

Understanding Problem-Based Learning



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UNDERSTANDING PROBLEM-BASED LEARNING

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INTRODUCTION

Problem-based learning as a strategy for developing knowledge and competence in the context of education and work

For over twenty years problem-based learning (PBL) has been applied in many countries across widely varying fields of education. The first and best known applications of PBL were in the study of medicine during the 1960s (Barrows 1985; Barrows 1996). Since then, PBL has spread worldwide across a range of other disciplines in higher education including business studies, architecture, economics, engineering, mathematics and law. The first implementations of PBL in Finland were introduced in medicine (1994, University of Tampere) and in physiotherapy (1996, Pirkanmaa Polytechnic). Two years ago, the PBL approach was adopted in the education of kindergarten and primary teachers at the University of Tampere. During the last few years, PBL has been the subject of research, especially in health education and in various other fields of vocational education. (Poikela & Poikela 1997, 2001; Nummenmaa & Perä-Rouhu 2000; Lähteenmäki 2000, 2001; Nummenmaa & Virtanen 2001; Virtanen 2001.)

Problem-based learning has often been understood simply as a method of learning. Correspondingly, many kinds of pragmatically based pedagogical applications and development projects are described as PBL. Problem-based learning has also been investigated within the context of education, although the theoretical basis of problem-based learning is closely connected

with learning at work. (Poikela 1998; Karila & Nummenmaa 2001; Poikela & Järvinen 2001; Poikela & Poikela 2001.)

A shared interest in research and in the pedagogical development of PBL was the starting point for the research group Pro-Bell (Problem-Based Learning in Finnish Higher Education), which was set up by researchers interested in PBL in January 2001. The purpose of Pro-Bell has been to support research, development and training projects in PBL in different fields of higher education.

The aim of this book is to present some basic results of the research and development project called '*Problem-based learning as a strategy for developing knowledge and competence in the context of education and work*'. The project was realised as part of the national research programme Life as Learning conducted by the Academy of Finland.

The aim of the project was to research the theoretical basis and implementations of problem-based learning (PBL) in education and learning at work. The specific purposes were:

- *to analyse the theoretical basis of PBL (epistemological starting points)*
- *to study the practical applications of PBL on different levels of education (developing the PBL curriculum and learning environment)*
- *to study learning at work (competence-based, multi-professional expertise)*
- *to develop a new paradigm for evaluating learning and competencies at work.*

The content of this book has been organised according to our original research tasks. These tasks are described more exactly in the introduction to each part. The articles included in the book are, however, only examples of the research and the development work we have undertaken in order to understand problem-based learning.

PART I

THEORETISING THE EPISTEMOLOGICAL PREMISES OF PBL

The prerequisites for developing education and professional practices are connected to general processes of change and to the educational systems in society. Societal change and the idea of lifelong learning demand a redefinition of relationships between research, education and professional practices. Knowledge gained through education rapidly grows out of date and loses its value for working life. When the gap between work and education becomes too wide, the educational system faces a difficult situation. The skills and knowledge needed in working life cannot all be taught during formal schooling and training. Working life requires new kinds of competencies including independent knowledge acquisition and application, problem solving, cooperation, multidimensional professional skills and the capacity to continue learning.

Two particular ideas are emphasised in recent research on learning in a professional context. The first is that the concepts of knowledge, cognition and learning are comprehended situationally and contextually. The other is that knowing, expertise and cognition are also products of the context in which they are presented. Knowledge acquisition and the use of knowledge are not separate processes. Knowledge, cognition and learning are bound to certain physical, psychological, social and cultural contexts in which they are formed and to which they refer. The context gives a meaning to learning and professional development in education and in work communities. At the same time, the context is interpreted by groups who produce and share knowledge in their communities of practice.

Research dealing with knowledge and learning is traditionally concerned with individual learning processes and conditions. In recent research, however, the focus of learning is increasingly on groups, communities, organisations and networks of professional practice. Fletcher (1996) characterises learning as a process of participation and partnership empowering individuals within group and organisational processes. The main principles of this learning partnership are a shared context of knowledge, action, reflection, dialogue and reciprocity. Meaningful action and division of work also assumes new kinds of models of working, as well as the development of multi-professional work cultures, which appears in new combinations of tasks, in a growing sense of shared responsibility or in a new kind of partnership with clients. (Launis & Engeström 1999.) Developing new kinds of multi-professional work orientations and competencies demands a new way of learning and evaluating, both in the formal context of education and in the informal context of learning at work.

In epistemological discussions knowledge is usually divided into theory and practice. Theory is understood as propositional knowing-what, and practice as practical knowing-how (Ryle 1949, Eraut 1994). In a broader sense, the relationship between knowledge (what) and knowing (how) can be understood as a problem between Cartesian finite and Heideggerian changing knowledge. The former reflects the modern idea of permanent knowledge and the latter the post-modern way of understanding knowledge as changing and dependent on the action context rather than on facts or the truth context. In PBL, the way in which knowledge is perceived has more in common with a post-modern than a modern a view of epistemology. (Cowdroy 1994.)

Most classifications of knowledge do not make a distinction between an epistemological and an ontological basis of knowledge. They assume that theoretical knowledge is in the mind as well as in books, or knowledge in practice is the same as experiential knowledge. It is important to answer two simple questions: where is the knowledge or who has it? How can someone gain, produce and apply knowledge? When the distinction between objective and subjective knowledge is made, it is easier to clarify what part of knowl-

edge exists outside the individual and what kind of knowledge is connected to personal experience and competence. (Poikela & Poikela 2001; Poikela & Järvinen & Heikkilä & Mäkinen 2002.)

It is important to note that experience is not the same as practice, as is often assumed in everyday thinking. It also describes the contextual and chronological transition between learning and knowing. Education should also make it possible for learners to achieve elements involved in tacit knowledge. Education by itself cannot produce complete professional competence, since professional competence incorporates more extensive dimensions of knowledge and knowing. For this reason it is important to create similarities between the worlds of education and working life.

Our first research task was to analyse the theoretical basis of problem-based learning from an epistemological perspective. The questions were:

- *How do we describe the different images, species, modes, resources and dimensions of knowledge in the contexts of education and work?*
- *What dimensions of knowledge need to be considered in formal curricula and what can be left for learning at work?*

These epistemological questions lie at the core of PBL, and will be discussed in the articles that follow. Our understanding has also developed during the research process. Esa Poikela offers some epistemological and ontological remarks in his article '*Knowledge, knowing and problem-based learning*'.

A problem forms the starting point of PBL. Terry Barrett examines in her article '*A problem as a provoker of space betwixt and between old and new ways of knowing*' how problems help to integrate knowledge, personal development and professional action.

Problem-based learning as a concept is under continuous construction. This is the main thesis in the article '*Deconstructing conceptions of problem-based learning*' written by Merja Alanko-Turunen and Jyri Linden.

KNOWLEDGE, KNOWING AND PROBLEM-BASED LEARNING

– some epistemological and ontological remarks

The western idea of science is based on a separation between knowledge and activity which has led, in turn, to a tradition of setting theory against practice, of practising science against practising a profession. This dichotomy is deeply rooted in our everyday thinking and is concretised in the division of academic and professional education or the categorising of intellectual and physical work. If it is believed that only conceptual knowledge reveals truth, then there is a danger of science retreating from reality. It is not possible to capture change and action perfectly because change is continuous and real-life events seem chaotic. This is why knowledge is often felt to represent constant truth, and certain groups such as priests, lawyers or professors take over the role of mediating the truth.

Ordinary people live under the unstable conditions of practice and have no certainty as to what is “right” knowledge. So, they require advice, instruction and guidance from someone wiser in order to cope from one day to another under the non-scientific conditions of everyday life. Initially, knowledge is produced for the purpose of interpreting reality, but it later becomes a truth in itself. However, reality itself has no value as truth; only the practical value of everyday, concrete doing which stands in opposition to

science. Our post-industrial society is information, knowledge and auditing society whose functions depend on increasing knowledge which is produced in many complicated forms. This state of affairs forces us to question the concept of knowledge based on differentiating between theory and practice. Knowledge does not create a basis for our society; on the contrary, such a basis rests on reality where knowledge is produced, used and evaluated.

This article considers the basis of pedagogical knowledge creation from the point of view of work and the work environment, not so much from the point of view of education. It is essential to look at the professional knowledge, knowing and competence needed at work. I examine the epistemological and ontological basis of problem-based pedagogy from the angle of theoretical understanding, practical wisdom, experiential knowledge and competence construction. The aim is to bridge the gap between work and education by seeking a connection between professional practice and pedagogy.

The dilemma of correspondence between work and education

So far, the gap between work and education has been bridged with reforms which are carried out from time to time. They have aimed at a *correspondence of content* in the qualifications demanded by work and those produced by education. The result of educational reform has usually been a new state of balance which founders once more as result of societal development and changes in working life.

An early collapse took place back in the 1800s when a two-tier educational system was created. One level was concerned with training ordinary people, while the other was reserved for educating the upper classes. The organisation of professional education was not given much attention because the “lower” vocations especially were still learned at work and in workshops supervised by masters and apprentices.

During the construction of educational systems there emerged a model of teaching and learning which was based on behaviour inside a classroom. This model has been immune to all the structural reforms of education conducted over the last century. The process of learning and teaching within the frame of curricula remained unchanged despite reforms which were carried out almost every decade (see Miettinen 1990). This was the situation until a development which began in the 1990s offered a promise of real change.

Our society's shift towards a post-industrial era during the 2000s is the result of the far reaching development of information technology bringing with it a competitive global economy and rapid social development, which has shaken up traditional divisions in the work place. Hierarchies have been lowered, people work more effectively together than alone, self-led teams have become usual in production, and a highly educated work force moves between countries and continents. The other side of this development is that the global economy is centralised, resulting in a withdrawal of decision-making involved in financial investment. Even profitable enterprises have been streamlined and moved from one continent to another in search of better profits. This has also meant that the feeling of uncertainty has increased in work places and in everyday life as society's social security network has weakened.

This development has been too fast for educational institutions and the signs of crisis are visible at all levels of education starting with the polarisation of primary schools into good schools and bad ones. The competencies and knowing needed by society and working life are rapidly changing and this means that the contents of curricula are already old-fashioned by the time they are implemented. Curricular development should be studied within the framework of correspondence of functions in work and education, rather than focusing simply on correspondence of the contents. Traditional education aims to store knowledge which can be later applied, but the idea of creating *functional correspondence* between work and education aims at creating the knowing and competence needed in our information society through doing, acting and thinking.

Pedagogical knowledge, knowing at work and the learning environment

One solution to bridging the gap between work and education is problem-based pedagogy. Traditional education and teaching assumes that learning starts when new content is delivered to the students. Problem-based learning, on the other hand, starts by dealing with problems whose origins are embedded in the reality of working life and society. Problems cross the borders of different fields of science and disciplines and problem solving requires the development of diverse skills in information seeking and independent studying. Another important factor is interacting and cooperating within different learning environments and communities of experts. This is the reason why the basis of pedagogy should also be explored in work and everyday life situations, and not only in school and the temporary, part-time reality school represents. In the following I will examine what kind of knowledge and learning environment work offers, and how the origin of pedagogical knowledge can be traced as a basis for producing learning and competence.

Practical wisdom

According to Hager (1999) Aristotle distinguishes between theoretical and practical reasoning. Theoretical reasoning (theory) concerns knowledge that is certain (episteme), while practical reasoning (phronesis) refers to wisdom concerned with the contingent world of action (praxis). Aristotle also identifies another type of practical knowledge related to praxis which he calls skill knowledge (techne) and this is concerned with making things (poiesis). While objects and artefacts are the products of activity, practical wisdom is created for its own sake. On the basis of this reasoning, knowledge embedded in artefacts is separated from knowledge embodied in the minds of individuals. In human actions these different types of knowledge dialectically integrate praxis and practice. Praxis refers to objective reality independent

of the individual, while practice concerns the subjective reality which forms individual experience (cf. Freire 1972).

Hager (1999) argues that Aristotle's identification of practical wisdom is an early version of so-called know-how, knowing what to do in practice. Instead of the term know-how he suggests the concept of practical judgement for understanding learning at work. This underlines the need to take into account the contextual dimensions of workplace situations from the point of view of practitioners. The contextual features of practical judgement consist of encountering non-routine challenges, flexibility as a part of change, social forces in a community of practice and integration of personal characteristics involved in workplace situations.

Practical judgement often starts from problem solving and with a judgement about what the problem is. It involves learning by experience, but it does not follow that all experience of practice is effective in problem solving. Hager discusses the features of practical judgement and refers to experiential learning in the problem solving process, observing that doing and being are basic to the human situation. He also notes a surplus of technical knowledge at the expense of contextual knowledge. Nevertheless, he does not illustrate the modes of knowing or knowledge involved in learning situations at work.

Relational knowledge

Burnard (1987, 1991) describes the three elements of knowing: propositional (theoretical), practical (know-how) and experiential (relational) knowledge. Propositional knowledge involves theories and models learnt during education. Practical knowledge is linked to learning practical skills and it can also be nonverbal in nature (c.f. tacit knowledge). Experiential knowledge has an individual dimension because experience is born only through personal contact with another individual or with the content under study. The essential element of experiential knowledge is knowledge through relationship which involves encountering humans and other elements (see Figure 1). This

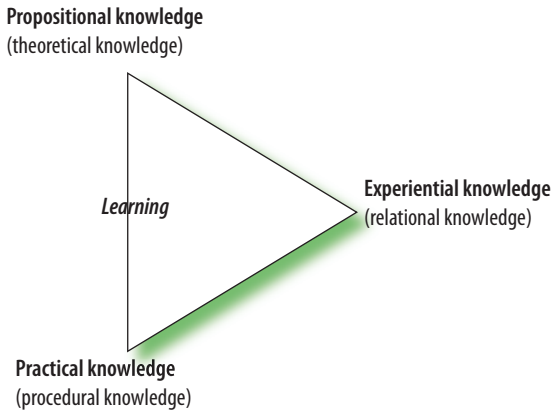


FIGURE 1. The knowledge dimensions of knowing
(adapted from Burnard 1987)

means knowledge is not owned solely by an individual, it is also embedded in the social connections between individuals (Burnard 1991).

Burnard's description emphasises the social context in which knowledge is gained, applied and internalised. Relational knowledge is essential because it connects experiential learning, personal knowing and tacit knowledge. The merit of the model is the way in which it connects the fundamental types of knowledge to one another, and how it views contextual relations from the perspective of pedagogical action. However, Burnard's model does not express the multidimensional nature of the knowledge environment in the context of work.

Images of knowledge

Blackler (1995) states that there should be a transition from a theory of knowledge to a theory of knowing which emphasises the processes of gaining, creating and using knowledge. His suggestion is that knowing is mediated, situated, provisional, pragmatic and contested. Its focus is in the proc-

ess of action, and the locus of knowing is praxis not theory. In these terms the work community can be represented as a diverse contextual, functional wholeness consisting of different sources, resources and types of knowledge.

Blackler divides *images of knowledge* into five categories: encoded, embedded, embrained, embodied and encultured knowledge. Encoded knowledge is written down in the form of books, instructions and other practical codes and is communicated with signs and symbols. Embedded knowledge is hidden in routines and structures that are expressed in technology, roles, formal procedures and organisational skills. Embrained knowledge is dependent on cognitive abilities and conceptual skills. Embodied knowledge is action oriented and only partly explicit because it is linked more to situation-specific knowledge (know-how) than to abstract rules or regulations. Encultured knowledge refers to common, social processes in which understanding is shared. Understanding is linked to language and is therefore socially constructed and open for negotiation. Language and concepts change work and organisational culture. (Blackler 1995.)

The five images of knowledge defined by Blackler offer an epistemic frame for understanding knowing and learning at work. Although he does not relate the images of knowledge to theoretical, practical or experiential knowledge this can be done using the tripod presented by Burnard (see Figure 2).

This tripod showing the images of knowledge offers an opportunity to analyse and define the complexity of the knowledge environment in the work place; firstly, as a relation between theory and practice; secondly, as a dimension in the form of experiential, conceptual and bodily knowledge; thirdly as cultural knowledge emerging on the basis of experience, practice and theory (see Figure 2).

- *Encoded knowledge* is symbolic knowledge saved in a kind of source (cf. theoretical knowledge). It can be written down in guidebooks or as curricular text.

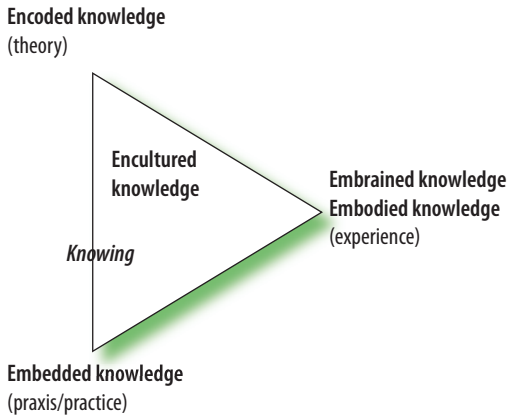


FIGURE 2. Knowing at work and the images of knowledge

- *Embedded knowledge* is located inside the work organisation as structures and objects, artefacts, facilities, resources, roles and routines (cf. practical knowledge)

Encoded and embedded knowledge are, by nature, objective knowledge because they exist outside an individual and are not dependent on an individual. For example, when an individual accepts a new job and moves to a new work community, s/he confronts a new world of knowledge and, at the same time, leaves a former world of knowledge behind.

- *Embrained knowledge* consists of propositional knowledge internalised by individuals and descriptive knowledge (declarative knowing what). These include learned facts and functional principles and also so-called meta-cognitions.
- *Embodied knowledge* is know-how linked to knowing and competence involving elements of tacit knowledge. Examples include experiences occurring when physically present and gained through a sense of feeling, or through doing and acting.

Embrained and embodied knowledge belong to the category of subjective knowledge (cf. knowing from experience). Both these types of knowledge also include tacit knowledge which can be expressed in many ways such as intuition, community spirit or house rules. When someone has “the right touch”, they have an intuitive understanding or feeling but it is hard to express it in exact words.

- *Encultured knowledge* is shared knowledge and it is typically produced in teams of various sorts. Encultured knowledge is closely linked with other expressions of knowledge inside an organisation. It can be either tacit or recognisable in various forms of functions and resources. Sometimes stories or metaphors are needed to express and create tacit knowledge. Stories and metaphors do not arise from a vacuum; their background is one of reality but also of legend.

Encultured knowledge is a construction emerging on the basis of other types of knowledge. It can be subjective when it says something about the community and the acting members within it. It can also be objective because its existence is not linked to a certain group or individual. For example, ancient cultures are known through knowledge embedded in objects and encoded in symbolic form, even though there is nobody left to speak about the community. (Poikela, E. 2004.)

Blackler has explored knowledge from the point of view of action. He has made a distinction between theoretical knowledge located outside an individual (encoded knowledge) and conceptual knowledge owned by an individual (embrained knowledge), but he has not separated the knowledge in praxis or practice existing outside an individual embedded in artefacts created by humans or in natural objects (see Figure 2). On the contrary, Blackler returns to the old epistemology by presenting embrained knowledge as “knowing what” and embodied knowledge as “knowing how”. This means that “knowing how” is simply a physical or bodily character and not linked to thinking at all. Although he has analysed the relationships between know-

ing and work organisation, Blackler has not defined the work community as an environment of knowing and learning.

The ecology of knowing

Barab and Roth (2006) have developed an ecological theory of knowing which introduces the idea of a curriculum-based ecosystem where participation is primary when compared to information acquisition. The central starting points arise from several theories: situational learning (e.g. Lave 1988; Wenger 1998); environmental ecology (e.g. Gibson 1986); activity theory (e.g. Leontjev 1978; Engeström 1987); and theories based on phenomenology (e.g. Schutz & Luckman 1973; Luger 2005).

