project based work have opened up, and collaboration through technology has come to play an important role in organising learning processes. More traditional distance learning where students individually were expected to give answers to posted materials such as questions, quizzes, and tasks posed by the teacher, have developed and paved way for models where students are encouraged to work together constructing their own knowledge through collaboration and with the support of computer technology (Koschmann, 1996; Stahl, Koschmann & Suthers, 2006). Dirckinck-Holmfeld views learning in this tradition as a "social construction and negotiation process mediated by artifacts between humans" (Dirckinck-Holmfeld, 2002, p. 32). According to Stahl and collaborators "the group itself has become the unit of analysis and the focus has shifted to more emergent, socially constructed, properties of the interactions" (Stahl, Koschmann & Suthers, 2006, p. 7), building on socially oriented theories of learning, social practice theory, and dialogical theories of learning. Computer and networked technologies provide environments that could enhance the practices of group meaning making. Koschmann presented a programmatic description of CSCL in his keynote at the CSCL conference 2002: "CSCL is a field of study centrally concerned with meaning and the practices of meaning-making in the context of joint activity, and the ways in which these practices are mediated through designed artifacts." (Koschmann 2002, p. 18). The

title of this keynote is, interestingly compared to our discussion above of the roots of project-based learning: 'Dewey's contribution to the foundations of CSCL research'.

In problem- and project-based learning, activities often take place in networks, and the aspect of networks is in focus of the research tradition of networked learning. In our understanding the term 'networked' implies a double meaning; on the one hand the term 'networked' refers to being in a network collaborating with other people (fellow students, teachers, or others); and on the other hand 'networked' refers to being connected through electronic networks to the online facilities and possibilities available (eg. for sharing, studying, or communicating). Banks et al. define 'networked learning' as "learning in which information and communications technology is used to promote connections: between one learner and other learners; between learners and tutors; between a learning community and its learning resources." (Banks, Goodyear, Hodgson & McConnell, 2003, p. 1).

Dialogue has always been of importance when people are working together, sharing ideas, constructing knowledge, but the networked technology makes this dimension more explicit. Wegerif and de Laat points to how technology can be seen as a "facilitator opening and shaping dialogic spaces that would not otherwise be there." (Wegerif & de Laat, 2011, p. 317).

THE FOURTH PERSPECTIVE: A DIALOGIC APPROACH

The fact that collaboration is difficult is what also makes it a possibility for learning. The Norwegian psychologist Rommetveit emphasized, from a dialogic perspective on education inspired by Bakhtin (Bakhtin, 1986), that asymmetry between participants in a dialogue can be supportive of discovering new perspectives (Rommetveit, 1996, p. 95). Entering into dialogue is an exchange with other perspectives. Thus, a creative learning environment is not necessarily established only through harmony and consensus, but may rather be developed by allowing for asymmetry and difference. With differences, more voices may come into play and interact, and by relating to different voices offering different perspectives, chances are to learn and develop.

According to Bakhtin, we develop or "author" our identity by positioning our voice in relationship to the voices of others - voices that may be present voices, past voices, or anticipated future voices. In a study of student teachers in their pre-service training, who collaborated through web-based blog- and wiki-communication, Burwell writes that: "Through the process of negotiating between and among voices in dialogue and then articulating new understandings either verbally or in writing, a teaching identity emerges." He here points out that the student teachers used their authoring of utterances and their interaction with each other to develop their identities as teachers (Burwell, 2010, p. 5092).

In another study of a course helping new teachers taking advantage of technological resources for teaching and learning, Mahiri reflects that the new teachers were helped in changing their perceptions through the dialogic relationships in the class and their collaborative writing of texts (Mahiri, 2004, p. 230).