According to these theories, the primary basis for learning does not lie in internalising contents and facts. Rather, learning takes place when participating in situations and contexts, during functional activity and in individuals' intentional interaction relation to their environment. Barab and Roth (2006) also point out that their theoretical background is linked to design theory (Barab et al. 2004), learning environments (Roth 2000) and problem-based learning (Savery & Duffy 1996).

The ecological theory of knowing is constructed on three basic concepts: affordance networks, effectivity sets and life-worlds. This theory's relation to the tripods depicted above (see Figures 1 and 2) can be described as holographic. It emphasises ontological rather than epistemological factors, and focuses on praxis and the world of individual and collective action (Figure 3).

According to Barab and Roth (2006, 5): "An affordance network is the collection of facts, concepts, tools, methods, practices, agendas, commitments, and even people, taken with respect to an individual, that are distributed across time and space and are viewed as necessary for the satisfaction of particular goal sets." They argue that "understanding the network and its nested components constitutes the minimal ontology for supporting learning". In other words, the pedagogical core of the affordance network is to fa-

cilitate learners' participation by observing environmental information and opportunities for knowledge acquisition, and by offering problems that can convert individual experience.

When describing the concept of effectivity sets, Barab and Roth refer to Shaffer's (2004) discussion of an epistemic frame. Shaffer states that learners need support to be able to adapt to an epistemic frame which would allow them to act and think, as much as possible, like experts. Barab and Roth define effectivity sets as properties of individual-environment transactions out of which a new epistemic frame might emerge. They are always coupled with particular affordance networks and particular goals. Learners need to prepare for developing competence in their professional future.

The term life-world refers to individuals' everyday life which is experienced subjectively. The material environment may be the same, but personal experiences are different, even contrary. Barab and Roth (2006) observe that "the contents of any life-world are dependent both on the individual's effectivity sets and on the available affordance networks, leading to a continuous evolution of both individual life-world and communicative patterns with others. A core goal of education is how best to support learners in developing

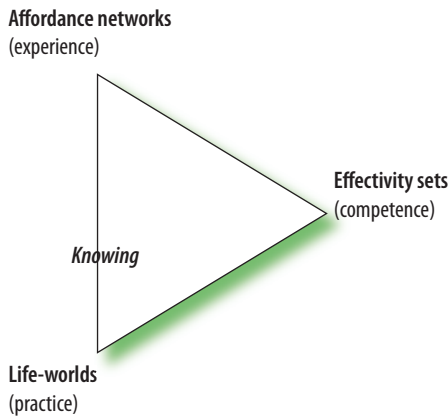


FIGURE 3. Knowing in the ecological system

personal life-worlds that overlap with those socially agreed-upon life-worlds that are engaged by more knowledgeable others. Similarly, a core challenge of education is how to develop curricular contexts that extend themselves meaningfully into the personal life-worlds of individuals.” (Barab & Roth 2006, 7). From the point of view of expert action, “professional life world” practice can also be unique, subjective and even contrary when compared with the actions of other practitioners.

Barab’s and Roth’s theory of knowing emphasises the learner’s involvement and intentional action in an ecological system where learning is based on acting in the learning environment and is constructed more around problems than certain contents. Supporting and facilitating learners’ intentional actions, problem-solving and mutual interaction in changing contexts such as time and place creates a solid basis for functional knowing and competence for the future of the profession and the work place. Instead of presenting content, curriculum-based ecosystems begin by setting up the problem and then making available various resources and suggested activities through which learners assemble the networks required for solving the problem. The curriculum includes the framing of the goal and contextual information, along with the tools and resources for achieving that goal.

The contextual framework of problem-based pedagogy

In epistemological discussion the relationship between knowledge and knowing can be understood as a debate between Cartesian finite and Heideggerian changing knowledge. The former represents the modern idea of permanent knowledge, and the latter the post-modern way of apprehending knowledge as changing and dependent on the context of the activity, rather than on facts or truth. Problem-based pedagogy can be characterised as a paradigm shift towards a post-modern society and a new epistemology (Cowdroy 1994).

Few scholars have attempted to distinguish between the epistemological and ontological dimensions of knowledge. Nonaka and Takeuchi (1995) do make this distinction. They argue that the epistemological dimension describes conversion processes from implicit (tacit) to explicit knowledge, and vice versa, from explicit to implicit knowledge. The result of this conversion is new knowledge and a new way of knowing and acting. The ontological dimension, on the other hand, describes knowing processes that take place between an individual, a group and an organisation. Cook and Brown (1999) also make the same kind of distinction between the mode of knowledge and the possession of knowledge. In their view, knowledge can be explicit or implicit and is possessed by an individual or a group.

According to Nonaka (1994) explicit knowledge is symbolic, observable knowledge and implicit knowledge refers to nonverbal, tacit knowledge which is hardly observable. The ontological dimension concerns knowledge existing somewhere and owned by someone: knowledge can be individual or collective. Tacit knowledge is subjective in nature and it is bound to personal, collective or organisational competence. This means that producing and delivering tacit knowledge depends on individual and collective action.

Nonaka and Takeuchi (1995) examine subjective tacit knowledge, while Ståhle and Grönroos (1999) study objective potential knowledge in the sense that it has not yet been transformed into the form of individual or common competence. Potential knowledge is a possibility embedded in environment and it is an object of goal-oriented thinking and action (c.f. Barab & Roth 2006). We are used to calling this kind of thinking and acting learning when practised within the framework of the curriculum in formal education and in the form of professional development and informal learning in working life (Poikela 2003).

Instead of the traditional two-dimensional theory/practice description, a holographic three dimensional view of knowledge consisting of *theory, praxis and experience* and *experience, practice and competence* should be adopted (see Figure 4). As the most important elements of producing competence, the concepts of objective and subjective, potential and tacit knowledge challenge former dichotomies of knowledge. It is no longer possible to

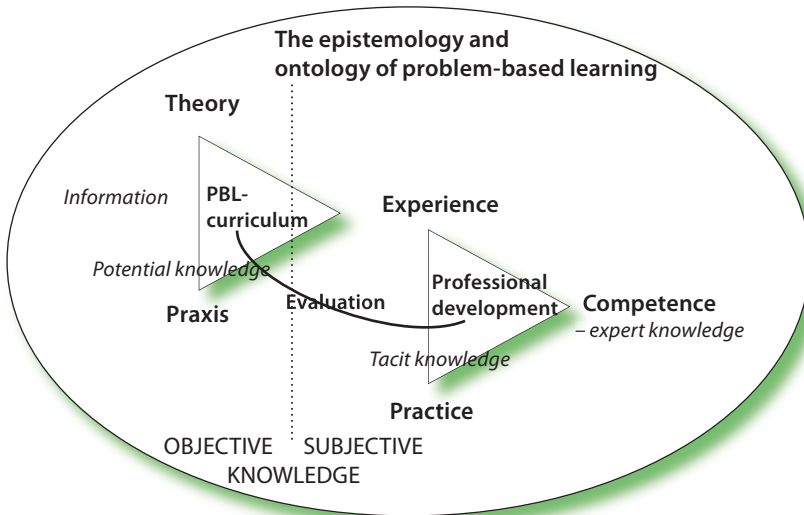


FIGURE 4. The contextual framework of the problem-based curriculum
(Poikela & Poikela 2005)

divide knowledge simply into the theoretical “that” and the practical “how”. A more useful division is theoretical “that”, practical “that” and experiential “how” knowledge. This locates knowledge in a new way and the dichotomy between theoretical and practical knowledge takes on the shape of a triangle where the third dimension is experiential knowledge. This makes it possible to clarify what part of knowledge is objective, existing outside of an individual (theory and praxis), and what part is subjective, experiential (experience, practice and competence) knowledge.

Conceptual knowledge in textual, codified or any other symbolic form is not the same as it is in the memory of an individual, a group or an organisation. Correspondingly, practical knowledge is not only in the possession of a professional, but can be embedded in artefacts produced by humans or in objects of nature. From the point of view of the learner, theoretical and practical knowledge, like any information, are sources of potential knowledge, the goal of learning lying outside her or himself. The integrative knowledge from and between theory and praxis/practice is needed for constructing

experience, the mode of subjective experiential knowledge, including the highly personal elements of tacit knowledge.

Figure 4 clarifies what the basic idea of learning is. The left-hand triangle depicts the world of education, and the right-hand triangle the world of work and professions. The aim of teaching is to guide the learner to deal with substance so that it is possible to integrate necessary theoretical knowledge (from theory) and practical knowledge (from praxis/practice) in the processes of learning. The result of the integration is experiential knowledge (forming experience) which has a permanence not enjoyed by knowledge gained from the memorisation of facts without connection to practice, or from emotional experiences without theoretical understanding. Figure 4 depicts the *contextual*, *chronological* and *ontological* transition between education and work life. Practitioners continuously learn at work (within a community of practice) and deepen professional competence (in personal practice) during the whole of their work history.

Discussion

Burnard (1987) aims to bridge the epistemological dualism (theory/practice) in her description of theoretical, practical and experiential knowledge. However, she does not make a distinction between knowledge, theory and practice existing outside an individual, but presents the types of knowledge as dimensions of subjective knowledge familiarised by an individual. Blackler (1995) describes the five forms of knowledge but fails to note the separation between objective and subjective knowledge outside and inside the individual or in the work community. Nonaka and Takeuchi (1995) describe the difference between the epistemological and ontological dimension of knowledge, but do not differentiate between potential knowledge in an environment and implicit knowledge in an individual and a community. The environmental and contextual point of knowing and learning is lacking.

Barab's and Roth's (2006) description of ecological curriculum theory is deeply rooted in praxis and they do not make a distinction between theory, practice and experience. Rather, differences are created between epistemic, functional and experiential possibilities, abilities and realities. They construct curricula as an ecological system and a learning environment where the learner's actions are as purposeful as possible. The individual's intentional and life-worlds need to be linked and this action must be supported. When life-worlds overlap and are "in discussion" with each other, this enables the ability to participate in and influence actions. In this way, the ecological theory offers an approach firstly, for creating problem-based curricula (see Figure 4, left triangle) and secondly, for structuring learning at work and professional development (see Figure 4, right triangle).

Pragmatic philosophers of education (e.g. Dewey 1911; Freire 1972) emphasise the importance of learners' actions and of facilitating these in the processes of growing and development. The way learners' experience is constructed is crucial, and also how they learn "to read" the concrete, social and cultural environment in which they act in the contexts of everyday life, work and education. Our information society offers a huge amount of data, but it does not offer knowledge when examined from the perspective of learning. The curriculum is full of theories, models, facts and exercises but, from the learner's perspective, this is just information coded and packed in a formal mode. Information is transformed into knowledge only when personal meaning is attached to it in the process of learning.

The dilemma of creating meaning is usually expressed in pedagogical discussion as difficulties in personal motivation, commitment and the ability to receive information. Praxis, arising from real problems is more useful for learning than theory because only in this way is it possible to create sense and structure ways in which to use theories. Learning is carried out through actions which can be aimed at achieving certain goals and targets in reality-based problem-solving processes. This is why education cannot be based on the transmission of information and skills coded as written text in books. A solid basis for education lies in functional models and in developing abilities which lead to lifelong learning in our present and future society.

The purpose of the problem-based curriculum is to link the world of education to the world of work and professions. Education should produce learning that leads to expertise in working life and, of course, to becoming a civilised member of a multicultural society.

A PROBLEM AS A PROVOKER OF A SPACE BETWIXT AND BETWEEN OLD AND NEW WAYS OF KNOWING

This chapter illustrates how the concept of the problem as a provoker of a liminal space, a space betwixt and between old and new ways of knowing was derived from analysing how lecturers as problem-based students talked about the problem in the dialogue of PBL tutorials. It focuses on what can be learnt about problem-based learning from how lecturers as problem-based learning students talked about PBL problems in the dialogue of a PBL education development module. The purpose of the chapter, then, is to explore how lecturers' language-in-use can help develop a conceptual understanding of the nature of problems as provokers of a space betwixt and between old and new ways of knowing. The main argument is that by conceptualising problems as provokers of a liminal space, educators will be encouraged and enabled to maximise their potential for learning. However, not all PBL problems provoke liminal spaces for all students in every context. Rather in this chapter I am analysing how I derived the illuminative concept of a problem as a provoker of a liminal space from listening to the students' talk about the two problems they encountered in the PBL tutorials of this specific education development module.

Barrows (1986; 1989) views the problem as a trigger, or a starting point for learning. Margetson (2001) provides convincing philosophical arguments for the rationale for learning in higher education to be based on problems. In PBL the problem is not defined narrowly as something broken that needs to be fixed but wider as an-ill defined, challenging starting point for learning. Types of problems include: understanding a puzzling phenomenon, resolving a dilemma, finding a better way to do something, meeting a challenge, exploring an effective way to design or build something and creating an artistic work. In this module there were two consecutive problems.

This chapter analyses the dialogue of two problem-based learning teams that were given the pseudonyms of the Glendalough team and the Skelligs team. Two teams of eight lecturers were completing a module on problem-based learning that was part of a staff development Postgraduate Diploma in Learning and Teaching in Higher Education in Ireland. These lecturers were problem-based learning students for the module. The lectures came from a variety of disciplines that included engineering, business, visual communication, nursing and architecture. They worked on two problems about PBL. Thus both the content and process of the module was problem-based learning. The teams met once a week for fourteen weeks. This research is based on all of the dialogue, of the full set of tutorials for two teams. Pseudonyms were given to these PBL students.

Methodology of the study

Interpretivism was the paradigm and methodology for this study. Understanding is the goal of interpretivism and the goal of this chapter is to understand how students talked about the problem and to learn from this understanding. Interpretivism seeks to understand the complex world of experience from the perspectives of the participants and this chapter is about students' perspectives of PBL. Robson explains the underlying principles of

interpretivism in terms of understanding the nature of people who are the subject matter of the social sciences:

People, unlike the objects of the natural world are conscious, purposive actors who have ideas about their world and attach meaning to what is going on around them. In particular, their behaviour depends crucially on these ideas and meanings. (Robson 2002, 24)

This central characteristic of humans has implications for doing research involving them. Their behaviour what they actually do, has to be interpreted in the light of these underlying ideas, meanings and motivations. From an interpretive epistemological position knowledge is seen as “interpretation, meaning and illumination” in contrast with a positivist epistemological position from which knowledge is seen as “generalisation, prediction and control” (Usher 1996, 18).

The formulation of the concept of the problem as a provoker of a liminal space began by identifying and exploring interpretive repertoires of how each team talked about the PBL process in the discourse of the module. Willig clarifies that the concept of interpretive repertoires are used by a range of discourse analysts:

to construct alternative, and often contradictory, versions of events. Discourse analysts have identified conflicting repertoires within participants talk about one and the same topic. (Willig 2001, 95)

This first level of analysis was informed by a critical discourse analysis approach. Discourse analysis involves finding patterns and proposing interpretations of the patterns together with accounts of the meanings and ideological significance of these patterns (Cameron 2001). Critical discourse analysis (CDA) makes use of systemic linguistics, continental pragmatics and cross-disciplinary trends “but attempts to go beyond them in providing a synthesis of necessary theoretical concepts and analytical frameworks for doing critical analysis.” (Fairclough 2001, 11). The Skelligs team talked about the problem in terms of “professional development” versus “personal development” and in so doing talked about different forms of knowledge,

different ways of knowing and different ways of acting professionally. The Glendalough team talked about the problem in terms of the problem being “about them” versus the problem being “about us”. In talking about the problem, they were also talking about issues of identity. When I presented my analysis of these themes back to participants at two participant validation sessions they both confirmed and augmented my interpretation of how they talked about the problem. They talked about this both in terms of experiencing working on problems as students and in making connections with this and using problems with their own students. Then analysing the interpretive repertoires of how participants talked about the problem across both teams, and listening to the discussion at the participant validation sessions, I formulated the concept of a problem as a provoker of a liminal space to describe and analyse participants’ talk about the problem. Jackson and Shaw highlight the fundamental nature of concepts:

Concepts are essential to advancing understanding and the development of practice. We create them as we understand and organise our environment and our place within it and we organise our environment and practice through developing our concepts. Because of this a concept is simultaneously the representation of a reality and the expression of an intention, a generalisation from experience and a hypothesis from which future experience might be predicted. (Bolton 1977). Concepts permit us to make sense of the world and apply this sense making to new contexts and circumstances. This is the power of concepts... (Jackson & Shaw 2002, 1).

The following figure summarises how the concept of a problem as a provoker of liminal space was formulated from how participants talked about the problem.

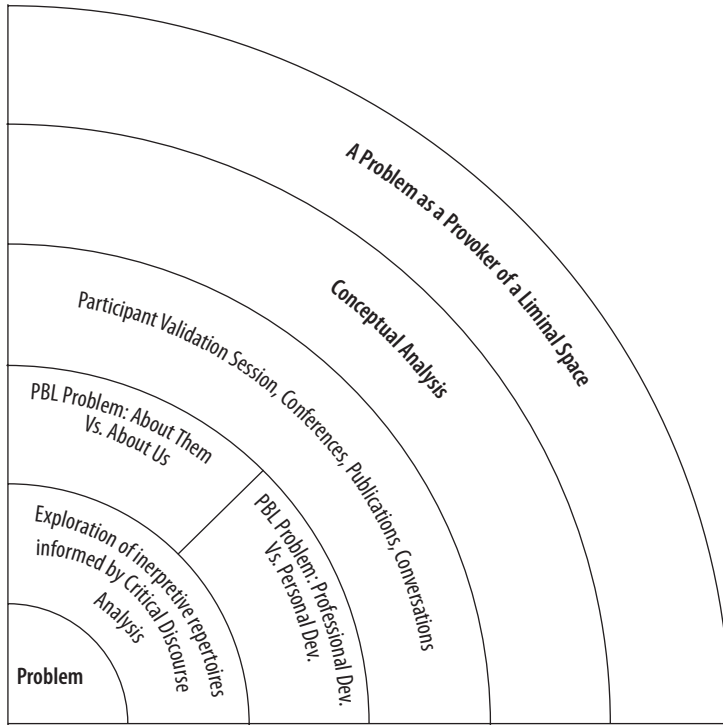


FIGURE 1. Formulation of the Concept of a Problem as a Liminal Space

The concept of a problem as a provoker of liminal space

The concept of a liminal space captures the “betwixt and between” state (Turner 1969) that the PBL problem provokes. The origin of the concept of liminal space is from social anthropology, where it was originally used to describe the space between one state and another as in the space between boyhood and manhood. The concept of liminal space derives from the latin word *limen*, meaning threshold or boundary (Meyer & Land 2003).

The PBL problems in this study provoked liminal spaces between current levels of knowing and new levels of knowing, established ways of thinking

and fresh ways of thinking, satisfaction with current identities and a desire to explore other possible identities, habitual forms of professional action and forms of professional action new to the learner. It is argued that the participants of this study were in a particular liminal space also because as lecturers who were problem-based learners they are betwixt and between the roles of teacher and student. The following figure illustrates my visualisation of the concept of the problem as a provoker of a liminal space.

This chapter focuses on one dimension of these liminal spaces—the knowledge dimension. The other two dimensions of the liminal space that PBL problems triggered as reflected by the language-in-use of the participants is discussed elsewhere (Barrett forthcoming). This chapter thus explores the connections between problems and liminality by discussing the linguistic forms and the functions of these linguistic forms that participants used in

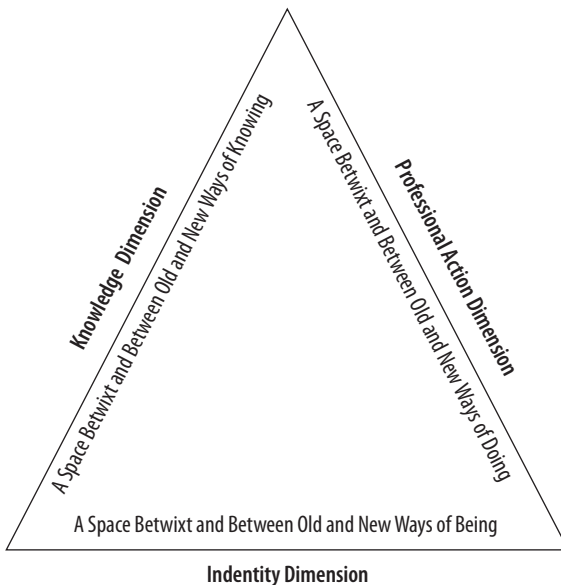


FIGURE 2. Three Dimensions of the Problem as a Provoker of a Liminal Space

their talk about the problem. I thus take up the challenge by Meyer and Land (2005, 380) who argue that: “the connection between liminality, creativity and problem-solving would also merit further enquiry”.

The space between old and new ways of knowing

The problems in this PBL module appeared to have created liminal spaces where the knowledge required for working on them was not obvious and straightforward but unclear and troublesome. The language-in-use quoted in this chapter illustrates how students could not have resolved the problem with their existing level of knowledge. The only way of resolving the problem was for students to acquire new knowledge in order to reconceptualise the problem and resolve it. Furthermore, problem-based learning offered participants ways of learning that combined professional development with personal development explicitly in integrated rather than disjointed way of knowing. Sometimes participants talked about a gap in their personal knowledge of knowing “that” or knowing “about” (to use their words) as they named what they needed to learn in order to work on the problem. I agree with Eraut (1994) that this should be considered as lacunae in their personal knowledge rather than propositional knowledge as these students developed “some constructs, perspectives and frames of reference which were “essentially personal even if they have been influenced by public concepts and ideas circulating in their community” (Eraut 1994, 106).

However sometimes process knowledge of the “know how” of specific skills was also required to work on a problem as in when students developed their process knowledge in terms of teamwork skills, information literacy skills and presentation skills in order to work on a problem. In the language-in-use the students also talked about a third type of “self” knowledge (their word) that they developed in terms of the greater self- awareness developing as they worked on a problem.

The students talked about the different aspects of this knowledge dimension of the problem as a provoker of a liminal space: in their talk in the PBL tutorials about their experiences of problems they worked on as PBL students, in their talk of designing problems for a module for nursing and management students as they worked on the first problem, and in their talk in the participant validation sessions as they made links between these contexts and designing and using problems in their own teaching situations.

Firstly, I focus on how they talked about the problems they worked on as PBL students. The participants in the study I conducted were conscious that they knew something “about PBL” but that they had to know more to work on the problems about problem-based learning. “The Professional Body Has Spoken” was the first problem that both teams worked on. IBEC (Irish Business and Employers Confederation) is the Irish national organisation for employers in Ireland. I give the full text of the problem, as it is important in order to understand the intertextuality as participants talked in the tutorials about specific words and sentences in this text.

The problem: The Professional Body has Spoken

Your professional body has come up with guidelines for preparing the professional of the future. They want people with specialist knowledge. However they emphasise that they want people who will not only continue to develop their technical skills but who will also continue to develop their communication, problem-solving, learning to learn and teamwork skills. Your institution’s strategic plan has an underlying theme of the promotion of the capacity to learn and reason, and of learning skills, as being of greater importance than the changing nature of learning content. Other colleges have also emphasised the importance of developing key skills. IBEC, have repeatedly stressed that employers are looking for graduates with key skills (e.g. communications, problem-solving, learning to learn. and teamwork) in addition to technical skills.

Your course is redesigning a total programme using a Problem-based learning approach. You are requested to redesign your module using a PBL approach to enable graduates to develop these attributes. Your

module descriptor and evaluation plan are due in on 22 October for a team meeting.

You have also been asked to give a 20 minute presentation on your module descriptor, the problem(s), the assessment strategies and your plan for evaluating the module at this meeting.

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When the Glendalough team were discussing “The Professional Body has Spoken” problem, which was a problem about problem-based learning, Noel a member of this team remarked:

But the only thing is that we don't know that much about PBL, we are part of the kernel, not the whole kernel.

Noel realised that he knew something about PBL but that he did not know “that much” about PBL and that he did not know enough about PBL to work on and resolve the problem. He realised that he needed to acquire more personal knowledge. He needed to find out more “about PBL”. Noel perceived that working on a the “Professional Body Has Spoken “ problem (that they contextualised in terms of a human resource management module) involved naming the space between prior knowledge and the new knowledge required to work on the problem as he said:

One of the big things is we organize prior knowledge, what do we know about it, I suppose to some extent what do we know about this interview with human resource management and then, to, eh to identify the areas that we know nothing about.

Kate in the Glendalough team was aware that not only did they need new personal knowledge but they also needed process knowledge:

Kate: We now believe that we don't know that, we don't know how (laughter).

Mary: We are creatively lost.

While working on the first problem, Sue developed her “know how” of teamwork skills and her ability to relinquish individual control:

Sue: I have learnt a lot about teamwork.....Can I let go a little bit more, yes I can.

Working on this PBL problem prompted Kate to move from her current level of teamwork skills to new levels of teamwork skills. This is important in terms of Eraut’s (1994) argument that the area of learning to work effectively in teams is often inadequate in professional education. He defines this type of process knowledge as “essentially knowledge of how to do things and how to get things done” (Eraut (1994, 93).

For the students in this study the problem prompted a space for the development of a third type of knowledge, a “self-knowledge”. Kate discussed how working on the two problems in the module has increased her self-awareness, her ability to reflect on her own actions. Towards the end of the module she said:

Kate: It has been the big difference to my didactic form of teaching and now learning about problem-based learning, reflection. If something didn’t go well for me in a didactic lecture, it fell flat but I probably moved on to the next lecture. This process, it’s forcing me to reflect on my own teaching and on my ability to work in a group.

Working on the problems has prompted Kate to become aware of her tacit knowledge (Schön 1987) about her own teaching and on her abilities to work in a group and to subject both to critical scrutiny.

Secondly, I focus on their talk about working on “The Professional Body Has Spoken” problem that involved them designing problems for a module for other students. When participants encountered the problem “The Professional Body Has Spoken” they experienced a liminal state: a state between the old way of knowing and the new way of knowing.

The students in the Skelligs team were in the process of debating what the problem was about. As well as engaging in problem-definition they were also following up the invitation they have been given in the PBL process guide

to rewrite the problem according to the contextual realities of one or more members of the team. They chose to rewrite the problem in terms of the context of a module on professional and personal development on a nursing programme that one of the participants was teaching on. They also later decided that other participants could adapt this module in their contexts. In the following extract the Skelligs team was talking about designing problems for a module on professional and personal development for nursing students.

Maura: *Could we take a section on professional development that might be generic?*

Michael: *Yeah.*

Joseph: *But there is an issue there, I am hearing two words, you said personal and professional development, my huge question has been for years is what is the relationship between those two?*

Hanora: *Yes, why are they lumped together?*

Joseph: *Or are they lumped together, I tend to think that they are. The way we (inaudible) ... into personal, the way we learn how we interact. But to what extent are we taking that on board. I don't think. I would want to explore that. I suppose my question is then how does it relate to our problem. Because you see, here is my problem I was thinking about this on the way down, if this is very much skill based, okay. You are talking about the relationship between personal and professional development, which I think goes into other areas like attitude, you were talking about snobbery and stuff like that. So how do we bring in something which I think goes beyond skills but yet still is skills.*

Joan: *Can we pose that as our problem, wouldn't that be a good problem... Is there a difference between personal and professional development. as they go through the course?*

Betty: *Isn't personal not characterised in professional, within a professional setting its how you conduct yourself within a professional setting, its context.*

Hanora: *That is it, that is it. Yeah, I personally... (laughter) ... I don't think we can, for me I can't separate the two because I have seen a huge leap for me on a personal level and I have brought that, how I have*

developed as a person in relation to my life long learning techniques. I know I have developed in my critiquing ability or my reflective ability, which has been huge for me lately. And I am so glad that I was, that part of the course was there for me. And I have been able to bring that without, consciously into my job because I can maybe see things in a different light and say hang on, I am not too happy. I am no longer so accepting because somebody has helped me develop a lateral vision. And I can now look at things, I am not afraid to maybe think laterally and confront if that is what it is. If you have to confront. The course for me personally has gone right into the professional development and maybe that is why in this particular area of nursing that you can't separate the two of them. Maybe in other areas you can, but here they are married together. I think they are incredibly good, because the person in this context does refer to me, impinge on how people develop and progress and behave professionally. That is how I feel, that inner personal strength.

Betty: I think you mentioned something that is quite important, it's that inner concept of themselves. I think that is really, really important in any, in architecture, in design. Where you know the processes you work through, you know how you get on with people or not. And being able to counter that or to be able to see yourself within that context is very important.

The problem has provoked them to explore the liminal space of the space between what they already know about professional and personal development individually and new levels of personal knowledge that can be achieved through sharing their existing knowledge and seeking new knowledge. They were drawing on their prior knowledge of their professional experience of teaching different disciplines and their experience of their own professional development.

The major theme of how the Skelligs team talked about the problem was in terms of the interpretive repertoire: "Problem: Professional Development versus Personal Development." They talked about this in terms of seeing them as different and separate and in terms of seeing them as integrated. The participants were constructing their own meaning as they committed themselves to varying degrees to different definitions of the problem through

making links and asking questions about the interaction between their prior knowledge and the current PBL problem:

If I had to reduce all of educational psychology to just one principle, I would say this: the most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly. (Ausubel, 1968, vi)

The participants were linking their prior knowledge to the problem, clarifying what they already know, and what they do not know. The problem had prompted a liminal space between old ways of knowing and new ways of knowing. The problem made them more conscious of their current knowledge of what professional and personal development is. They were also increasing their level of knowledge by benefiting from other participants' prior knowledge. It was also a liminal space in the sense that they were in an in-between space in terms of seeing professional and personal development as integrated and working out how to action that integration more in their teaching with the nursing students and their own students compared to their current existing situations.

The participants of the Skelligs team were designing problems for a PBL module on professional and personal development for a nursing module. They considered that the problems would help the students develop "skills", develop their "knowing how" (to use their words). These problems will prompt students to move from their current level of skills to new skills levels. They also argued that the problems they were designing for this module will also go "beyond skills" to develop "that inner personal strength", "that inner concept of themselves". Skills are not merely a question of technical know-how but involve the integration of personal knowledge and the embedding of appropriate attitudes.

Betty considered that curricula should provide spaces for engagement with "the inner concept of themselves". She argued that curricula in professional education should also be about self-awareness, self-development, and management of self. She said:

I think you mentioned something that is quite important, it's that inner concept of themselves. I think that is really, really, important in any, in architecture, in design. Where you know the processes you work through, you know how you get on with people or not. And being able to counter that or to be able to see yourself within that context is very important.

She argued that it is important that higher education should focus on enabling students to develop their sense of self, the space to become and know who they are. Key elements to this is being aware of how they present themselves in their everyday working life to others and of what is happening when they are getting on or not getting on with people. She argued that students should not just learn specific work processes but should know these work processes in such a way as to be able to adapt them to their personal styles.

Eraut has highlighted the metaprocess of being aware of and directing one's own behaviour as a key kind of process knowledge:

The term 'metaprocess' is used to describe the thinking involved in directing one's own behaviour and controlling one's engagement in ...processes... Its central features are self-knowledge and self-management, so it includes the organisation of one-self and one's time, the selection of activities, the management of one's learning and thinking and the general maintenance of a metaevaluative framework for judging the import and significance of one's actions. (Eraut 1994, 115).

They considered that the new knowledge that will be prompted by the problems in this module would provoke the students to move from their current levels of process and self- knowledge to new levels of process and self- knowledge.

In addition to talking about problems in PBL tutorials and in relation to writing problems in response to "The Professional Body Has Spoken" students also talked about PBL problems at the participant validation sessions. At the participant validation discussion the Skelligs team confirmed that the theme of professional and personal development was an important theme of how they talked about the problem in the dialogues of the education de-

velopment module and that it is still an important theme in their work as teachers. Maura saw personal and professional development as difficult to separate in terms of their student experience:

As adult learners we are coming with a certain amount of baggage and experience and you know it is hard to separate the two, professional development and personal development.

They talked about how this debate of professional development and personal development was still being worked through in their practice and has been influenced by their experience of the PBL module. Beatrice elaborated:

I think a lot of the time design courses have been very directive. A lot of the time you would see the hand of the tutor all over the work...I'm sure it happens with writing and theses. Having been through that system myself, I don't think it has the interests of the student at heart, it has the interest of the tutor at heart... And you made the point further down that what people are most interested in is themselves and their personal development. And, eh, I think that is true. That's another part of it you actually give it over to the students and let them....

Beatrice talked about using ill-structured open-ended PBL problems with her design students in a way that gave them space to become more self-aware and to develop their own style rather than imitating the tutor's style.

The knowledge dimension of the experience of the problem as a provoker of a liminal space was about a betwixt and between state between prior knowledge and new knowledge, between old and new ways of knowing in terms of personal knowledge, process knowledge and self-knowledge. These knowledge dimensions of problems as provokers of liminal spaces were talked about by the participants, in terms of three interrelated contexts experiencing problems as PBL students, designing problems in response to "The Professional Body Has Spoken" and using problems as teachers in their own situations.

Conclusion and implications for practice

Gijsselaers (2005) challenges us to locate the nature of the problems we use in our PBL practice from contrived to authentic. I argue that in order to maximise the potential of PBL as a bridge between education and work and to exploit the knowledge, professional development and identity dimensions of problems then we must design problems that are at the far end of the authentic side of the contrived-authentic spectrum of problems. Well-designed problems are keys to maximising the learning potential of problem-based learning (Gijsselaers & Schmidt 1990; Schmidt & Moust 2000). This chapter highlights major areas where problems conceptualised as liminal spaces have implications for practice; namely: the design of problems, using problems from and/ or in the workplace and PBL education development.

In relation to problem design there are three issues; 1) writing problems where the problem links with prior knowledge but demand new knowledge to resolve it, 2) designing problems that integrate professional and personal development, 3) having the size of problems big enough and their style real-life so as to prompt professional action. In terms of the problem as a liminal space betwixt and between old and new ways of knowing it is important to design problems where the learner can make links between the problem and their prior knowledge but also where they are challenged to acquire new knowledge without which they cannot work towards resolving the problem. Part of this is writing problems where the problem definition itself is not obvious and evident but searching and debatable. This sets up antithetical patterns of dialogue where knowledge about what the problem is about is generated.

One of the ways of knowing is to integrate professional and personal development. I would assert that one of the things that people are most interested in is themselves and their personal development. Problems that deliberately combine personal and professional development mean that participants are getting two for the price of one. One of the values of well-designed PBL problems is that they combine professional development with

personal development in ways that instil a high level of engagement of participants with the problem.

My study suggests that in some situations larger problems that allow students to work on problems over longer lengths of time with the size of the problem real-life nature and the timescale mirroring the work place may capitalise more fully on the professional action dimension of this liminal space and the potential for learning from problems. In the module of this study only two big problems were used for a fourteen -week module. This stimulated some participants to move from using smaller problems to using larger problems with their own students. This is in the context of the more common practice of using smaller problems in PBL, for shorter time durations e.g. one problem lasting two weeks. PBL problems were originally seen as a way of bringing professional practice into classrooms of higher education. I think the challenge of the current wave of problem-based learning is to creatively find ways of writing problems that demand action in the workplace. The professional action dimension of the liminal space in terms of moving people on from habitual forms of professional action to forms of professional action new to them is the major aims of problem-based learning. This is important when the future direction of PBL appears to be developing PBL in workplaces not just institutes of higher education. Exploring the professional action dimension of problems will help us to maximise their potential to bridge work and education, provided we have traffic going in both directions on the bridge. Using problems from and/or in the workplace as a basis for situated expansive action learning in a way that demands professional action as well as reasoning is a way of maximising the professional development dimension of problems as a liminal space for learning.

The implications for the concept of problems as provokers of liminal spaces is the realisation that some effective PBL education development is in fact about deliberately putting lecturers in a major liminal space of being PBL students thereby encouraging new ways of knowing, being and acting. I was doing this somewhat sub-consciously previously in my various educational roles but I would now do it with a focused intentionality. An understanding of the knowledge, dimension of problems as provokers of liminal

spaces highlights the importance of education development initiatives on problem writing aimed at maximising their potential for learning.

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DECONSTRUCTING CONCEPTIONS OF PROBLEM-BASED LEARNING

From Plato, and throughout the classical age, there has been a tradition in which knowledge is perceived as a hunt: “To know is to put to death [...] To know is to kill, to rely on death [...] The reason of the strongest is reason by itself. Western Man is a wolf of science.” (Serres 1983, 198.)

This article is based on an ongoing dialogue between the two writers. Jyri Lindén is interested in theoretical curriculum issues in problem-based learning, while Merja Alanko-Turunen has studied the discursive resources business students drew on while constructing a PBL tutorial site. A recurring topic in these dialogues has been the discourses the PBL rhetorical community draws on when constructing the concept of PBL: what is reconstructed and what is silenced in these negotiations of PBL? This article aims to offer some tentative answers to these questions by critically examining the theoretical basis and construction of the problem-based learning curriculum.

It has been argued on numerous occasions that problem-based learning is one of the most important pedagogical innovations in higher education in recent decades or even of the 20th century (e.g. Boud & Feletti 1977; Boud 2006). Even though PBL has gained popularity worldwide among faculties of medicine, engineering, business and nursing, there are universities and eminent researchers who are, in one way or another, trying to disassociate themselves from the mere concept of problem-based learning despite having been strongly involved in its development (e.g. Boud 2006). They are not denying its role as an effective approach to studies, but prefer using other concepts or terms to describe learner-centred learning environments. Furthermore, there are a number of social actors within problem-based learning taking different stances towards PBL's theoretical underpinnings, but they nevertheless represent what could be called a rhetorical community, sharing a general vision of PBL, albeit a vision that contains diverse ideological and procedural assumptions (Savin-Baden 2003; cf. Sipos-Zackrisson 1999, 4). The concept of the PBL curriculum seems to have lost its credibility as a logical theoretical framework. Some researchers have persistently tried to sustain the construction of PBL by focusing on the practical development of the curriculum.

We understand these signals to indicate that an intervention is needed to challenge and deconstruct conceptions of PBL in order to be able to argue more convincingly about its role and background, and position it among other pedagogical approaches. We are writing this article from a moderate critical perspective, and our position and values influence our choice of material and how we represent it. These dilemmas are the starting points of this article in which we wish to critically scrutinise and deconstruct conceptualisations of PBL in general, and current thinking about the PBL curriculum in particular. The idea of decontextualisation is based on a certain understanding of the PBL curriculum. We see it as a construction, a continuum where each theoretical explanation has been part of its discursive formation. By using the term deconstruction in this context, we do not suggest a profound analysis of discourse practices, but refer rather to the idea of decontextualising the dominant concepts. As Benno Galuser (1997, 151) puts

it, “[T]he importance of deconstruction lies in trying to find out what lies behind and at the origin of the concepts currently dominant. It means trying to answer questions such as: to what do the terms used refer; how were they generated; in response to what problems and issues did they arise; and whose interests and needs do they serve?” We aim to be cautious in our efforts to deconstruct conceptions of PBL since there are internal contradictions and ambiguities in every story and text.

This article deals with three main ideas with regard to thinking about the PBL curriculum. First, we reflect on and open up some of the discussions associated with the problem-based curriculum. The idea is to take a brief look at the general thinking and theoretical approach behind the problem-based learning curriculum. In addition, we also support the argument that the theoretical positioning of the curriculum has been somewhat random and partly purpose-oriented.

The second part of the article focuses on the relationship between PBL, the curriculum and the narratives of learning. We suggest that curriculum theorisation combines metaphors of constructivist and humanistic theories of learning in an appealing way. This has led to an ideological conflict that has consequences at the practical level of the curriculum. Moreover, the current practical conception of the curriculum appears to transform the disputed idea that learning processes are controllable. PBL curriculum theorisation has been contextualised closely to the narratives of constructivist theories of learning. Practically speaking, the ideal has been an autonomous learner who constructs her own knowledge. In the past few years, however, there has been considerable debate about these root metaphors of constructivism. This critique is targeted mainly at the ideology of constructivist theories about learning. The reason, however, that we outline this critique shortly, is that it is vital for future argumentation regarding the philosophical roots of PBL.