Wegerif and de Laat reflect on the challenge for education today of developing higher order thinking. One of the tendencies in the knowledge-based information society of today is the general decrease of low-skilled and semi-skilled jobs and the growing importance of such skills as critical thinking, making reasoned decisions between alternatives, or innovating new approaches, what is often termed higher order thinking skills (Wegerif & de Laat, 2011, p. 313). The concept of higher order thinking is often attributed to Bloom in his development of a taxonomy of learning categories. Here higher order thinking is located in a hierarchy from 'lower levels' like remembering and understanding to 'higher levels' like analysing and evaluating. This taxonomy can be criticized for its linear understanding of learning as developing through these levels, and for its foundation in an individualised, cognitive psychology. However, the term 'higher order thinking' still points at relevant competences needed today as being reflective, innovative etc. This also applies in the context of problem-oriented project work, where the development of analytic skills and processes of meta-cognition, continuing self-evaluation and reflection are central.

Therefore, instead of dismissing the concept of 'higher order thinking' for its understanding of thinking and learning as predominantly individual and cognitive processes, Wegerif and de Laat argue for a reconceptualisation of 'higher order thinking and learning skills' as socially situated practices, and as a property of dialogues. Wegerif and de Laat therefore elaborate on the importance of 'dialogic reflection' as the primary higher order thinking skill (Wegerif & de Laat, 2011, p. 314).

Within the dialogic and social constructivist tradition meanings can never be final and fixed once-and-for-all, but are open to re-interpretation. Meaning and knowledge are established through dialogues, which may take place internally as well as externally. Wegerif argue that a dialogic approach should not solely be considered a *means* for participating individuals to reach a negotiated goal, but should rather be considered an *end* in itself, since people through engaging in dialogic processes will be able to construct knowledge and develop reflective thinking (Wegerif, 2013). Wegerif and de Laat states that "Thinking always occurs within dialogues (both internal and external to individual minds)" (Wegerif & de Laat, 2011, p. 316).

LEARNING THROUGH PROBLEM- AND PROJECT-BASED WORK

The four perspectives discussed above are to us elements of a contemporary problem- and project-based learning approach. We will in the following point out some main characteristics of learning through problem- and project-based work.

Problem-oriented project work is an active and participant-directed kind of learning (Illeris, 1999). Central to the process is the students' own formulation of a research question, which they then investigate during their project work. In this process the students negotiate what problems to deal with, enter in continuing dialogues and investigations with each other, and together develop a product, eg. a written project report (Mallow, 2001, p. 107). The project-organised learning approach is characterized by problem-orientation, interdisciplinarity, experiential learning, principle of exemplarity, and participant-directedness (Nielsen & Webb, 1999). Through this approach students relate their new insights to their previous experiences and hence through their study process construct new valuable skills and experiences, expanding beyond the specific frame of the project. The process is interdisciplinary in that the research question will often require combining knowledge and ideas from different kinds of academic fields (Olsen & Pedersen, 2005).

The process is often characterized by collaborative project work in groups. When students work as members of a group, their learning involves both individual and co-operative activities. The students need to act as well *independently* - at an individual level to take initiatives, propose solutions and choose between possibilities - as *interdependent* - at a group level to develop methods of working together, communicating clearly, agree on decisions, and benefit from the shared effort. The aim is to develop a productive interaction through discussions and collaborative writing processes, leading to a final project report.

Processes of learning are often associated with difficulties and laborious work, as elaborated by the Danish learning theorist Knud Illeris: "The learning process may take the form of coming through a crisis, in which the learner struggles for a certain length of time with a problem which is of urgent subjective importance" (Illeris, 2004, p. 58). Frustrations for students working in groups may in periods reach a high level, and tensions, misunderstandings and conflicts among the participating students can occur. De Graaff and Kolmos refer to empirical findings from students' group work, that co-operation among group members can be difficult (de Graaff & Kolmos, 2003, p. 659). As pointed out students often invest much time and energy in project work, and their feeling of ownership is crucial in order to engage in the extraordinary work that often lies within the carrying out of a project.

The pedagogical approach of project-organised learning can be said to reflect the new needs for qualifications that occur in the transition from an industrial society to a knowledge-based information society (Dirckinck-Holmfeld, 1996; Wegerif & Mansour, 2010). Skills like the ability to communicate, engage in teamwork, be innovative, dynamic and flexible, and carry out problem solving relate to these societal changes (Krogh & Rasmussen, 2004, pp. 40ff). Through students' project work such skills are developed: communicative and listening skills, ability to show respect and understanding for one another, and to reflect on their personal development (de Graaff & Kolmos, 2003). They also develop skills in co-operation and

project management through learning how to plan, manage, and evaluate projects. This is a long-term process for the students, that will be gradually developed through participating in a number of project work cycles.

HISTORICAL DEVELOPMENT AND THEORETICAL ROOTS

In the light of this discussion of problem- and project-based learning, we will draw out some characteristics of how the approach has developed historically and theoretically in Denmark.

In Denmark PBL took its form as problem- and project-based learning especially at the 'reform universities' in Roskilde and Aalborg, which were founded in 1972 and 1974. The pedagogical innovations that lay behind this development came through contacts among educational researchers and practitioners representing alternative, critical pedagogical approaches (Nielsen, 2002, p. 56). Various sources of inspiration were combined from among others Dewey, Piaget, Negt, Lewin, and Freire, some of which will be discussed in the following.

Dewey was an inspiration through his description of the process of "experiencing". He pointed to the integrated dimensions of *continuity* and *interaction* as playing a central role when students learn through relating their new insights to their previous experiences: "The principle of continuity of experience means that every experience both takes up something from those which have gone before and modifies in some way the quality of those which come after" (Dewey, 1963 [1938], p. 35). Students develop their experiencing through interactions, relations and dialogues among participants.

Negt was another inspiration, who reformulated Dewey's understanding of "experiencing" as an active, productive process in a societal context. Negt especially focused on developing workers' conditions and consciousness (Negt & Kluge, 1993 [1972]; Illeris, 2004, p. 150ff). Negt also emphasized the principle of exemplarity, which meant that the question in focus of a project can be seen as an example of something 'bigger'. Thus students working with a specific research question will not only be capable of understanding this in depth, but also of seeing it in a wider context and be able to 'transfer' their findings, their approach and their methods to other research areas (Negt, 1975 [1968]).

Lewin's notion of dynamics within groups, his understanding of experiential learning and his experiences within the field of action research was a third inspiration. Lewin underlined the importance of interdependence - as discussed above on the relation between independence and interdependence - among group members (Lewin, 1948). Lewin stated that a powerful dynamic can be created if a group's tasks are such that members of the group are dependent on each other for achievement.

Lewin's three stage change model developed within organizational research is another relevant notion in relation to students' collaborative project work (Lewin, 1951). The first stage of this model is *Unfreeze.* Group members should be aware of problems and tensions in the current stage of the functioning of the group. The more people recognize that a need for change exists, the more likely they are to "unfreeze" from their current mode of operation and become receptive of new ways to work. The second stage is *Change.* People who have been "unfrozen" are in a transition that can result in a change of behavior or procedure that can help them become more effective team members. The third stage is *Refreeze*, where new procedures, thought patterns, and behaviors are to be accepted and implemented in order to be part of the ongoing practice. Such processes of unfreeze, change and refreeze will continually take place.

At the Danish reform universities these inspirations were unfolded in practice in a way where the learning environment was structured in specific physical surroundings, 'houses'. In these houses a cohort of 65-100 students was located for joint studies during several semesters. Here students organised their project work, had courses and held seminars. Until the 1990s, during these project periods, the teachers had - and the study secretaries still have - their offices in these 'houses'. Thus a milieu characterized by participant-directedness emerged, where students and teachers together could build an inspirational learning environment and as a result a wide variety of competencies could be produced. Such environment paved way for the development of social competencies - e.g. democratic participation through the ongoing discussions and negotiations, not least in relation to contested issues in society in general.

From the beginning of the 1990s and onward, Lave and Wenger's terms of situated learning and communities of practice have been of inspiration, e.g. for the MIL programme, which is discussed below. The concepts of *joint enterprise* (negotiation of common goals, conducting joint project work), *mutual engagement* (mutual responsibility for the task and the activities undertaken, doing things together, group relationships, community maintenance), and *shared repertoire* (actions, artifacts, tools, work styles, learning styles, concepts, discourses) (Wenger, 1998, p. 73) have been relevant for project-organised learning, in relation to supporting learning processes in groups.