Finally, the last section of this paper considers the ways in which the current contextualisation affects the future development of PBL. The interpretation of PBL which frames the practical implementation of the PBL curriculum determines the extent to which PBL can be understood either as

a technical method (almost as an eclectic practice), a critical emancipator pedagogy, or a means of furthering the oppression it has led to in some educational contexts (e.g. Conway & Little 2001).

What is the curriculum anyway?

The current research tendency has been to compare PBL curricula with conventional curricula. These studies have been criticised strongly as they seem to assume that there is such a thing as blind intervention. The truth of the matter is that it is impossible to attribute the success or failure of a curriculum exclusively to the intervention. In these studies the focus has been on whether PBL works in terms of end-goals, but the underlying theoretical underpinnings of PBL curricula are rarely addressed (e.g. Dolmans, de Grave, Wolfhagen & van der Vleuten 2005). Furthermore, in various discussions of PBL, the interests of the world of work and the employability of the student are foregrounded when arguing for the implementation of PBL curricula. The value of institutions and the education they provide are mostly based on the competencies they produce. These competencies are increasingly determined by global corporate markets, and they are represented by the needs of local and global working environments. The demands of the world of work have been described in such a way that it is no longer sufficient for a graduated student to have knowledge of an academic subject; more important are those skills which enhance her prospects of employment. Employability skills are understood as employers' preferences regarding employee values, attitudes, personality and other personal qualities. The powerful role of industries in curriculum planning has raised questions, but nevertheless representatives from the world of work on various curriculum advisory boards (especially in professional education contexts such as business, engineering and architecture) have gained a very important role and claim to have privileged insight which qualifies them to pronounce upon a broad range of educational issues. These notions effectively reveal how education has become

transformed into an industry, and curricula are seen as commodities to be compared in a straightforward manner. Additionally, the combined effect of competition and performativity is turning educational processes into a matter of economic efficiency, rather than a matter of building societies (see e.g. Autio 2003).

The concept of the PBL curriculum has, in essence, been based on the idea that the curriculum is a practical solution to the issues of learning and teaching. In order for a curriculum to be described as a PBL curriculum, it has had to meet certain standards. The division between a PBL and a non-PBL curriculum (or standard curriculum) has been clear and it has been made even clearer by published comparative analyses and meta-analyses. The result of this has been that institutions have focused on meeting practical demands in order to show that they are doing things right. They have wanted to believe that if the practical circumstances comply with those described in publications or in some other PBL institutions, results are guaranteed. The division between PBL and non-PBL curricula is based on the idea that the curriculum can be separated from the context of an educational institution. From this perspective the curriculum is seen as a surface, a practical layer that links goals and orientations to learning processes. Above all, the curriculum is seen as a transferable tool which can basically be copied from one institution to another.

This way of thinking about curricula is heavily critiqued by many recent curriculum theorists. As suggested by Reid (1978), Kelly (2004, 21), and Pinar (2004), the curriculum actually has a moral rather than a technical basis. In order to understand the curriculum thoroughly, we need to keep in mind that education is more than instruction or even more than individuals' or groups' learning situations and their circumstances. What curricula at all levels actually do, this also being the justification of this approach, is collect and forward the moral, ethical, political and cultural atmosphere of society and reveal their connections with social autobiography and national identity. Through these elements they actually determine how and what to teach. (Värri & Ropo 2004, 58; Pinar 2004, 2.)

The theoretical positioning of PBL – anything seems to go?

Instead of basing an educational approach on just one philosophical theory of learning, we argue that it has become acceptable for institutions to take whatever set of educational theories seems to suit them best. It was interesting to discover that Harold Barrows (2000, viii) claimed that neither the work of Dewey, Bruner, nor Gagne inspired him in the development of PBL. He argued that the introduction of the idea of small groups working with a series of problems was practice-related, and that the pioneers at McMasters University were not guided by educational psychology or cognitive science. It was only after a few years of implementing the programme that they started to study the outcomes of their approach and to relate it to other educational methods and conceptions. It was only at this phase that the understanding and development of problem-based learning required a positioning of the approach within theoretical educational discussions.

Problem-based learning was first grounded in modern cognitive psychology theory which suggests that learning is a constructive, not a receptive process, in which the learner actively constructs new knowledge on the basis of current knowledge. Information-processing theory, especially, was said to underlie PBL (Schmidt 1983). Cognitive psychology is based strongly on a positivist research paradigm and, as is well-known, the origins of problem-based learning lie in medicine, which is also very positivist-orientated. It is for this reason that the cognitive perspective has dominated the early years of theorising problem-based learning, emphasising the role of the individual as a knowledge acquirer and problem-solver.

Despite all the theoretical research undertaken by educational scientists, the conceptualisation of educational psychology has maintained its position in the mainstream of the PBL curriculum. The focus on the practical issues of curriculum organising has also set the limits on theorising. While there have been numerous attempts to conceptualise the curriculum, these theories have been shaped to follow the guidelines of “good practice”. An example of this is Ralph Tyler’s (1949) curriculum rationale. Without further theoretical analyses, his conceptualisation of curriculum planning around

goals, educational experiences, their organisation and evaluation has been rediscovered as the framework of practical PBL curriculum planning. However, the Tyler rationale has its roots in theories of scientific management and behaviourism, and is in fact ideologically at variance with humanist and constructivist curriculum ideas (see e.g. Autio 2002; Kliebard 1995). In the context of the PBL curriculum this seems not to be an issue, as long as the model fits the practical orientation of the current curriculum.

As PBL was first introduced in medical education, it is important to explore how PBL has been challenged in that field. Some critical notions about PBL have been voiced in medical education, especially with regard to its cognitive emphasis. It has been seen as strengthening instrumental rationality in the encounters between medical practitioners and patients. Medicine is reduced to a task-orientated endeavour: to query and to examine a patient in order to determine the diagnosis. In the name of efficiency no room is given for value-orientated action. The interrogatory stance adopted in PBL is said to present the medical practitioner's world as the real world and the narrative told by the patient is less important (e.g. Yamada & Maskarinec 2003; Milligan 1999). Accordingly, Charlotte Silén (2000, 40–41) underlines the idea that learning should not be reduced to mere problem-solving taking place in the human mind which is what the cognitive perspective seems to emphasise. The social contexts of learning and the pragmatic aspects of group interactions were often side-stepped in studies of problem-based learning (e.g. Hmelo & Evensen 2000).

Grand narratives of the PBL curriculum

Problem-based learning forms an appealing mixture of student-oriented and motivating goals connected to new type of constructivist curriculum thinking. This is probably why it rapidly gained popularity among educational institutions. Despite the somewhat loose educational theory during the early years of implementation, the general objectives of PBL curricula

were set high. In addition to forming deeper understanding of subject matter, goals such as self-directed learning, emancipation, critical thinking, reflective thinking, and acquisition of information were all added to the curricula. The origins of these goals were two-fold. On the one hand, they were promoted by corporate institutions that demanded new qualifications from their employees. On the other, cognitive research on student motivation and meaningful learning, pinpointed the importance of these general objectives. To teachers and curriculum planners this was somewhat confusing because meeting the objectives required a totally new approach to the curriculum. To find a scientific basis for the curriculum, sometimes at the expense of subject matter, curriculum planners and researchers began to stress the humanistic aspects of learning and instruction. Theoretically, this meant attaching the narratives of humanistic psychology and experiential learning to the constructivist core of the curriculum. For example, the group process and forms of self-evaluation, open-ended problems and the tutor's work as a facilitator were highlighted and brought to the practical process of curriculum planning.

The implementation of humanistic values into curriculum planning processes caused a conflict in both students' orientations and curriculum practices. Many institutions reported serious cultural difficulties and resistance. The inclusion of humanistic values in curriculum planning also confused many teachers, revealing curriculum issues that had previously been hidden. Although progress seemed rather promising at first, there was considerable debate about PBL students' content knowledge. For example Jerry A. Colliver (2000) argued that a review of the literature, mainly in medicine, revealed no convincing evidence that a PBL curriculum improves a student's knowledge base or clinical performance. The reason for this disappointing conclusion, he stated, was not only in the debatable effectiveness of PBL, but in the loose educational theory that provided very little scientific background to support curriculum formation. The reaction to these accusations was to connect the PBL curriculum more tightly to ongoing constructivist theorisation (e.g. Norman & Schmitd 2000).

What is, then, the problem with this mainstream constructivist orientation mixed with humanistic premises? Humanistic and constructivist curriculum theorisations are based on very different philosophical assumptions. However, this level of the curriculum is often hidden because of the practical orientation of curriculum development. It is partly this foundational difference, we argue, that makes curriculum theorisation somewhat confusing.

Practical curriculum development seems to form a pattern as far as orientation is concerned. It usually begins by emphasising identity construction, students' own interests and open-ended goals. However, after some time, the students usually demand a return to the old system, teachers report that exam results are worse and there are general questions about an increased need for resources. As a result, the practices tend to move towards more controllable studies, problems with one right answer, and equal objectives. After this process, the curriculum has echoes of rationalism with a strong emphasis on social control. In many institutions, this has meant returning to the traditional culture, with the exception that now the structure of the curriculum seems different. As a result, instead of developing the curriculum on a new basis, there is a pressure to adhere to the appearances of a PBL curriculum. There is a danger, therefore, that the curriculum becomes unconvincing to both students and teachers.

There have been great expectations that PBL curricula would solve problems, mainly concerning students' motivation and theoretical understanding. What is perhaps common to most of these curricula is the belief that these problems can be sorted out by constructing a curriculum according to scientific theorisations and practical findings. This work has proved endless and exhausting, especially to teachers. In addition, and perhaps most importantly, this paradigm has left very little room for alternative contextualisations of the curriculum.

To conclude, the curriculum as prescription ideology values mechanistic development over ideological considerations. It promotes the kind of thinking in which an institution is always two steps behind as far as practical development is concerned. Teachers and curriculum developers seem to think that almost every problem in student learning can be fixed by making

certain, well aimed changes in a curriculum. Not only does this orientation make the curriculum work exhausting for teachers and students, but it also promotes the idea that learning processes are controllable. As Ivor Goodson (1990, 299) argues, this view of the curriculum develops from a belief that we can dispassionately define the main ingredients of the course and then cover them systematically.

The disputed promises of constructivism

PBL has recently been positioned within several genres of constructivist learning: the socio-constructivist perspective (e.g. Raucant, Galand, Frenay, Laloux, Milgrom, Vander Borghet & Wouters 2005), the situated learning framework (Hung 2002), and in Vygotsky's sociocultural framework (Harland 2003; Loftus & Higgs 2003). What is perhaps shared by all these contextualisations is their overall approach to theorisation. This theorisation can be called theory as idealised practice. People involved in curriculum design "think up ways in which the existing goals of practice could be more effectively attained. The theories produced are inspirational and represent a kind of thought experiment" (Reid 1978, 17). They are based on "good practices" and use benchmarking to find out "what works". But, as has been noted and reported by numerous institutions, the curriculum in practice has its own logic, which is highly situational. Students and their orientations differ, institutions differ and cultures vary. As Reid (1978, 17) puts it: "It is hardly surprising that inspirational prescriptions often turn out badly and fail to provide suitable guides for action."

Generally speaking, PBL became fully acceptable to curriculum planners when it was rooted in the metaphors of constructivist theories of learning. This can be described as a process of reconstruction, where practices and theory were mixed together with the premises and starting points of cognitive psychology, rationalistic curriculum thinking, and instrumental goals of education. Constructivist theories of learning neatly match the practices

of PBL, since they promote the student's individual knowledge construction and simultaneously accept an individual and active learner as the implicit goal. Many PBL curriculum planners shared the vision of an ideal educated person¹ promoted by constructivism. She is an independent and critical individual, ready for the international labour market, an enterprising soul, who takes responsibility for her own competence. Needless to say, this ideal was readily accepted by heads of departments and educational policy makers. The shared vision also connected companies, governmental and educational institutions. They all seemed to share these educational goals based on a post-modern view of citizenship. PBL seemed like an ideal solution for turning this educational thinking into reality.

C.A. Bowers (2005) argues that constructivist theories of learning make false promises regarding students' own knowledge construction and autonomy.

“And how can students be expected to construct their own knowledge and thus emancipate themselves so that they can become autonomous individuals when they are exposed to a constant barrage of media messages scientifically engineered to influence the deepest levels of their consciousness and self-identity? The tragedy is simply being compounded by encouraging students to think they are constructing their own ideas, meanings, and identity when this rootless form of individualism is exactly what serves the interests of promoters of consumerism. Students may learn to think critically about aspects of their world, but they are not likely to understand that their own subjectively limited knowledge and lack of skills will not provide a real basis for resisting the forces of consumerism and environmental destruction.” (Bowers 2005, 54)

¹ For example, Dave S. Knowlton (2003, 6) argues: “Namely, students cannot meet the basic criteria of ‘an educated person’ unless they are adept at managing and solving problems. From this statement emerges an allied mandate to faculty members in higher education: Professors must engage students in PBL because to ignore problem-solving skills is to undermine the academy’s responsibility to develop educated individuals.”

Every institution has a body of culturally important knowledge that it tries to transfer to the students. The PBL curriculum, like all curricula, as a cultural continuum includes a moral code hidden within its metaphors and structures. As Bowers points out, there is a danger that the constructivist metaphor of an autonomous learner separates students from this ongoing cultural idea and leaves them alone with their identity work. At the same time, teachers distanced from their previous relations with students will not be able to help them to recognise the boundaries of their knowledge. By highlighting an autonomous and independent learner as the ideal of the curriculum, PBL can promote the same kind of individual knowledge construction.

Simultaneously, the humanistic aspects of the curriculum may boost the illusion of doing better without the cultural and historical background. There is a danger of students losing their abilities to recognise the location of the moral and social basis of their professional identity. Bowers calls this a paradox of the constructivist theories of learning. For all the promises of constructivism, young people do not seem to be becoming more aware, more responsible and free, but more dependent on consumerism and markets. Instead of opening up to outside influences as autonomous actors, they have turned inside, towards individualism and towards their own bodies.

From deconstruction to reconstruction – two possible futures

How are these examples regarding the theoretical basis of the PBL curriculum related to curriculum work in practice? In other words, what is the practical relevance of this kind of deconstruction? It has been apparent that implementing PBL without thinking about its basis has led to difficulties regarding the depth of students' learning. Students seem to work hard, but many teachers are convinced that their content knowledge is below the average. There seems to be a paradoxical situation as far as learning results are concerned. Curriculum thinking based on theory as idealised practice

and the ability to control students' learning processes seem to produce superficial knowledge and stable power relations. However, deep learning and usefulness of knowledge are the very areas that originally supported the implementation of PBL curriculum in many institutions.

To sum up, we argue that the ideological basis of the PBL curriculum, despite its wide range of contextualisations, appears to have been reduced mainly to the level of a method, and its curriculum theorisation to the level of curriculum as prescription. These developments are mostly due to the lack of theoretical research regarding the PBL curriculum. Accordingly, problem-based learning will probably find its place among other widely used teaching and learning methods, although some of its shortcomings have been pinpointed on several occasions. According to David Boud (2006), the main problems with PBL are that one single model is used across the curriculum. He also mentions that the pre-defined problems give a static picture of the practice. Moreover, simulated problems may ignore the real challenges of professional work. He also finds it problematic that the identity constructed for the learner is that of a student rather than a practitioner.

However, some people will find this acceptable, because teachers and curriculum planners can now focus their efforts on thinking how best to turn goals into practice. This trend may even increase the popularity of PBL, because the knowledge produced offers more accurate explanations of practical curriculum problems. As a practically valid methodology, PBL provides useful answers to the questions of many institutions in an ever growing educational market. One indication of this trend is the traditional specialisation of the research field regarding PBL. It has been divided into different curricular areas (goal planning, problem design, the tutor's work, and assessment), where researchers in different areas seem to have no shared theoretical basis or orientation.

This construction of PBL, however, is not sufficient to solve the problems that exist between the curriculum and identity in the post-modern context (Goodson 1998; 1999). As indicated in some academic studies (e.g. Savin-Baden 2006), the starting points of PBL indicate a shift towards regarding the curriculum first and foremost as place for identity work. Ronald Barnett

(2000, 258) emphasises that “[e]ach curriculum can be understood as a set of more or less intentional strategies to produce – in each student – a set of subjectivities.” He adds that, in the current circumstances, higher education has to follow the “needs” of society by producing human capital for the labour market even more extensively than before. What these needs are and what ideologies they are based on are partly in the hands of curriculum planners. A remaining question is whether PBL can have an alternative form of reconstruction. What is there to be found in PBL after the process of decontextualisation? The field of curriculum theory is anxiously looking for practical solutions that would promote the curriculum as a narrative construction (see Goodson 1999). This alternative idea would require that PBL distance itself discursively from the grand metaphors of work-based learning and constructivism. Those metaphors could be replaced by identity construction as a curricular starting point.

PART II

CONSTRUCTING PBL CURRICULA AS A LEARNING ENVIRONMENT

From the postmodernist point of view, PBL is a strategic answer to the competency needs of an information society (Cowdroy 1994). These competencies emphasise the skills of processing knowledge, communication, interaction and problem solving. The shift from knowledge to knowing is reflected in the demands for continuing learning and for the ability to develop or even change a professional orientation repeatedly. Education has to be able to respond in a new way to the demands of knowing. It is no longer enough that education provides sufficient knowledge to be applied in professional practice; education itself has to be able to produce professional competencies.

PBL has been described as offering a constructivist (Schmidt & Moust 2000), an experiential (Savin-Baden 2000) and a situated practice field (Barab & Duffy 2000) approach to learning. The aim of PBL is to build a bridge between education and work. The first and most essential characteristic of PBL is described by Boud (1985, 13). *“The principal idea behind problem-based learning is ... that the starting point for learning should be a problem, a query or a puzzle that the learner wishes to solve”*. Because the problems of working life do not follow the divisions of science and academic subjects, it is necessary to learn to solve problems as they appear in professional practice, both in present and future communities of work. The problem, as a starting point for the learning process, can be a scenario, a trigger, a case or a structured, contextualised problem depending on the aim of learning. These carefully designed problems should come from the reality of working life and professional practice (Schmidt 1983; Barrows 1985; Woods 1994).

There is a long educational tradition behind problem-based learning. The main idea can be traced back to John Dewey, one of the most influential

pragmatist philosophers of the last century. Dewey (1938) states that strategies of learning can be characterised by inquiry and problem solving. Facing new situations, dealing with them and drawing conclusions is a directed and controlled process of forming knowledge. In the process of learning, the unstructured situation and the observation will be constructed and understood, and the original situation will be converted into a new unified whole. Hence, Silén (2001) argues that cognitive psychology has excessively dominated the field of PBL. In her view, learning cannot be reduced to individual problem solving. The roots of PBL are found in Deweyan pragmatism which emphasises the process of learning, not just the outcome.

PBL is based on two transformative principles – social interaction and self-directed learning. The learning and problem solving process is guided during the tutorials; students learn to acquire and construct knowledge, and gradually become *self-directed learners*. PBL is essentially different from traditional approaches, which assume that learners have to have the knowledge required to approach a problem before they start to work with the problem (Boud 1985). PBL tutorials, particularly, offer students a challenging environment for testing their own understanding and examining the understanding of the others. One of the central questions around which recent research on learning and teaching has concentrated is how *social interaction* mediates the construction of knowledge in a learning situation. Hence, it has become important to understand the kinds of opportunities particular interaction patterns and social activities offer to students' learning and the possible obstacles there may be to effective problem solving and peer group learning.

In PBL the learning and problem solving processes are guided in the tutorials; students learn to acquire and construct knowledge collaboratively and gradually become self-directed learners. The group is a resource for learning and it offers a mirror for individual reflection in relation to one's own actions, interaction in the group, the substance of the problem in hand and theoretical aspects of the phenomenon. Learners have considerable control over and responsibility for their choice regarding which issue to pursue,

the identification of individual learning needs and the selection of resources they use.

Knowledge is not simply material for memorising, but an object for observation, analysis, integration and synthesis. The co-construction of knowledge through dealing with problems is one factor in the process of developing multi-professional and scientific competencies. Individual learning (independent knowledge acquisition) and collaborative learning (knowledge construction in tutorials) are separate processes in PBL. However, together they form a comprehensive process of developing professional knowing and competence. In the tutorial, the teacher acting as a tutor has an important role in facilitating the process of constructing knowledge.

Tutoring is used not only to coach students in professional techniques, it is also to help develop the competencies needed in the professional life, such as cooperating with different personalities, leading teams and projects, taking responsibility for one's own and others' learning, producing and using knowledge, acquiring and allocating resources and so on. This creates a challenge for the teachers' own professional development, too. Teachers learn to cross the boundaries of traditional teaching practices and methods. They also learn to facilitate individual and group learning processes, to guide problem solving within the group, to utilise group dynamics as a resource for shared learning and to promote the processes of professional development in the context of education. (Neville 1999.)

As a resource and catalyser of learning, *the nature of knowledge is contextual*. It is not only conceptual, symbolic or formal fact, it is embedded as potential in objects, artefacts, human action or in the structure of an organisation. This is why the education should teach "reading" of the context of a future profession – the complex knowledge environment of work (Karila & Nummenmaa 2001; Poikela & Poikela 2001). Although this may appear rather chaotic, the development of this kind of competence requires an organised curriculum.

A curriculum normally consists of starting points, aims and principles formed by the particular ideology of the era in which it is created. It forms a general reference for discussion and action in the field of education. The ba-

sic principles of a curriculum also determine how the learning environment is organised. (Goodson 1989; Bernstein 1990; Tompkins 2001). The essential characteristics of a PBL curriculum are:

- a) the organisation of the curriculum around problems that are relevant to desired learning outcomes, rather than around topics or academic disciplines;
- b) the creation of conditions that promote small-group work, self-directed learning, independent study, contextual knowledge, critical thinking, life-long learning and self-evaluation;
- c) the construction of a student-centred learning environment.

The aims and specific research questions concerning the practical applications of the PBL curriculum and learning environments on different levels of education were:

- *How is knowledge constructed in the PBL tutorial discussions?*
- *How do students learn within the PBL curriculum as compared with subject-oriented curricula when constructing knowledge?*
- *How do students learning within the PBL curriculum describe their learning experiences and processes compared with those pursuing subject-oriented curricula?*
- *How do PBL students describe and evaluate their own processes of knowing, learning, problem solving and adopting roles in tutorials?*
- *How can a web-based learning environment be organised in a PBL curriculum and what advantages/disadvantages will using this technology create?*
- *How can learning at work be organised as part of a PBL curriculum and integrated as a part of a tutorial?*
- *How does the PBL strategy enhance transformative learning, critical thinking and emancipatory processes in teacher education?*

These questions will be analysed and discussed in the following articles:

Esa Poikela and Sari Poikela *'Problem-based curriculum – theory, development and design'*.

Timo Portimojärvi *'Synchronous and asynchronous communication in online problem-based learning'*.

Marja-Leena Lähteenmäki *'Constructing the physiotherapy curriculum – reflective dialogue between education and working life'*.

Merja Alanko-Turunen *'Working out a text: PBL tutorial participants as knowledge constructors in international business studies'*.

Helvi Kaksonen *'The repertoires of tutorial discussion as resources of collaborative knowledge construction'*.

Satu Öystilä *'The significance of group dynamics in problem-based learning – experiences of PBL tutors in higher education'*.

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PROBLEM-BASED CURRICULA

– theory, development and design

Problem-based learning has often been understood simply as a method of learning. What distinguishes PBL as a teaching technique, as an educational strategy, or even as a philosophy are the changes in the whole learning environment that the approach requires. Defining PBL as an educational philosophy involves the holistic consideration of a number of elements: organisational context, curriculum content and design, and the teaching and learning approach, including methods of assessment and evaluation.

Although problem-based learning has been investigated within the context of education, the theoretical basis of PBL is closely connected to learning in the work place. PBL runs the same risks as any other progressive pedagogical idea: the baby may be thrown out with the bath water. PBL can fail, for instance, because of the way in which it is applied, or because no changes have been made at the curriculum level or because a system of assessment and evaluation has not been developed in response to the new ideas about learning. In this article we examine the contextual basis of PBL and describe prerequisites for the development of PBL curricula: the functioning of cur-

ricula as knowledge and learning environments, the construction of integrated PBL-curricula and the design of appropriate problems.

The publication of Herbart's *Science of Education* during the early 1800s marks a turning point in the development of curriculum theory. This development is characterised by a distinction between the Anglo-Saxon curriculum tradition and the German tradition of the *lehrplan*. The basic difference between the two approaches is that the former emphasises the functional pedagogical system, while the latter emphasises the administrative and didactic system. The roots of western curriculum philosophy can trace back to Descartes' rationalism, Locke's hermeneutics and Kant's dualism. During the 1950s the *positivist*-empirical ideas of science appeared in the form of a goal-oriented rational curriculum posited by Tyler. (Autio 2002.)

Contrary to conventional ideas about the curriculum, problem-based pedagogy and the problem-based curriculum is founded on problems which function as starting points for learning. Learning is organised around problems and this is the main principle of pedagogical action, rather than the delivery of knowledge and information during lessons. In other words, the process of problem solving governs the kind of information needed, as well as the substance of the learning. There are some similarities between the Anglo-Saxon curriculum tradition and problem-based learning. For example, both emphasise student-centred learning and the importance of interaction. However, there are also clear differences: with problem-based learning, problems do not simply support didactic teaching, instead the whole curriculum is organised around problems and problem themes.

The problem-based curriculum creates both knowledge and the learning environment in which learners operate. For teachers it offers an effective tool for facilitating learning and producing learner competence. However, the use of this tool demands collegial cooperation rather than the tradition of working alone. In this article, we explore the epistemological underpinnings of problem-based pedagogy, the strategic and practical elements of the problem-based curriculum and the basis of problem design within the framework of renewing learning and of the teaching culture.

Philosophical remarks regarding curriculum theory

Curriculum theory can be explored through a series of world views known as formist, mechanist, organicist and contextual. According to Pettigrew (1985) the aim of a hypothesis is to create the order out of chaos and each idea has its own basic metaphor. The metaphor for formism is similarity in categorising phenomena and ideas. Mechanism, on the other hand, seeks permanent causalities between phenomena, creating a system that functions like a machine. The metaphor for organist theory is harmony and a systematic view of the world. Contextualism differs from organist theory in its focus of time, and its metaphor is that of historical event.

The similarity of curricula reveals notions of formism. The state's educational administration ensures the same level of education and similar curricula in all schools. This is achieved through setting given norms and through school inspections. This kind of thinking has been partially abandoned as the state nowadays defines only the basics of curricula and delegates the power of decision making to a local level.

Mechanist thinking is expressed in the way the qualifications demanded by the state and by places of work are equated with the content of curricula. These qualifications have to be renegotiated from time to time because education has a tendency to lag behind social developments and especially behind developments in working life. As a result, the teacher-specific parts of curriculum documents are usually updated every two or three years.

Organicist thinking integrates the curriculum, a system consisting of pieces, into a whole entity. An integrated curriculum is a structure formed of teaching modules which comprise different kinds of contents and skills. The systemic structure also enables cooperation between teachers because modules can seldom be left to the responsibility of a single teacher. At their best, the curricula of higher education achieve the level of systemic design. Unfortunately, they all too often degenerate to the level of mechanist or formist planning. (cf. Pettigrew 1985; Poikela, E. 1999.)

Contextualism implies that both the common and the specific context of pedagogical actions are taken account in curriculum design. The starting

points for curriculum design are the processes of learning and knowing that lead to competence. Mere similarities between qualifications or the regulation of structures are not enough. For instance, universities are required to express their excellence, profile and mastery of quality. The core idea of the so-called Bologna process is precisely this: to recognise core, basic and specific competencies demanded by disciplines and professions, and to make visible the processes of learning and teaching which produce functional competence.

PBL curricula as knowledge and learning environments

Pedagogical approaches based on problem solving may differ in several ways. Problems are used as criteria in order to select content and learning methods in *problem-oriented* curricula. Teaching may still be traditional and real changes are not made. A curriculum based on *problem-solving* concentrates on techniques of rational problem solving and students are trained in using such techniques. Because the former is too broad and the latter is too narrow for the needs of professional and scientific education, the *problem-based* curriculum lies between them. (Ross 1991; see also Savin-Baden & Wilkie 2004.)

Miller and Seller (1985) analysed the quality of curricula according to meta-orientations of knowledge; transmission, transaction and transformation. Transmission describes the one-way delivery of knowledge from teacher to student. The educational argument for this is found in behaviourist psychology. Transaction describes the two-fold nature of knowledge as a dialogue between teacher and student. The basis for this approach lies in humanist psychology. Transformation is connected to the purpose of renewing and changing knowledge and the result is personal and social change. The meta-orientation of the problem-based curriculum at least achieves the transactional level because PBL is based on communication within a group

and the facilitation of learning. PBL also creates opportunities for transformation and empowerment. (Poikela, E. & Poikela, S. 1999.)

The problem-based curriculum can be understood as a knowledge and learning environment which can be researched as wholeness from many points of view: psychological, technological, cultural and pragmatic. Psychological factors are connected to hidden beliefs as to how individuals gain, organise and use their knowledge and competence. Technological expectations focus on actions, methods and infrastructures of the learning environment created by advanced technological possibilities such as virtual learning environments. A cultural perspective reflects existing educational beliefs, organisational values and roles. Pragmatism provides a bridge between theory and reality. (Hannafin & Land 1997; Poikela, S. & Portimojärvi 2004.)

In the context of PBL, knowledge is not only an object for memorising, it is a subject and tool for observing, analysing, integrating and synthesising. The construction of shared knowledge starts from facing the problem, and it is an essential element for producing scientific and multi-professional competencies. Independent knowledge acquisition (individual learning between tutorials) and shared knowledge construction (during reflective discussions in tutorials) are separated chronologically. Together these processes lead to deep learning and competence.

The PBL curriculum can be simplified in the form of a proto-model (see Figure 1). The core or dynamo of learning is the tutorial, namely a group session of 7–9 students and a teacher acting as a tutor.

Tutorials are held once or twice a week with the same participants during the whole study module or semester. Another fundamental element is a self-directed study period between tutorials when students utilise several kinds of information resources. Common and shared information seeking focuses on theoretical knowledge resources. The aim is to reach sufficient understanding to allow closer exploration of the phenomena at hand. Besides this, supplementary information seeking can be shared between participants. This can be done by interviewing experts, seeking information on the internet or acquiring some other kind of knowledge based on experience. (Poikela, E. 2001.)

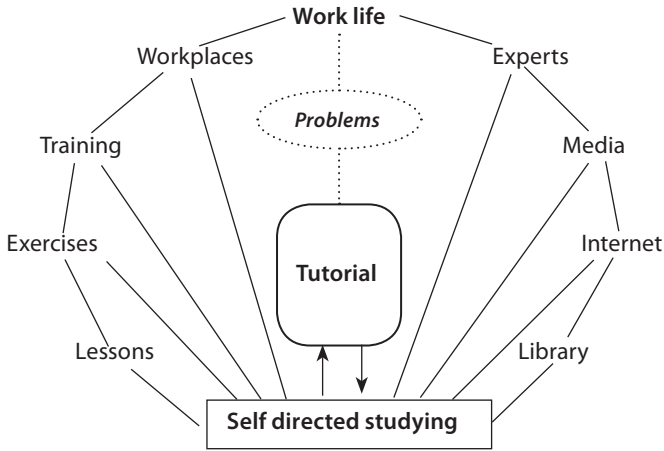


FIGURE 1. The PBL-curriculum as a knowledge and learning environment

The result of this new way of integrating shared and self-study is to reduce time spent in lectures and to increase time for independent study and information seeking. Lectures become a learning resource like any other type of study, including professional literature, training periods and exercises. New kinds of demands are placed on the quality of lectures and exercises – they need to be tailored and timed according to the process of problem solving. New demands are placed on the qualities of learning materials, too. For instance, the web-based material available needs to be useful for problem solving. Useful material, relevant literature and established theories need simultaneous updating. The importance of material produced by the students themselves increases because the learning processes are shared and cooperative.

The PBL-curriculum requires broad cooperation among staff in various positions within the organisation. Teachers cannot handle the curriculum by themselves because PBL demands collaboration in planning and implementing the teaching and learning program.

The problem solving process

The process of problem solving may be structured in different ways. One of the most famous models was developed by Barrows at the University of McMaster, Canada (e.g. Barrows 1985; see also Barrett 2005). The other well-known model is Schmidt's (1983) "seven jump" model from the University of Maastricht, the Netherlands and its variations in many universities. The cyclical model developed at the University of Linköping, Sweden has been applied in many places, too. For this reason it is not possible to identify a single model of PBL (Poikela, S. 2003; Savin-Baden & Howell Major 2004; Barrett 2005).

Sometimes PBL is defined simply as a method. For example, Fenwick and Parsons (1998) argue that students might become "blind problem solvers" and PBL may even create an impression of a fragmented, problem-centred world. They claim that use of PBL may increase the development of closed professional elite. Helle, Tynjälä and Vesterinen (2004) emphasise the superiority of project-learning by stating that PBL is more like practice without connection to a real professional world. In such cases it seems that PBL is understood only as a method, a technique or exercise aimed at increasing interaction and autonomy in a restricted classroom environment.

PBL offers a procedure for structuring and facilitating learning and group processes based on problem solving. Carefully designed, work life related problems create a solid base for learning (Poikela, S. 2003, 144). The tutor facilitates the problem solving process during tutorials lasting two, three or a maximum of four hours at a time.

During phase 1, students have to find a shared understanding of perspectives and conceptions of the problem. The purpose of the second phase is to elicit and elaborate former knowledge about the problem phenomena. This is achieved by brainstorming ideas about possible ways of dealing with the problem. The third phase starts with connecting similar types of ideas together into separate categories and naming them. During the fourth phase, the most important and actual problem areas (named categories) are negoti-

ated. The fifth phase culminates in the first tutorial session, the aim being that students form the learning task and the objects of study.

The sixth phase is a period of information seeking and self-study between tutorials. Students work both alone and in small groups depending on the learning tasks and aims. The second tutorial begins the seventh phase. It is a practical test for using new knowledge. Freshly acquired knowledge is used to tackle the learning task and applied in constructing the problem in a new manner.

New knowledge will be synthesised and integrated at a more advanced level and it provides a basis for learning to be continued. During the eighth phase, the whole process of problem solving and the learning process is clarified and reflected in the light of the original problem. The assessment is

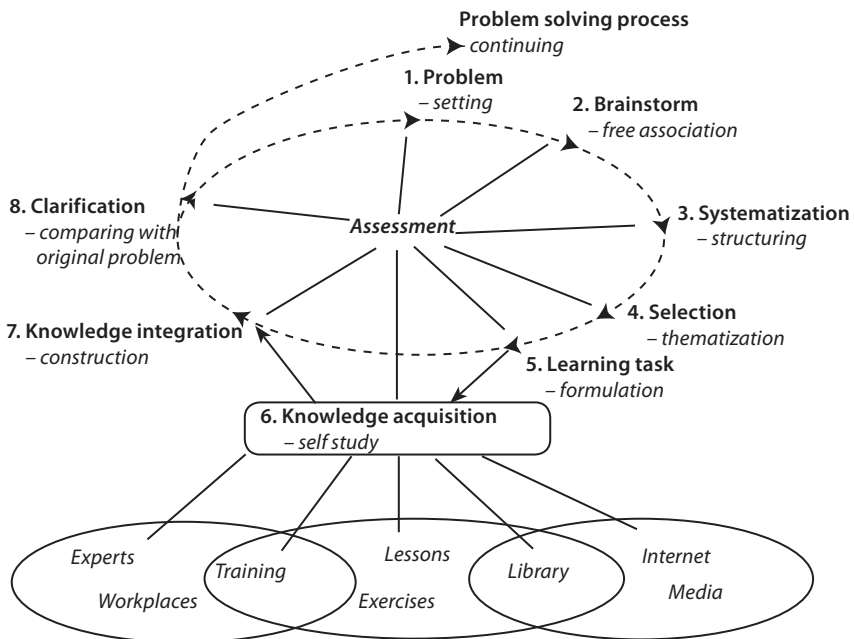


FIGURE 2. Problem-based learning cycle and knowledge acquisition

described in the middle of Figure 2. It is part of every single phase, but it is necessary that the tutorial closes with a period of feedback and assessment discussion. It means that students get necessary information and feedback about their own learning, group processes and problem solving skills.

Students' information seeking skills may require a great deal of improving when starting with PBL. It is not enough that tutors simply ask students to go and find information from the library or the internet. It is essential that tutorials include discussion about where the most relevant information could be sought and what the most important resources are. Acquiring information and becoming familiar with different kinds of information environments needs practice and assistance. Librarians and informants are specialists whose help is needed, too. The importance of virtual and web-based environments is increasing as forums for guiding courses and for finding, sharing and evaluating materials. (Poikela, S. & Portimojärvi 2004.)

Constructing problem-based curricula

Savin-Baden and Howell Major (2004) categorise different models of PBL curricula. They describe "the PBL funnel approach" and "PBL on a shoestring" as examples of implementation on a macro level. This means that individual teachers are trying to experiment with PBL in their own courses or modules within traditional subject-based curricula. The so-called "patchwork PBL models" are described as two-track, one track based on lectures and traditional teaching and the other based on group work which partly follows the ideas of PBL. An integrated curriculum allows PBL to be implemented on a macro level across the entire curriculum. A cross-disciplinary approach is the underlying strategy, allowing problems to be linked with each other. It is a strategy for transforming curricula. At its best, it leads to fundamental pedagogical changes, the redirecting of teachers' work and a transformation of the whole learning culture (Barrett 2005; Chen 2000; Poikela, S. 2003).

PBL does not follow the academic logic of subjects but the logic of problem solving within shared and individual learning processes. Figure 3 clarifies why it does not make sense to apply PBL within single subjects. Starting PBL within separate subjects rapidly leads to a situation in which problems are not challenging enough because they are designed simply within the framework of one subject. It also precludes the possibility of developing a method of assessment which is in harmony with problem-based learning. This ultimately results in “ostensible PBL” which does not satisfy anyone.

The problem-based curriculum is organised on the basis of problems and problem themes creating core competence (for example, academic or general professional competence). Time, place and other situational factors need to be considered during the problem solving process. Lectures, exercises and other types of teaching are carried out as before, but their timing and content is designed according the needs of problem solving. Implementation of PBL usually leads to diminishing time for face-to-face teaching because students themselves acquire a remarkable deal of information that was earlier delivered in the form of lectures. However, students need more guidance with independent studying, especially at the beginning of their studies.

An integrated PBL curriculum makes it possible to produce functional core competence (C) related to a discipline or profession. At the same time,

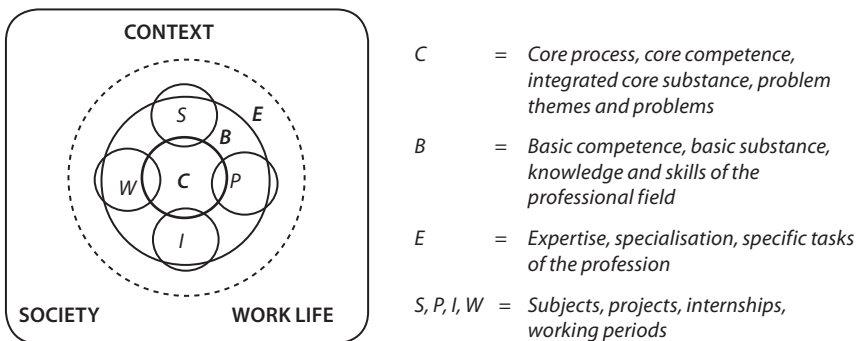


FIGURE 3. Integrated PBL curriculum

basic competence (B) related to professional knowledge and skills are developed. In other words, students learn to learn, to acquire and use knowledge, to understand complex relations of interaction, to solve problems together and independently, and to utilise different resources and technologies. This creates a solid basis for the learning expertise (E) needed at work. (Poikela, E. 2005; Poikela, S. 2003.)