A final development in relation to project work is the way of assessment. De Graaf and Kolmos underline that assessment and exams should take place on a group basis if a project is made by a group (de Graaff & Kolmos, 2003, p. 659). This was actually the case in Denmark until 2006, that group projects could be evaluated through group exams. However, in 2006 the center-right government issued a law that even if a project work had been undertaken as group work, all examinations should take place individually. In 2012, the center-left government reversed this law, and it is now up to the educational institutions themselves to decide the kind of assessment form. Aalborg and Roskilde universities (including the MIL programme)

have accordingly decided that students' learning process involving group project work should be assessed through group examinations.

A project pedagogy process in MIL has a variety of different phases, ranging from face-to-face meetings between supervisor and student group to communication through digital media in virtual learning environments featuring written communication, audio and video. The roles of students and teachers change during a project working period, as discussed in the next section.

TEACHERS' ROLES AS SUPERVISORS

In the following, we will discuss some of the changes related to the roles of being a teacher and a supervisor in the context of project work and problem based learning. Usually when dealing with design for learning, the teacher or professional instructor is responsible for the planning and implementation of the teaching and learning process. Within project-organised learning it is however crucial that also students can act as co-designers of the learning environment.

Within the framework of project-organised learning, the teacher's main role is acting as a supervisor - not solely as a lecturer or instructor. When students are involved in participant-directed study processes, they are in contact with a teacher, who acts as a supervisor in relation to their project. As a supervisor the teacher may act as a coach, a mentor, a discussion partner; as one who supports as well as challenges the students in their project work. This is done by being initiating in relation to the students' projects and showing possible ways to go for the students, but at the same time without taking too much responsibility. The reciprocity in the teacher-learner relationship is of great importance.

The specific needs for supervision in relation to students' project work are studied by Dahl, who outlines an understanding of student-tailored supervision (Dahl, 2008). By 'student-tailored' he means that the supervision should be continuously adapted by the teacher to the needs of the students, in a way that matches different combinations of process-oriented and product-oriented guidance, of which Dahl terms the basic combinations 'consulting', 'discussing', 'training', and 'instructing' (Dahl, 2008, p. 93). A supervisor should not just give the students what they want, but should instead stimulate the students to transgress their familiar abilities and to enter new areas of activity. Following the terms of Vygotsky the supervisor should facilitate the students to enter their 'zone of proximal development'. Vygotsky defines this zone as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). The zone of proximal development is thus the area

between what a learner can do by him- or herself and what he or she can do with help from more knowledgeable persons or groups of people.

This concept of students' proximal development zone has contributed to a focus on relating the teaching effort towards the specific students and their actual experiences and possibilities. The use of the concept has however also been criticised, eg. by Illeris and Engeström (Illeris, 2004, p. 54) who asserts that the teaching-learning process implied in the concept of "proximal development" may take form of a teacher-controlled and somewhat authoritarian form of teaching, as the teacher is the one that knows best in which direction the student may develop. In their criticism they cite Griffin and Cole: "Adult wisdom does not provide teleology for child development. (...) A zone of proximal development is a dialogue between the child and his future; it is not a dialogue between the child and an adult's past" (Griffin & Cole, 1984, p. 62, here from Illeris, 2004, p. 55). This reformulation involves as Illeris remarks an understanding of the zone of proximal development as a space for creativity for the child, or in our case the student. As Engeström puts it: "We must stop talking about the acquisition of what has already been developed, and understand that what is important are creative processes" (Engeström, 1987, p. 169, here from Illeris, 2004, p. 55). Such understanding we see as essential for project-organised learning processes to build on the students' initiatives and new ideas.