Designing curricula

Problem-based pedagogy is often misunderstood simply as an activity undertaken in tutorials, and the requirement to negotiate the schedule and content of different disciplines is not understood. Nevertheless, PBL demands considerable cooperation between tutors facilitating tutorials and teachers responsible for their subjects. Problem-based curricula demand a high standard regarding the problems used as starting points for learning. The purpose of problems is not only to integrate disciplines or subjects, but also to achieve the pedagogical core process of producing learning and competence. It is the foundation of lifelong learning and of continuing professional development amidst the changing conditions of working life. (Barrett 2005; Poikela, S. 2003; Savin-Baden & Howell Major 2004.)

Problem-based curricula offer a strategy for developing the functional competencies working life expects from trained novices. This means, for example, that academic skills of research and argumentation will be drawn upon in order to manage the varied tasks demanded by complex work environments. Professionals graduating from polytechnics are expected to have the ability to apply knowledge and act as creative problem solvers in practical work situations. Trained workers from vocational institutes are expected to work initiatively according the rules and to be able to cooperate in the work community.

Students who have chosen their field do not only study techniques or substance, they construct their personal and professional identity, too. Two

fundamental starting points need to be considered when designing PBL curricula: firstly, that students have a need to construct a professional identity related to their discipline; secondly, that society and employers have a need for a civilised and competent work force (see Figure 4).

It is necessary to clarify what of kind of competence and knowing is required when starting PBL pedagogy. It is essential to define novice competence when planning the training program. Usually, the goals of exams, study

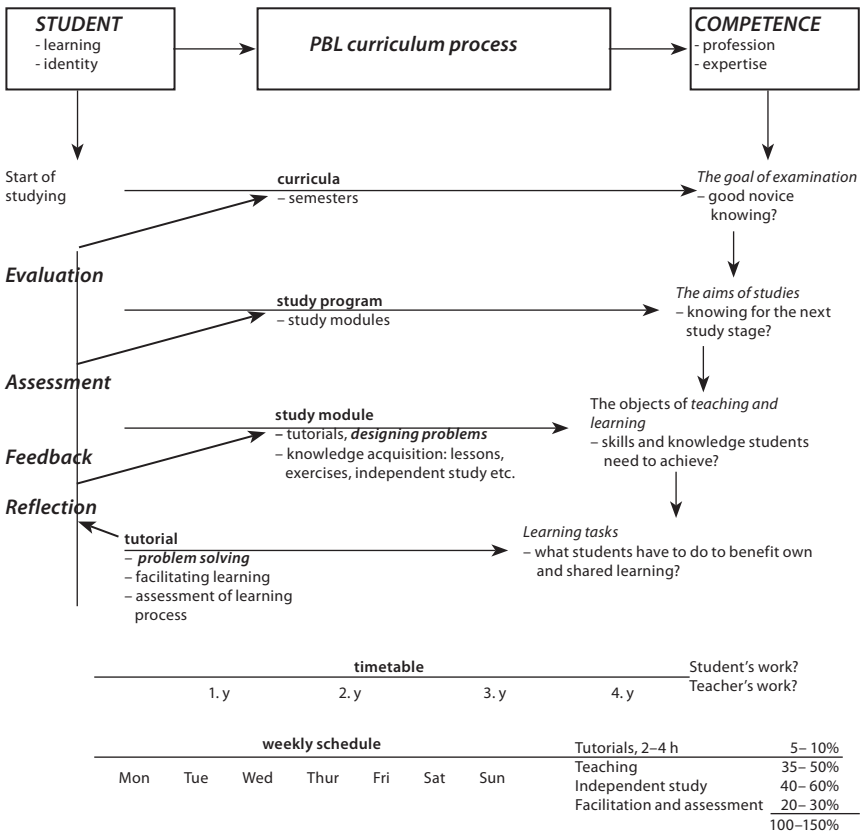


FIGURE 4. Designing PBL curriculum

modules, teaching and learning are set deductively on the basis of more general goals of education. This kind of approach does not provide a solid basis for PBL curricula. The goals of learning have to be reproduced inductively through problems and problem themes and these need to be connected to deductively set goals and aims regarding education. In other words, the PBL curriculum is designed abductively, on the one hand from the point of view of wholeness and on the other from parts. So, the PBL curriculum may be understood as a process involving participants (students), actors (teachers), owners (departments or units) and interest groups (society, employers).

Planning semesters, study modules, learning modules, tutorials and problems needs continuous evaluation because the focus of collaborative design is in the curriculum process and its ability to produce competence for studying further and for professional capabilities needed in the future. Even an excellent novice competence cannot be compared to the expertise of experienced professionals. That means it is essential to evaluate what kind of competence and knowing working life requires and what kind of core, basic and special competencies education is able to produce within the period of a few academic years.

One of the most important tasks of the tutorial is to direct what students need to do together and independently in order to achieve learning results. This is more important than the traditional approach in which teachers' lecturing separates substance or attempts to teach contents and skills when they cannot be used. Students need to learn skills of reflection, as well as self and shared assessment because these are the means of producing 'learning to learn' skills (Silén 2000; 2004). The knowledge and skills necessary for problem solving must be obtained when they are needed and learning must be verified with the help of well-focused and appropriately timed feedback. The importance of process assessment is emphasised through the use of peer assessment and tutor feedback in tutorials. Students become actors and owners of the assessment and evaluation process. This helps them become interested in their learning results and their level of knowing. Nevertheless, those organising PBL have to be prepared for continuous evaluation of the

competencies needed in working life, now and in the future. (Poikela, E. 2004; Poikela, E. & Poikela, S. 2004.)

Implementing problem-based learning leads to re-evaluation of teacher and student workloads. Reduced contact teaching means that the need to facilitate learning increases. New ways of defining teachers' work descriptions are needed. The amount of lecturing hours is not crucial, but the varied content of work over short and long periods is. Shared planning and cooperation with colleagues becomes an indispensable tool in the application of the PBL curriculum. Students' contributions to learning may vary strongly depending on previous levels of knowing, experience and talent. Skilful facilitation within the PBL tutorial creates an atmosphere of shared learning and students can lean on one another during different phases of learning.

The time needed for tutorials is only a small part of the total study time. However, the tutorials' power for organising learning is surprisingly effective. This is why the problem solving process in tutorials can be characterised as a dynamo or an engine that is the driving force for the whole PBL curriculum. Conversely, if the engine is not working well, the whole system suffers.

Problem design

Why use the term problem when it has a generally negative connotation in everyday language? In English the concept of problem-based learning has been accepted, but the word "problem" still has many roundabout expressions. For example, integrated learning, case-based learning, pathway models, context-based learning or solution-focused approaches are used (see Chen, Cowdroy, Kingsland & Ostwald 1994; Poikela, S., Lähteenmäki & Poikela, E. 2002). The endless variation of terms serves to make the concept more obscure, rather than clarifying what PBL is all about.

The basic unit of the problem-based curriculum is the problem. It can be described as a puzzling phenomenon that might not have a clear or single

solution. Nevertheless, the concept of problem is perhaps the most misunderstood or underestimated factor in PBL. The problem in PBL comes close to the concept of the research problem that is not connected with simple solutions or the negative connotations implied in everyday language. Margetson (1993, 20–22) defines a problem as a description of a situation at a certain moment involving an option of development or improvement. Every kind of creative task requires naming, clarifying and solving problems before achieving goals and outcomes becomes possible. Types of problem may include:

The scenario. This may include a wider and longer perspective of problem solving that extends beyond the single cycle which occurs between the first and second tutorials. The following cycles may focus the learning task on problem areas that have not have yet been covered.

The case. This frames problem solving more precisely under certain conditions and lasts one cycle. It means the problem is set during the first tutorial and it is solved in the second tutorial. After this a new problem is set during the same tutorial.

The trigger or starting point. Here the aim is to awake interest, ideas and viewpoints regarding a situation. It might be a picture without words, a short video or audio clip, a drama or other performance.

Typically, the problem is a description of a case or a starting point reminiscent of a situation encountered in working life. The background for the problem always lies in real life phenomena and in situations of professional practice. Dealing with problems requires information from different disciplines and professional areas. Knowledge linked with a certain discipline becomes evident when it is needed in problem solving. In other words, the same problem may have dimensions within natural, social and human sciences. Knowledge may be obtained from many fields of science and practice. Values and ethical issues need to be taken account, too. Problem solving never starts from a complete blank, but from identifying former knowledge and experience.

The scenario is a problem with a wide and long-term perspective. As a starting scenario or as problem theme it can consist several sub-scenarios,

triggers or cases (see Figure 5). Single problems steer students' learning and studying based on knowledge acquisition from different resources (literature, lectures, projects, exercises, work periods). Figure 5 depicts the logic of

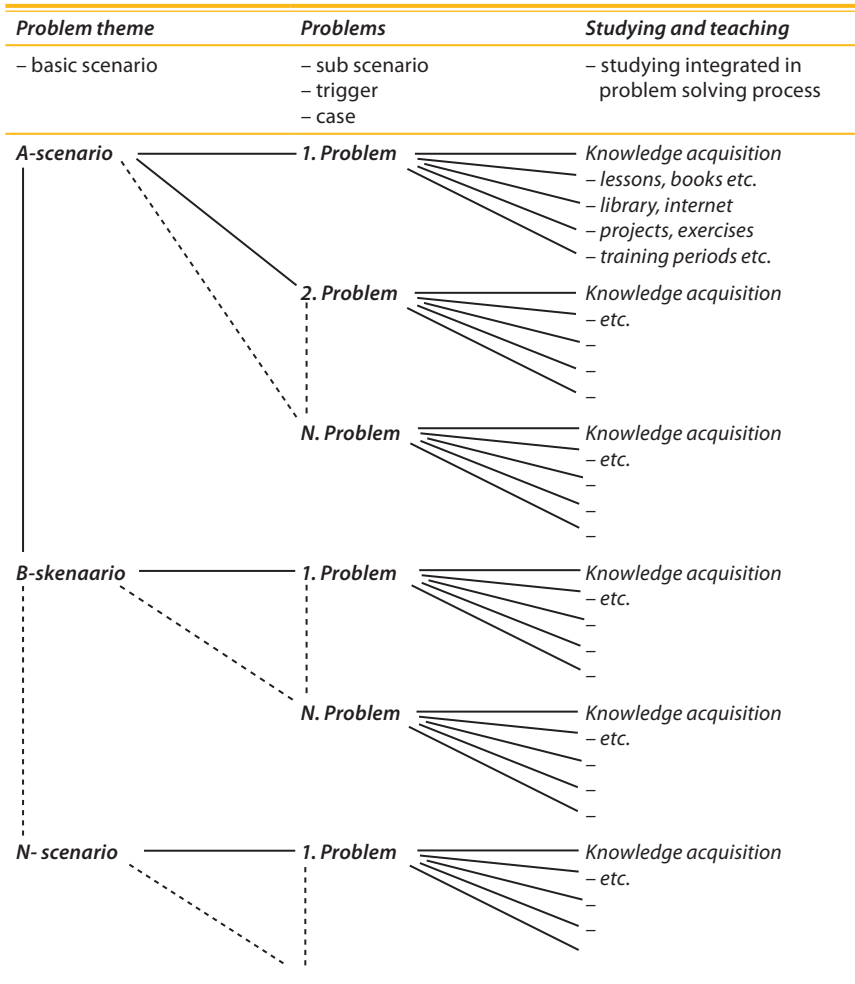


FIGURE 5. Problem design in integrated PBL curricula

problem design where problem themes or scenarios correspond to the aims of study modules or courses.

With problem design it is necessary to take into account what students are able to do between weekly tutorials. Problems cannot be too loaded; neither can they be too simple. If a problem is too demanding, knowledge acquisition is difficult or even impossible within the period of a single week. This may lead to postponing the second tutorial for too long a period. If a problem is too simple, it does not offer sufficient challenge for the development of knowledge acquisition and study skills. If the answer to a problem can be found directly from a textbook, it becomes simply the problem-centred teaching that is used to support traditional lecturing. So, the problem has to be the right size to challenge, motivate and engage both shared and individual learning. (Poikela, E. & Poikela, S. 1999.)

In the following, we present a general structure and guidelines for problem design. The aim is to offer a basis for developing discipline- or profession-specific guides for tutors and experts designing PBL problems (see Figure 5). The presentation format of a problem has to vary and it needs to be sufficiently complicated, as students become bored with problems “that smack of textbooks”. The aim of the problem is to initiate learning and to act as a challenge to action. We have modified a list based on our experiences as teacher trainers in PBL. The list helps with the early stages of problem design and serves as a checklist which helps to evaluate the problems being used.

- What is the background of the problem?
- How does it relate to work and professional practices?
- When is the problem typically encountered?

- What kinds of skills and knowledge are needed in problem solving?
- What kinds of action are needed in the problem situation?

- What is the student expected to learn during the process of problem solving?
- What kinds of learning results are aimed for?

- What characteristics of the problem situation match best with learning goals?
- What are the most appealing items of the problem that will awaken students' interest in learning and problem solving?

Writing the problem

Writing a problem requires careful planning and help is needed from experts in working life, colleagues and students alike. The feedback from students is the final test for a functioning problem. When writing a problem, pay attention to the following:

1. Try to use the present tense.
2. Describe the context: time, place, actors and roles.
3. Be clear and avoid information that is easy to misunderstand.
4. Do not write a list of questions.
5. Write in an active way – the aim of the problem is to challenge action.
6. Test the problem with students or at least with your colleagues.
7. Make corrections or rewrite if necessary.
8. Write guidelines for tutors. Also do this when tutoring yourself because it secures the future of PBL.

Developing the curriculum and designing effective problems is a challenging task. Single problems have to be bound together both with the goals of the study module and the time used for study. Designing and testing problems takes time – do not attempt to do it the night before. One problem cannot cover everything, but it has to be sufficiently wide and challenging. Framing and matching problems is difficult, too. At first, problems are often either too transparent or too full of detail because teachers are afraid that students will not form the right idea about the content. In turn, students

become frustrated if they immediately notice where the solution lies. The process of problem solving loses its power and meaning if it is done only because the curriculum demands it. (Poikela, S. 2003.)

Conclusions

We have described the theoretical basis of problem-based pedagogy and the process of designing PBL curricula and problems. There are several approaches to teaching that have problem solving as a starting point. Implementations at a micro level do not usually change the curriculum. Macro level implementations, which are applied simultaneously across the entire curriculum, mean that difficulties are encountered in one go. The small units that comprise the traditional curriculum can be gathered and restructured according to the logic of problem-based learning and problem solving. However, most Finnish PBL applications have followed a step-by-step strategy with the result that advances and difficulties are faced one after another. In this case, a strong goal-oriented concept of PBL is needed. So, what is a good starting point for applying PBL? The object of implementation and development should be a cross-disciplinary and multi-professional study module of appropriate size that is easy to develop once it has been encountered.

Only by changing the curriculum can problem-based pedagogy be used as a stable strategy within an organisation. The change is fundamental affecting every single part of the curriculum, including teachers' professional identity and work habits. This is why the process of change is very demanding. In our view, teachers first need to understand basic principles and have initial trials in applying PBL. After this they will begin to worry about their abilities in facilitating group processes and learning. During the next phase they will begin to understand the importance of assessment and evaluation and its relationship to the new curriculum. If the methods of assessment do not follow the principles of PBL, the new pedagogy loses credibility. Students contribute to studying that is assessed and evaluated. They behave according

to the way in which they have been assessed and according to their role in the assessment and evaluation process. This is one of the biggest challenges in developing problem-based pedagogy.

SYNCHRONOUS AND ASYNCHRONOUS COMMUNICATION IN ONLINE PROBLEM-BASED LEARNING

In this article I will examine the forms of synchronous and asynchronous communication as a part of the problem-based learning process. The article is based on research into combining problem-based learning (PBL) and research on computer-mediated communication (CMC). The article supports earlier studies, which indicate that successful working within the distributed group requires both synchronous and asynchronous forms of communication.

Problem-based learning is not just a method of teaching, it is a strategic alignment which also takes place at the curriculum-level. It is vital that the culture of the educational institution, its mode of action and the tools it uses are congruent with one another. However, in this article I consider only one aspect of the programme – the level of practices and processes which shape the group-intensive learning process. Firstly, I will describe the viewpoints of PBL with regard to the learning process. In connection with this, I will examine the forms of communication, the alternating forms of action and the process of conceptual transformation. Secondly, I will focus on communication and the social aspects of PBL. I will examine media choices which support distributed collaborative work and learning. Here, I will lean on two

contemporary studies on mediated communication. They offer interesting interfaces for structuring forms of online PBL. Thirdly, I will combine the modelling of the PBL process with an examination of forms of communication. Here, I will highlight the alternation of synchronous and asynchronous communication, and I will consider the phases of the PBL process when implemented fully in virtual environments.

I interlink considerations of PBL with contemporary progress in amplifying online learning and with the intention of supporting PBL with technology (Donnelly 2005). Instead of examining technological premises, I argue that it is more important to focus on pedagogical viewpoints and processes. In conjunction with these processes, I would combine applicable technologies in such situations where physical and temporal presence is limited, or where technology offers real added value.

Alternating processes of learning in problem-based learning

The practices of PBL can be illustrated using different models in order to make pedagogical principles and ideas more concrete. Descriptions of learning, collaboration and tutoring cannot be transformed into active practice unless the executors have suitable tools or ways of working. Methods of working, learning and assessing, which emphasise group- and student-centred assessment, are difficult to apply if the values and the culture of an institution do not support these. The learning activities in PBL are described in the literature in terms of step, phase or cycle models, which are constantly under development, and there are numerous versions of these around the world (Uden 2005). In this article I examine the cyclical model, which emphasises experiential and communal aspects of learning and the importance of assessment and reflection. This model has been created at the University of Linköping in Sweden and further developed by the ProBell research group in Finland. (Poikela 1998; Poikela & Poikela 2005, 34.)

The cyclical model of the PBL process is based on models of experiential learning, of which Kolb's cycle (1984, 20) is the best known. In its basic form it is based on Lewin's model, which starts from concrete experience. This is followed by reflective observation, abstract conceptualisation, and finally a return to action and experience. Kolb has reviewed the likenesses and differences of the models offered by Lewin, Dewey and Piaget. All of these models include alternations of bidirectional, even opposing processes of meaning construction. In Lewin's model the alternation occurs between concrete experience and abstract conceptualisation. In Dewey's model the conflict is between the impulse which starts the learning process and the directive orientation of the process. In Piaget's model we find a balance between assimilation and accommodation. Paolo Freire (2005) is also often mentioned as a theoretical agent of problem-based learning. According to his reasoning, there is parallelism (rather than polarity) of objectivity and subjectivity. His concept of praxis combines the abstract and the concrete.

This list can be continued by pointing to the dualism of cognitive structures. Learning can be seen as a transformative process between the episodic and semantic structures of memory and understanding. This aspect of learning is related to theories of Vygotsky, Bruner and Schank, among others (Cole 1985, 152–154; Tolska 2002, 85; Schank & Abelson 1977). The aspects listed up to this point are strongly individual-centred; learning is seen as an internal process, even though these scholars, with the exception of Piaget, agree on the social nature of learning.

There has been an obvious shift towards more social, collaborative and communal perspectives of learning in recent educational research. Various forms of collaborative and inquiry-based learning include the idea that learning should be understood as a combination of participation, knowledge creation and internal processes (Hakkarainen *ym.* 2005, 125). Those pursuing problem-based learning, especially in the tutorial groups, can be seen as forming communities of learning and construction sites of shared knowledge. Tutorial settings include various forms of action, convention, genre and discourse (Alanko-Turunen 2005, 22). This connects PBL to socio-cultural or socio-historical traditions. Lave and Wenger consider learning as a proc-

ess of becoming a legitimate member of a group, community or a field. The construction of one’s own identity, the development of competencies and the process of empowerment are aspects of the same process. This process may include questions of motivation, recognising prior knowledge, information acquisition, transforming prior knowledge and re-conceptualising. Becoming a legitimate member of a community is a demanding communicative task, which connects or distinguishes the member and the community (Lave 1993, 65).

Each phase of the PBL process involves specific, even unique forms of action and communication. Online learning applications, especially, require that these characteristics should be resolved and understood in order to be utilised within online environments which have certain limitations. The communication among groups varies from rapid, intensive and involving

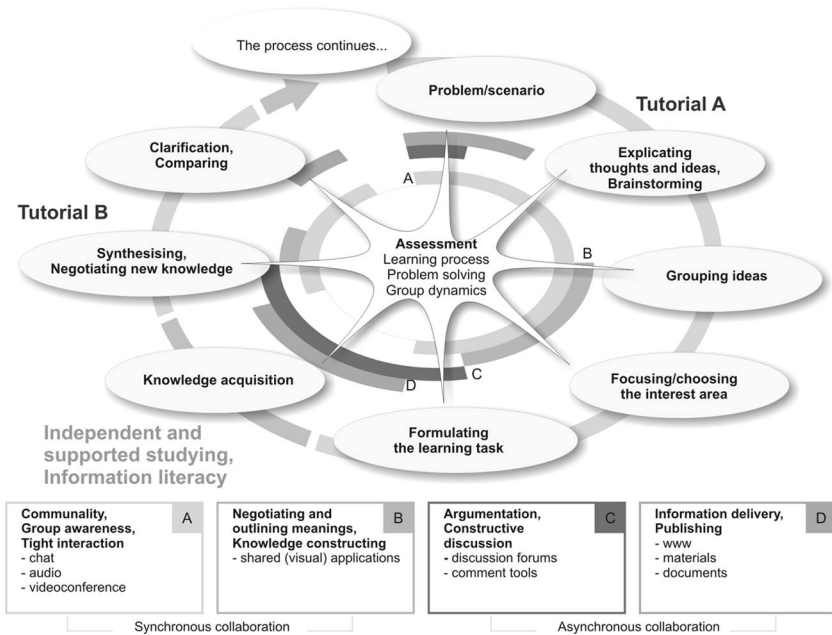


FIGURE 1. Communicative forms in the PBL cycle model

tasks such as brainstorming or debate, to cautious and individual modes of information seeking. Furthermore, groups often use collaborative methods to create shared understanding by using visual or other aids, such as whiteboards, mind maps and concept maps. (Portimojärvi 2002.)

Figure 1 illustrates the forms of communication and media in online PBL. These specifications are based on traditional face-to-face tutorial settings, and require more detailed research into communicative activities and technological solutions, which could support distributed collaborative tasks.

Media choices for distributed collaborative learning

Collaboration in a distributed group presumes social presence, shared understanding and versatile communication among the participants. The basic structure of PBL – the tutorial group – can be considered a community of learning. Transferring the group's activities to online environments requires the selection of suitable media for each situation and task. For instance, storytelling, creating new ideas, commenting on drafts, negotiating, decision making and synthesising are all different processes. Even in face-to-face situations these processes may be supported with different tools for presentation and documentation.

Almost any tool that enables one to present one's thoughts to another – a sheet of paper, for example – can be seen as a collaborative tool which creates a shared space (Schrage 1990, 90–100). Collaborative tools can be used to stimulate other people's thinking, and this is the way to achieve dialogical, shared understanding. One basic type of shared space (created with a collaborative tool) is a room equipped with a blackboard or whiteboard displaying notes for the whole group.

In an online environment, physical space is not a connective element as it is in a face-to-face setting. Instead, it becomes an element of separation. This emphasises the importance of the communicative tools and shared virtual spaces that are available to the group. Distributed communication and col-

laboration may be considered from the viewpoints of social presence, media richness, shared understanding and media synchronicity. I regard the theory of media synchronicity (Dennis & Valacich 1990; De Luca & Valacich 2005) as a useful conceptual tool for understanding the cycle model of online PBL. The theoretical developments that I will present next are based on media synchronicity theory, and offer important tools and perspectives for understanding online PBL.

Action and learning within a community presumes awareness of other members. This awareness is built through communication. Social presence theory (Short, Williams & Christie 1976) offers a view of social psychology and highlights the experience of other actors. The question here is how group members experience the presence of the group in a mediated environment, and to what extent the members experience the communication as warm, sensitive, personal or intimate. The level of social presence is dependent on the medium's ability to convey information, tone of voice, gestures, expressions, eye contact or other social cues. The members' consciousness of the social presence standard of each medium directs the selection of media. Recent mainstream literature on online learning highlights the lack of social cues as a reverse side of social presence. This is in keeping with the notion that online learning is seen mostly as asynchronous, text-based and involving limited communication. What communication there is between students is not seen as a vital element of learning. This, in turn, can be understood as an out-growth of the tradition of distance learning and a consequence of low-bandwidth connections (Preece 2000, 151). Media richness theory (Daft & Lengel 1986) is often discussed alongside social presence theory. Here the point of view is medium-centred, and the main question is, to what extent each medium can convey or support immediacy of feedback, non-verbal cues and natural language.

While learning is understood as a process of participation and knowledge construction, it also requires shared meanings and concepts. Common ground theory (Clark & Brennan 1991) deals with communication from the viewpoint of constructing shared meanings. Participants involved in a communicative occasion have to control both content and process, and this is not

possible without common ground. Shared understanding and the process by which common ground is constructed have a double importance. They are both communicative tools, which utilise methods of presentation based on shared meanings, and also communicative tasks, through which participants develop the common ground further (Preece 2000, 159). Co-presence, visibility, audibility, immediacy, synchronicity, alternation, rehearsability and reprocessability are central elements in constructing common ground. I will briefly review these concepts, since they are suitable tools for examining a group's communication and its collaborative learning process.

Co-presence is widely thought of as a basic form of human interaction, which includes various kinds of action. The concept of presence is usually linked with physical and temporal closeness. It is closely related to social presence, which does not presume physical closeness.

Visibility refers to the opportunity to perceive people's body language, gestures and other visual cues. In text-based communication media, such as discussion forums, SMS, and email, there are smileys and other substitutes for these.

Audibility of communication allows the perception of tones and stresses of voice – elements which convey strongly emotional messages. On the other hand, speech is also an effective tool for conveying explicit knowledge.

Contemporality concerns the speed of communication. An immediate message reaches the receiver almost at the same time as it leaves the sender.

Simultaneity, in turn, includes the idea of many participants acting at the same time. It includes the idea of talking or writing occurring among many participants at the same time. In multimodal environments participants can use different modalities for different tasks.

Sequentiality refers to the notion that the order of messages is not mixed up.

Reviewability describes the option of returning to a previous message to check what had been stated earlier.

Rehearsability presumes a capacity to store communication.

Revisability is connected to reviewability. It includes the possibility of editing, adding or changing previous messages.

Different media have different capabilities for supporting these elements. On a communicative occasion a missing element may be replaced, but this is usually laborious, or, alternatively, the defectiveness of communication may be accepted. However, it should be pointed out that a situation, which is first considered defective and limited, may offer added value when it compels the use of forms of communication that may sometimes be even more effective. For instance, the absence of synchronous conferencing may force participants to produce messages with better arguments. (Preece 2000, 159.)

With regard to supporting shared understanding, each medium has its own affordances and attracts users accordingly (see Gibson 1977). Media richness theory examines tools for communication, their modalities and facilities for conveying information. However, it simplifies the order of superiority of different media. Media synchronicity theory is based on media richness theory and social presence theory. Here, the perspective is focused primarily on the communication processes, and secondly, on suitable media. Dennis and Valacich (1999) argue that five characteristics form the basis for action in a group, and that all communicative actions are based on two main processes. The theory also considers the relationship between different groups and different forms and needs for communication.

The characteristics of media are immediacy of feedback, symbol variety, parallelism, rehearsability and reprocessability.

Immediacy of feedback – the capacity to receive rapid feedback from a communication. Immediacy of feedback describes the medium's ability to enable rapid response and also its capacity for bidirectional communication.

Symbol variety – the format by which information is conveyed. This includes verbal and non-verbal symbols, the cost of delays in order to alter or compose a message for a medium, and the social cost wrought by a lack of symbols. Symbol variety illustrates the versatility of modalities and forms of symbolic presentation. Scripts and symbols are created

through socio-cultural processes, and are prerequisites for language and communication. They can exert four influences on understanding communication and messages. (1) Some types of information may be more easily understandable in one form, and others in another form. (2) Lingual and non-lingual forms of symbolic presentation supplement each other. Together they strengthen the intelligibility of the message. (3) One set of modalities, symbols and tools may create delay, and another set may require a more complicated production process. These costs and disadvantages have implications regarding the ways in which messages may be sent and also regarding their quality. (4) The absence of lingual or non-lingual symbols may have significant effects on social observation. This may cause a loss of experience regarding social presence or promote the objectification of persons.

Parallelism – the number of effective simultaneous conversations. For instance a telephone enables only one discussion, but many forms of digital communication open the way for many parallel discussions. However, when the amount of parallel processes increases, they are less easy to control.

Rehearsability – the fine tuning of a message before sending. Text-based tools, especially, enable rewriting and careful revising before sending.

Reprocessability – the readdressing of a message within the context of the communication event. It describes to what extent the sent or received messages may be revised or refined. This requires recording of communication.

In summing up the characteristics of media, three observations can be raised. (1) No single media is rich in all characteristics. (2) Media are not stable; they can be used in many ways or as parts of different systems. Sometimes a telephone may be a tool for something other than speaking. (3) It is not reasonable to set different media in order of superiority. The context in which they are used changes the way they are used.

Communicative actions are basically built on two processes: conveyance and convergence. Conveyance refers to conveying and exchanging information. There may be divergence – all participants do not have to concentrate on the same subject or fully agree on presented arguments or meanings. Ba-

sically, media with low synchronicity are suitable for conveyance. Environments which support low immediacy of feedback and high parallelism are tools for asynchronous collaboration, which is a central element of conveyance. Convergence refers to convergence on shared meanings. It is a process of searching for mutual understanding and agreement on shared understanding or at least agreement on accepting various viewpoints. Basically, media with high synchronicity are suitable for convergence. Environments which support high immediacy of feedback and low parallelism prompt synchronicity, which is a key to convergence. (Dennis & Valacich 1999.)

There are five notions that emerge from synchronicity theory, and these provide a basis for further development and research. (1) For convergence, media of high synchronicity (high feedback, low parallelism) are preferred. (2) For conveyance, media of low synchronicity (low feedback, high parallelism) are preferred. (3) Symbol variety is a factor only when a symbol is not available. (4) Generally, media of higher rehearsability are preferred. (5) For conveyance, media of higher reprocessability are preferred.

In addition, media choices are considered from the viewpoints of group processes, stages, roles and norms. From these arise further notions regarding matured groups and newly-formed groups. (6) A lower degree of high synchronicity is needed with matured groups. Having established accepted norms, such groups do not require synchronous tools as much as new groups. (7) Over time, a lower degree of high synchronicity is needed. (8) Media of high synchronicity should be used with new groups. (9) Media with symbol sets allowing greater social presence should be used with new groups. Not having accepted norms, these groups engage in more socially communicative modes than matured groups, and select tools which offer richer forms of social presence. (Dennis & Valacich 1999; 2005.)

Research into audio- and videoconferencing and computer-mediated communication has a tradition of more than 40 years. Wainfan and Davis (2004) have comprehensively reviewed this tradition and the tools of mediated group interaction, and they have ended up with results that closely parallel media synchronicity theory.

Alternating synchronous and asynchronous collaboration in online problem-based learning

Based on the theoretical developments presented above, I will now describe the processes and tools of online problem-based learning. There are outcomes in two areas: the first area concerns changes in the group during long-lasting collaboration; the second concerns the PBL cycle model, its phases and suitable media choices.

The most successful implementations of problem-based learning cover the whole curriculum and shape the learning culture of the educational organisation. During long periods of study the learning cycles create a chain or continuum. In such cases a group's previous meetings and history builds common ground for new collaborative situations. In the context of this socio-historical co-presence the members of the group get to know each other, create a shared set of concepts and understanding, as well as setting shared goals and working to achieve these goals together. This is in congruence with the notion of media synchronicity theory which notes that the need for synchronicity decreases and that, over time, asynchronous collaboration becomes more and more beneficial. As the group's shared history expands, the issues in the tutorials change. This can be seen especially with the problems which start the learning processes, and in the first phases of the PBL cycle model. With a newly formed group the problems relate mostly to personal experiential knowledge and implicit prior knowledge. With a more uniform group, the shared prior knowledge is more explicit and conceptual. This shift in prior knowledge seems to set challenges in creating problems and tutoring the learning process. As a group's work progresses over time, the importance of convergence decreases and the importance of conveyance increases.

New groups stress the need for convergence and a rich social presence, although this is often expressed in more practical terms. Literature on online learning, for example, often brings up the importance of face-to-face meetings at the beginning of a course. This has been seen as vital for group formation and therefore important for a successful course. With a new group,

synchronous forms of communication are stressed, and this is also the case in virtual environments. (Portimojärvi 2006.)

The objectives of recognising prior knowledge and convergence are typical at the beginning of the PBL cycle model and the first tutorial. Participants are supposed to be able to deliver and share their own basis of knowledge and experience with other group members. This is needed in order to create a shared, mutually understood learning task. Communication, which is synchronous and rich in modalities, supports social presence, shared understanding, and especially immediacy, visibility and co-presence. When the meanings that are converged on are experience-based and often implicit, the need for multi-modal forms of presentation is emphasised. On the other hand, asynchronous story-writing and reading one another's stories might create a solid basis for common tasks. This mode of getting acquainted is widely recommended for groups starting an online course. With a matured group the need for multi-modality decreases, but the need for shared spaces and visible productions remains.

The ending of the second tutorial includes the objectives of negotiation and decision making. At its best this is a consequence of the previous process of convergence, but it may also include disagreements, which highlights the importance of instant feedback. These phases are mostly based on coordinated synchronous collaboration.

The use of information and communication technology changes the phase of information acquisition. Instead, this becomes a phase of knowledge acquisition and sharing, where group members add notes and memos of their information findings to a repository or discussion forum. The tools used during this phase enable asynchronous, loosely coordinated communication with many parallel discussions and developments of viewpoints. In such a case there is no need for turn-taking, and the tasks are flexible with regard to time and place. The main characteristic of this phase is a shift from individual and self-directed studying towards interactive and collaborative study, which is supported by peers and the tutor. It is concerned with searching, retrieving information and distributing it to the others. Conveyance is the main process during this phase, and it serves the later process of

convergence in the second tutorial. Discussion forums, blogs, wikis or other applications for argumentation and commenting may allow the students to take negotiated, alternative reading positions (see Alanko-Turunen in this book), and thus help the students to adopt positions of critical contesting during the second tutorial.

The communicative nature of the second tutorial is similar to that of the first. The goal is to converge, compare, combine and synthesise the information or knowledge components that the group has gathered. There is a difference, however. In the first tutorial the aspects of knowledge are experiential and individual, and in the second tutorial the group works with components which are gathered through a planned, systematic information seeking process. These components are known to all members of the group before the second tutorial. In this case there is no longer a strong need, in the second tutorial, for participants to get to know one another's background, as was the case in the first tutorial. Instead there is a need for rehearsability and reprocessability which can be provided by asynchronous forums. However, the kinds of activities that are based on negotiation, cry out for synchronous tools which offer comparison, collaboration and instant feedback. The main characteristics of these phases are shared, coordinated and synchronous – or almost synchronous – collaboration.

The second tutorial is followed by a phase, where learned and constructed knowledge is applied to practice or new learning tasks. If the PBL cycle model follows the cycle of experiential learning, it should be possible to apply the learned knowledge and constructed meanings in a concrete fashion.

Summary

In this article I have examined the cycle model of problem-based learning and the modes of communication which occur during this process. I have also considered the changes in communication which take place as the group matures. Media synchronisation theory, among others, offers tools for

understanding the solutions that were arrived at during the development of online PBL. These were alternating and multimodal solutions. Examining the PBL cycle model in parallel with theories of communication supports and strengthens earlier suppositions and results regarding the successful combination of online learning and problem-based learning. Traditional face-to-face tutorials can be supported with asynchronous collaboration, especially during the phase of information acquisition. For distributed groups, problem-based learning offers a way of working which requires multifaceted, varying and multimodal media choices.

CONSTRUCTING THE PHYSIOTHERAPY CURRICULUM

– reflective dialogue between education and working life

The aim of this article is to answer the question: How do teachers, students and working physiotherapists cooperate when designing a physiotherapy education program? The research focused on the change in curriculum from subject-based learning to problem-based learning that took place at Pirkanmaa Polytechnic. The research methods included individual and group interviews using an interview schedule based around the theme of cooperation in developing the new curriculum. The data was interpreted using qualitative content analysis.

This article is part of my PhD project which was made possible through the support of The Finnish Academy and the Life as Learning project award for the ProBell research group. The original article was earlier published in Finnish (Lähteenmäki 2006).

Dialogue and dialogism

Dialogue and dialogism are common, but often loosely used, concepts. People frequently understand dialogue as synonymous with the concept of con-

versation, without taking account of its special nature. Since these concepts are seldom separated in the literature, it is important to define dialogue, dialogism, dialogical and (discussion) conversation as I use them in this paper.

Dialogue in Greek refers to the flow of meanings, which created a cornerstone for the discussion that was needed for autonomy and for democracy (Isaacs 2001). Nowadays, dialogue may be understood as communication between two or more people connected by time and space so that they are aware of one another and are oriented towards one another (Markova 1990). Dialogue and conversation differ from each other. Conversation refers to everyday interaction, where other peoples' viewpoints, opinions and ideas are downplayed. People may refuse to acknowledge other peoples' ways of thinking or stand their own ground without being willing to question their ideas. (Jenlink & Carr 1996; Isaacs 2001.) Conversation can be regarded as dialogue only when it has features of dialogism.

Dialogism cannot be characterised as winning, losing or compromising (Kent & Taylor 2002). According to the theologian Martin Buber (1878–1965) reciprocity and equality between those taking part in conversation are essential characteristics of dialogism (Buber 1995). The philosopher and literary theorist Mikhail Bakhtin (1895–1975) characterises dialogue as the skills of thinking together and acting together. The conversationalist, on the other hand, offers his/her background and knowledge base to the partner and the latter tries to take it actively into account. (Bakhtin 1986.) Burbules, who examines dialogue in relation to learning and teaching, asserts that dialogue refers to focused dialectics, where at least two participants act as speaker and as listener. These persons express statements that are of different lengths including questions, answers, new directions for the discussion or new statements. Dialogue consists of socialising, asking, arguing and guiding dialectics. Dialogue is open and confidential. It is both inquiring and seeking to explain, and involves the “need to see into the heart of things”. People engaging in dialogue aim at common understanding, new insights and the creation of new knowledge. (Burbules 1993.)

The adjective dialogical describes the nature of the previous type of conversation (Markova 1990). When different people talk after one another, the resulting conversation can be either dialogical or non-dialogical. Such a conversation can be defined as dialogue if it contains features that correspond to dialogism such as considering the other person's differing views without confrontation. The reciprocal and receptive atmosphere that characterises dialogism arises from openness in relation to other peoples' viewpoints as well as openness in relation to delivering one's own viewpoints. Openness promotes the skill of thinking together and allows deeper consideration of issues. It provides an opportunity to clarify each person's thinking and, in this way, it offers a basis for finding common understanding. Dialogism implies that the partners trust and respect one another, appreciate one another's viewpoints and are aware of their common goal. They can achieve common aims when they respond to their partner's comments, await a response to their own comments, and are ready to change their own earlier viewpoints.