When dealing with online learning activities, new roles and tasks for the teacher appear compared to the well-known practice of classroom teaching. In relation to higher education, Kahiigi et al. suggest that when teaching online "the teacher takes on a facilitator role while the students take ownership of their learning and personal development" (Kahiigi et al., 2008, p. 82). Based on our experiences from teaching at the MIL programme, we will point out that teaching online creates a need for technological as well as social awareness, where teachers should be visible and accessible through online discussion periods, in other words mobilize tele-presence. The challenge for the teacher is to allow adequate space for students to operate and navigate, but at the same time provide clear criteria and standards to make sure students understand the tasks and activities. Especially in online activities it is important to assist the students to stick to their work and hold on to their plans. An online supervisor must be capable of giving constructive feedback, either face-to-face or through various synchronous communication programs such as Skype, Adobe Connect, or Google Hangout. Sometimes it also demands being available at odd hours.

With the multi-faceted communication modes within reach today, we often find that a distinction can to a lesser degree be drawn between whether people are online or on-site, but may follow other lines, for instance whether one prefers communicating synchronously or asynchronously.

Thus, the role of the teacher is developing in current educational settings. In relation to project supervision, we may outline three general positions, which can be described as: the lecturer position; the facilitator position; and the mediator position. The first position, *the supervisor as a lecturer*, is an instructive teacher position, where the teacher is giving professional advice as an expert. The second position, *the supervisor as a facilitator*, is more related to methodological aspects, with an emphasis on qualifying the students' choices during the project work and supporting their ongoing reflection on their learning process. The third position, *the supervisor as a social mediator*, deals eg. with the difficulties that may occur when students are collaborating. In the mediating role, the supervisor will mainly be inquiring in order to facilitate student engagement in explorative dialogues (Nielsen & Danielsen, 2012, p. 263-265). In practice a teacher and supervisor should be able to take on all three kinds of positions depending on the phases of the project work and the situation of the students.

THE MASTER PROGRAMME IN ICT AND LEARNING (MIL)

In the following we will concretise the discussions on problem- and project-based learning through examples from the Danish postgraduate Master programme in ICT and Learning (MIL). MIL is a part-time programme, most of the students are employed full-time or part-time while studying, and the students come from all parts of the country. The MIL programme was established in 2000 as a continuation of a national research network, and is being offered as a joint programme between four Danish universities.

The programme builds on a networked learning structure and combines on-site seminars every second month with online periods of course activities and project work. The pedagogical model of the programme builds on didactical principles of student engagement in formulating research questions, enquiry of exemplary problems, and interdisciplinary approaches. In their projects, the students bring in research problems from their own work practice to study, while using theories, concepts and methods from the academic practice (Fibiger et al., 2004). Thus, the Master programme is a development of problem- and project-based learning, adapted to the virtual study environment. The MIL programme can be seen as a dialogue-oriented approach based on a social constructivist approach of networked learning (Dirckinck-Holmfeld & Jones, 2009, p. 261).

The virtual learning environment used at MIL contains asynchronous and synchronous communication facilities, file sharing, individual mailboxes and profiles, a who-is-online facility, etc., primarily based on a communication and collaboration system called FirstClass. In this system, student groups have their own virtual folders, which they are free to design and create, and where they can write, share, and organize their contributions. In addition to FirstClass, the students also use synchronous video meeting facilities (Adobe Connect, Google Hangout), peer-to-peer tools and web 2.0 facilities (Skype, Messenger, Google Docs,

Facebook, blogs), and tools to support project and course work (e.g. Camtasia for screen recording, Zotero for reference handling).

STUDENTS AS CO-DESIGNERS

As a result of the dialogue-oriented approach of the MIL programme, the design of the courses of the programme often involve students as active contributors and co-designers of activities in the learning environment. Such was the case of a third semester course at MIL on organisational learning and ICT. We will discuss elements of this course, as it took place in 2009. The course was based on virtual dialogues and collaboration, and it had a focus on meta-learning, meaning that the students were encouraged to continually reflect on the organisation of the course and the outcome of the virtual dialogues. The course took place over a period of two months, starting at an on-site seminar where students met for presentations, workshops, discussions, and group work, and followed by two months that were conducted through online discussions and project work in groups.

At the on-site seminar and the first week online, the students were asked to discuss which specific questions and themes they wanted to be reflected during the course. Drawing on the course literature and their own work practice, the students prepared specific questions to be discussed. A separate online discussion board was established for each question, and during two weeks each student contributed to an asynchronous discussion with his or her reflections on the various questions. Hereby the students explored the themes of the course through online dialogues.

Following these discussions, a small project work was organised, where students collaborated in groups. The specific questions, ie. the problems, to investigate in the projects were defined by the students. These projects were often carried out in relation to an organisation with which one of the students had closer contacts. Some groups organized their work with this task fully online, as the students participated from all over the country, while other groups combined online as well as physical meetings.

In the final week of the course, a shared discussion forum was created for the students to exchange their experiences, reflect on the methods they had applied, and build up knowledge relevant for their upcoming work on the final thesis of the programme, the master project. This final online discussion period was meant as an opportunity for the students to reflect on the course and their small project work: What insights did they achieve? What did they learn during the process? What would they eventually do otherwise next time in a similar situation?

During these final reflective discussions among the 2009 cohort, the 19 students added 116 contributions. One of the main themes discussed by the students dealt with collaboration processes in the students' groups. The students reflected on questions such as how to handle

working together online, and how to maintain an overview of the work, the deadlines and decisions; questions that are relevant also in relation to Lewin's work on group processes discussed above. A second main theme in the students' final online discussions also dealt with another topic discussed above, ie. the relation and interaction between students and supervisors online.

REFLECTING ON GROUP COLLABORATION PROCESSES

In relation to the students' discussions of group collaboration processes, one of the points discussed was how to handle the balance between on the one hand developing insights through the groups' oral discussions and on the other hand keeping these insights by producing written text. A student, whose group had found it difficult to find a direction for their work, explained that "we were not good in putting things down in writing, but on the other hand we were really good at talking and talking at our Skype meetings." (Male student, third semester, our translation). It is a well-known dilemma for many students to establish a practice where they as well talk and unfold ideas, but also capture these ideas in writing. The process of writing may be hard work, but it often contributes to clarifying the students' ideas. We see this dilemma as a parallel to Wenger's discussion of the importance of the interplay between participation and reification, between the momentary process of generating ideas and the long stretch of forming products and results (Wenger, 1998). Both processes are necessary parts of productive group collaboration.

Another meta-reflection developed by the students in relation to the discussions of group collaboration dealt with the relation between students and their supervisors. One student had the experience that students often "have a tendency to follow the guidelines from the supervision very strict," (student, third semester, our translation) and advocated that students need to be independent and reflexive when dealing with feedback. It is a balance for a supervisor between being outwardly pushing or patiently waiting. This balance is reflected in a contribution from a student who states how easy it is to fall into a 'traditional' student role, even though they 'should know better' from their daily work as teachers. This student writes that: "the world just looks different on the two sides of the fence: as a student, you need to know that it is okay, and that you are on the right track; as a supervisor, you are interested in being informed as precisely as possible what the student is writing and what you as supervisor can assist with. Furthermore, as a supervisor you are in contact with many students (...); while students have only one dedicated task that makes up a huge part of their life." (Female student, third semester, our translation). In this situation, the two positions of being a student and being a teacher/supervisor are so different, that even though they are held by the same person, it is difficult to transfer knowledge from one situation to the other. What seems logical in one situation may seem very different when situated otherwise (Andreasen & Nielsen, 2013).

DEVELOPING 'MASTER PROJECTS'

After dealing with student and supervisor roles and issues of collaboration in relation to the specific course, we will now turn to the students' final project work of the MIL programme, their work with the master projects. The master project serves as a conclusion to their two years of studying, and is often used as a chance to dive deeper into a specific problem or research question, which the students have a wish to investigate and potentially solve. The master project is thus driven by the students' own interests, as well in the starting point as during the project process. The participants have mutual responsibility for their joint learning process, and the collaboration among them is a long term process lasting the whole of a semester. Their work with the master project concludes with a written report of a relatively large size, often amounting to 60 or 100 pages (Mallow, 2001, p. 108).

At MIL the master project takes place during the Spring semester (February to June), but already at the face-to-face seminar in October the year before the students start a process of developing and negotiating which problems and research questions to focus on. A brainstorming event is organised, where proposals are lined up and students get a first idea of which themes could be relevant and which groups could be formed. Some students develop further on the themes from their small projects in the previous semesters; others move into new areas. These initial discussions are followed by online dialogues during the following months, where students are continually presenting potential topics for projects, and negotiating among them. At the January face-to-face seminar, the students decide regarding the choice of research questions, the final forming of participants individually or in groups takes place, and teachers are allocated as supervisors/facilitators for the projects.

Like projects in general, the master projects are oriented towards research questions that could occur in real life, and are often carried out in relation to or in interaction with concrete actors. When master projects are written in collaboration between two or three students, one of them will often be an "insider" in relation to the case or organisation being studied, while others may be "outsiders" (Dirckinck-Holmfeld et al., 2008, p. 178). The insider will often have a deeper knowledge of aspects of the research topic and will be able to facilitate access to contacts, places, etc. It may however be difficult to study practices you are involved in. Partly because of the involvement itself, partly because some practices may have become routines that you are unaware of. Therefore it may be difficult as an insider to establish the 'academic distance' necessary to study the case. Here other group members will as outsiders be able to challenge understandings and put forward critical puzzling questions. The possibilities of such a collaboration in a master project lie in the meeting of different perspectives, not by uncritically combining both, but through constantly being challenged in the students' assumptions and interpretations of their material.

CONCLUSIONS

We have presented and discussed four dimensions of a contemporary problem- and project-based learning approach. First, the focus on problems, which gives students an opportunity to explore problems through working with practical cases, often based in real-life. In the original PBL tradition the teacher has the responsibility of finding and presenting the problems to be dealt with. Working with problems are motivating for students, who are able to develop creativity and problem solving skills.

Secondly, project work was framed through going back to Kilpatrick's pioneer work in relation to the project method. Here focus is on students' own responsibility for developing and directing their meaningful work, and in this way gain motivation through a feeling of ownership and engagement.

Thirdly, we stressed collaboration and online work, since networked collaboration provides opportunities for students in flexible ways to connect to fellow students, interact with teachers and use varied forms of advanced technologies as learning resources. Collaboration through networked devices and the ability to engage in dialogues adds new dimensions to problem- and project-based learning.

Fourthly, a dialogic approach was pointed out, emphasizing that focusing on dialogue does not necessarily mean that creative learning environments should be established by fostering harmony and consensus. Rather, differences, variations of voices and viewpoints - even certain kinds of conflicts and tensions and the dialogues that they cause - may pave the way for learning and development.

We highlighted especially the history of problem- and project-based pedagogy in Denmark and the centrality of students' own responsibility of formulating the research questions to investigate. The roles of teachers as supervisors are to interchangeably apply different positions as lecturers, facilitators, and social mediators. For students to act and learn in complex knowledge-based societies, they need to reflect on their knowledge in relation to new situations that develop. Challenges are to organise their shared study processes, engage in dialogues, negotiate and find solutions to complex matters, as demonstrated through the examples from the MIL programme.

To work with projects is not always easy for students, but is something that has to be learned and practiced. In the beginning methodological aspects will be prominent, but eventually as students become more familiar with the method, the academic side will come sharper into focus. As discussed, participants in problem- and project-based learning processes may at times experience frustrations and collaborative work can be filled with tensions. On the one

hand authentic–learning can be the result of such situations, but on the other hand the obstacles should not be too high in order for students to handle the situations.

A critique raised in relation to problem- and project-based learning is that while students may achieve a fairly broad and methodologically oriented competence and may also be highly competent within the specific areas, on which they have focused in their projects, a worry is that they might lack a more general academic knowledge, i.e. the accumulated canon of established theories within their field. However, as Barrett and Moore argued, graduates from problem- and project-based learning institutions acquire competences that enable them to cope with real-life problems, get acquainted with new topics and help finding innovative ways of solving complex challenges and tasks.

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