In educational contexts dialogue between teachers and students cannot always be completely reciprocal. Buber (1995) observes that in dialogue, the educator considers situations from the students' perspective and aims to assist and guide them in the best possible way. Sarja (2000) along with Seikkula and Arnkill (2005) also consider inner dialogue. Inner dialogue takes place when one individual offers opportunities for their partner's reflection. This kind of dialogue can occur, for example, when reading an author's book (Markova 1990; Burbules & Bertram 2001).

Dialogue and reflection

Maranhao (1991) notes that dialogue with other people requires reflection – a process that involves observing and considering the viewpoints other people have highlighted. Dialogue is essential for reflection, because with dialogue one gains new perspectives for reassessing and testing previous viewpoints (Markova 1990). Dialogue activates individuals' reflective skills,

enabling them to understand phenomena more fully, change viewpoints and connect theory to practice (Ojanen 2002).

Reflection occurs when action, learning or knowledge creation is connected with active observation, thinking and reasoning (see Kolb 1984; Boud et al. 1985). Critical reflection is about questioning previously learnt, already established, conventional presuppositions. It is about renewing knowledge by yielding new or transformed meanings. (Mezirow 1991.)

Reflection can be seen as a fundamental part of the learning and knowledge creating process. Kolb (1984) views learning as a process in which knowledge is created through transforming experiences. He argues that reflective observation of concrete experiences is an important part of experiential learning. Observing practices helps the observer to discover the intelligence behind them which Schön (1986) calls knowing-in-action. Schön further states that reflection represents the interrelationship between thinking and action, both during (reflection-in-action) and after (reflection-on-action) action. According to Boud et al. (1985), active reflection is important for learning at every phase of the learning process. McAlpine et al. (1999) highlight the importance of reflection for planning future actions and call this reflection-for-action.

When one participates in a discussion one constructs new meanings, either alone or together with others (Isaacs 2001). Nonaka and Konno (1998) present the concept of “ba” in connection with common knowledge creation. In their view “ba”, which offers a basis for creating new knowledge, represents a shared space for existing relationships. This space can be physical (for instance a school), virtual (telephone or e-mail), mental (shared experiences or ideas) or a combination of these. Within this shared space the cooperative partners can achieve new knowledge by reflecting on their own and others’ experiences. Nonaka and Takeuchi (1995) argue that only an individual can create new knowledge. Cooperating partners pass their knowledge to one another and, at the same time, provide tools for their partner’s individual knowledge creation – a process Nonaka and Takeuchi describe as social discussion. This article will focus on the process of social discussion in constructing physiotherapy education.

The context of the research

The focus of this research is the curriculum transition that took place at Pirkanmaa Polytechnic and the cooperation between the different partners involved in this process. The old subject-based curriculum was replaced with a problem-based one, and I was the teacher responsible for coordinating this process, which meant organising meetings, writing the agendas and memos and acting as a chairperson.

At the beginning of this process we had to define what physiotherapy students needed to learn during their education (Savin-Baden 2003). We did this by asking teachers and the physiotherapists to brainstorm together. The next step was to group the numerous items that had come up, using our professional expertise. We gave titles to all the groups and arranged them in order from the beginning of the education programme to the end. The next task was to formulate modules from these grouped ideas, which meant specifying the name, aims, contents and size of each module. At the end of this process, teachers were nominated to take charge of each module. They were responsible for the more detailed planning, including organising cooperation with professionals from working life and other teachers, as well as constructing the problems together.

These problems were designed to activate the students to study in relation to the written learning outcomes of the curriculum (Dolmans et al. 1997). The problems acted as starting points aimed at stimulating students to engage in problem solving. Problem solving was regarded as the thinking required in clarifying issues, finding solutions and making appropriate choices (Ropo 1994). It has been repeatedly stressed that PBL problems come from the demands of working life and that they describe situations encountered at work (Drummond-Young & Mohide 2001; Poikela 1998). The problems can be classified as scenarios, triggers and cases and I make specific differentiations between these three categories. The scenario is typically a problem that does not lead to any single solution. The trigger, on the other hand, aims to guide the students towards a certain solution. (Poikela 2001.) A case may, for instance, refer to a patient description. In this curriculum

study we used all of three types of problems in the form of written descriptions, pictures, videos and simulated situations.

Data and analysis

Interviews were conducted with all four physiotherapy teachers, who worked at Pirkanmaa Polytechnic during the years 1997–2004 and were responsible for the modules that included practical training outside the Polytechnic. Those physiotherapists who had taken part in the curriculum change for at least one full year were also interviewed. The aim of these individual interviews was to elicit teachers' subjective experiences. A further interview was conducted with a group of five volunteer students who were approaching graduation. Here, the aim was to learn about the students' shared understanding, as well as their individual experiences (see Vilkkä 2005). One of these students had also participated in curriculum development meetings as a representative of her group.

All the interviews were structured around themes selected from the agendas and memos of curriculum development meetings. The themes relating to cooperation were curriculum, teacher in charge, problems, working life expertise, practical training and final theses. Since a number of interviewees asked for their interviews not to be recorded, open questionnaires were used in these cases and answers were written down. During the interviews interviewees were asked to discuss the previously selected themes in relation to the cooperation that took place between the different partners. Many interviews included emancipator episodes where discussions served to broaden understanding about the problem-based learning environment (see Vilkkä 2005).

After each interview written notes were expanded to include further detail, then all items that represented the interviewee's own thinking and activity in relation to cooperation were selected for further analysis (see Uusitalo-Arola 2004). The data was structured entirely around the interview themes,

although one of the original themes (teacher in charge) was deleted because the interviewees did not mention any cooperation in relation to this theme. Also, one new theme (practical lessons) emerged from the data and was added to the list. The 17-page summary was sent to all informants for checking and correcting. This was one way to ensure that the data was authentic (see Puolimatka 2002). After receiving the feedback one addition (from a physiotherapist) and one clarification (from a teacher) was made to the data.

The method of qualitative content analysis was adopted for analysing the data, and the focus was on features of dialogism in informants' speech. (See Eskola & Suoranta 1996; Tuomi & Sarajärvi 2002; Vilkkä 2005.) The analysis helped to clarify the type and nature of the dialogue (see Nonaka & Takeuchi 1995) that emerged from the data.

Results

Dialogism was very much in evidence in the cooperation that took place between teachers, physiotherapists and students. Communication was open and there was a respect for other partners and their viewpoints. Dialogical discussion made it possible to achieve the common goal that was the aim of the cooperation. The various categories of dialogue can be described as: understanding dialogue, expert dialogue, inner dialogue and guiding dialogue. Next I consider in more detail the nature of dialogism and common knowledge creation in each of these types of dialogue, supporting observations with quotations from informants.

Understanding dialogue

Understanding dialogue was apparent in constructing the curriculum and in its continuous updating. The teachers, physiotherapists and students worked as equal partners beside one another. After the cooperative work began and

the partners became better acquainted, a sense of openness developed and participants started to express their own viewpoints more freely. Trust developed between the partners, and viewpoints were appreciated and listened to. All viewpoints were discussed and taken into account when reaching common conclusions. In fact, it was the combination of each partner's expertise that brought richness to the final outcomes.

Participating in cooperation meant "*learning to talk a common language*" (P2¹, T3). This common language was said serve as an intercessor between working life and education. Teachers said that physiotherapists gave the students "*wordless respect which showed that the school is not apart from practice*" (T1). Also the students felt that their voices were fully taken into account.

The teachers reported that the physiotherapists at the beginning of the process gave their "*blessing to the themes included in the curriculum*" (T2). Later, the physiotherapists had a role in deciding on the relative importance of different parts of the curriculum and in correcting its content. The teachers pointed out the way in which the physiotherapists confirmed that the content of the modules corresponded with the needs of working life. Teachers appreciated the way physiotherapists "*brought everyday realism into education and kept the teachers' feet on ground*" (T1). Some teachers felt that it was thanks to the physiotherapists that the curriculum remained "*up-to-date*" (T4). The interviews with the physiotherapists supported these views. They saw one of their functions within the group as "*bringing the teachers back to earth*" (P4). Physiotherapists viewed themselves as intercessors, bringing the changes in working life to teachers' attention, and generally acting as "*middlemen*" (P1) between education and working life.

Cooperation was often described in terms of metaphors, a way of making tacit knowledge explicit when one does not have direct words for it (Nonaka & Takeuchi 1995). The cooperation process itself involved making individuals' experiences and expertise explicit for others' reflection (see Nonaka &

¹ In connection to the quotations I use the codes T1, 2, 3 and 4 to refer to teachers' speech, P1, 2, 3 and 4 to refer to physiotherapists' speech and S to refer to students' speech during group discussion.

Konno 1998). This is how dialogical cooperation can activate reflection in individuals who participate in cooperative processes (Maranhao 1991). Participants process what they listen to and everyone produces his/her own reflection for creating common understanding (see Nonaka & Takeuchi 1995; Järvinen & Poikela 2000).

All who took part in the cooperation represented their prevailing expertise, and each considered the items under discussion from their own point of view (Schön 1986, reflection-on-action). This was a way of making common understanding possible. Through common reflection participants had the opportunity to also consider items that were unfamiliar to them, giving them the possibility to understand the reality in a broader way than before. (Freire 1972; Hannula 2000.)

Figure 1 illustrates the equality between partners in understanding dialogue. The expertise, experiences and needs of the teachers, physiotherapists, as well as students meet in the dialogue space that is located in the middle of the figure. Each of the arrows describes the reflection each individual partner offers in the dialogical discussion.

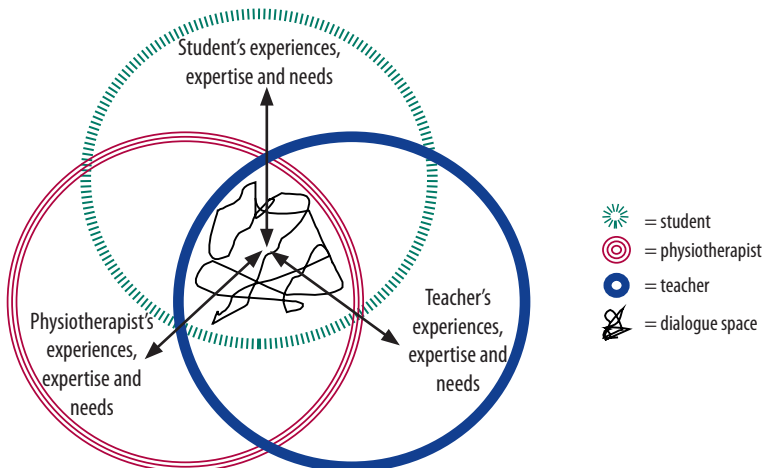


FIGURE 1. Understanding dialogue in the cooperation between teachers, physiotherapists and students

Expert dialogue

Teachers were responsible for constructing problems in accordance with the aims set out in the curriculum and also in accordance with the reality of working life. In order to achieve this, they cooperated with physiotherapists, other health professionals, patients and other teachers. Although teachers had dominance over the other partners, the data reveals that power was given as well as taken (see Järvillehto 1996). This cooperation mostly took the form of bilateral discussions, and the dialogue here showed a clear respect for other partners' expertise and experience.

One teacher noted that the physiotherapists "*helped us to understand patients' situations and they added professional perspectives to the items selected in the starting points*"² (T1). She added that creating problems together with the physiotherapist offered a feeling of "*security*" (T1) when running PBL. The students noted that the problems they handled were just like pieces from "*everyday life*" (S). Such problems, they argued, guided their learning towards practical issues and, in this way, they felt their learning experience was "*inspiring*" (S) (see also Fyrenius 2003; Hafler 1997; Silén 2003).

Physiotherapy teachers also cooperated with nurses and patients' relatives in order to achieve a broad understanding of the issues in problems. For instance, the experience in which one mother described her child's disease as "*a pain in my heart*" (T1) helped the teacher to understand the relative's feelings more deeply. Creating problems had different phases: the teacher's initiative, the experts' input, the teacher's confirmation, the expert teachers' comments, finalising the problem, implementing the problem, getting feedback, redefining the problem and updating the problem (Table 1).

² In physiotherapy education at Pirkanmaa Polytechnic we use the word starting point as a synonym for problem in order to avoid misunderstandings. In physiotherapy the term problem is reserved for the physiotherapy problem that physiotherapists create after having assessed their patient (see Boud & Feletti 1997; Fyrenius 2003).

TABLE 1. Examples of creating a problem dialogically

The phases in creating problems	Example 1	Example 2
Teacher's initiative	The teacher told the student nurse about the aims and basic contents of the module.	The teacher wrote a case from her previous expertise as a physiotherapist using the physiotherapy report one student had written on a placement.
Experts' input	The nurse thought of an example in which the aims and contents could become concrete.	Three different physiotherapists read the case making additions from physiotherapy practice.
	The nurse told the teacher about a case in which she had connected things from two different students' life situation. The teacher tape-recorded the story.	
Teacher's confirmation	The teacher listened to the tape a number of times and wrote a case after appropriate editing.	The teacher read through the case making additions from the point of view of the module.
Expert teachers' comments	The subject expert teachers made comments about the case using their subject expertise.	The teacher asked for comments from another teacher who was familiar with the content.
Finalising the problem	The nurse read through the case and made some corrections with the teacher.	The teacher finalised the case with physiotherapists using telephone contacts.
Using, redefining and updating the problem	The case was used as a problem. Later, the case was redefined and updated after the feedback.	The case was used as a problem. After feedback from the tutorials, it was later updated .

After the dialogue, which prompted the teacher to reflect on the issues raised, she seemed to achieve a richer understanding of the theme area she was responsible for. During the dialogue the partners found common ground through sharing reflections based on their own areas of expertise. Nonaka and Takeuchi (1995) as well as Nonaka and Konno (1998) talk about a similar connecting of knowledge. Expert dialogue led to the creation of new problems for PBL learning environments (McAlpine et al. 1999, reflection-for-action).

Figure 2 describes how expert dialogue occurred between teachers and physiotherapists. The dialogue started on equal terms, with the teacher's

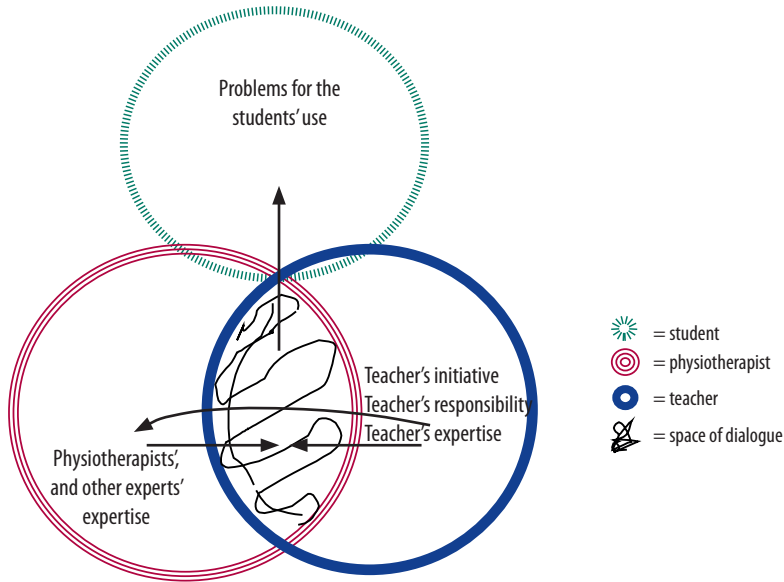


FIGURE 2. Expert dialogue in creating problems

initiative. The teacher offered her expertise for consideration and also gives space to the partner's expertise which, in turn, enriched her viewpoint. The dialogue led to a mutually created outcome in the form of PBL problems that were used for students' learning.

Inner dialogue

One teacher's dialogical reflection started when the teacher attended a lecture by an expert physiotherapist and, in another case, when a teacher observed students working with patients. The know-how that was derived from this open reflection helped the teachers to reconsider their former views about the content and the implementation of their modules.

In their interviews teachers reported that the experts in physiotherapy put lecturers in touch with practice in a “*hard and solid*” (T1) way “*they deepened the knowledge in question for the students*” (T4). The physiotherapists observed that the lectures given by expert physiotherapists gave conceptual frameworks regarding how different approaches work in practice. The physiotherapists need to be able to mediate patient-centeredness and the different viewpoints used in therapy practice. One teacher said that she attended these physiotherapists’ lectures in order to learn something new, and also to be able to develop the module as a whole.

During the education process, the students attended practical examinations where they met ‘real patients’. The students made plans for these situations as a group. They welcomed the patient, interviewed him/her and observed his/her movements and the functioning of his/her joints. They also carried out a detailed physiotherapeutic examination, drew conclusions with their patient and offered them guidance. One teacher said that situations like these showed the students’ preparedness to act in real work contexts. One teacher felt that, from these situations, she could “*discover the strengths and weaknesses the students have and thereby develop their education.*” (T2).

Inner dialogue is connected to observing action and the reflection it provokes. Here, the active partner made his/her knowledge explicit (Schön 1986, knowing-in-action), while the observing partner – the teacher – considered the elements she had noticed in relation to her previous experiences and own expertise. This reflection during action, reflection-in-action (Schön 1986), is promoted by the teacher’s expertise, and the resulting inner dialogue offered useful insights regarding students’ learning abilities.

Figure 3 shows how the teachers’ participation in the physiotherapists’ lectures and the observation of students’ physiotherapy work activated teachers’ inner dialogue. In situations like these the physiotherapist or student makes his/her knowledge explicit and offers this as an instrument for prompting teachers’ individual reflection (Nonaka & Konno 1998). Nonaka and Takeuchi (1995) describe this as internalisation, which refers to the inner thinking process, reflection, that starts during action and that assists the development of action.

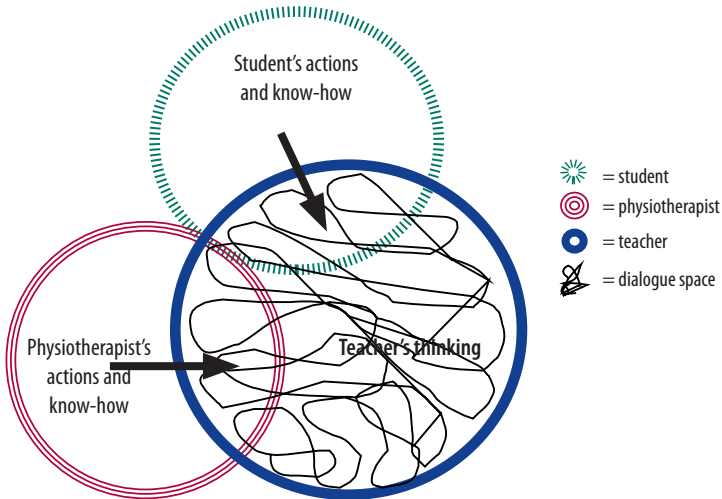


FIGURE 3. The teacher's inner dialogue

Guiding dialogue

Guiding dialogue took place when teachers chose practical placements for the students. It was also in evidence when the supervising physiotherapist selected patients for the students which she thought would further his/her learning. Characteristic of guiding dialogue was the initial aim, on the part of the teacher and the physiotherapist, to learn about the student and his/her level of knowledge. Although the teacher and the supervisor occupied dominant positions in relation to the student, they tried to respect the student's know-how and goals when making choices.

One teacher mentioned that she worked both with students and the supervising physiotherapists in order to find the most suitable placement for each student. A physiotherapist stated that, at the beginning of the practical training, she takes students with her to her own therapy sessions. She explained that she chooses the patients for the students according to her un-

understanding of each student and his/her capabilities. Students start by carrying out physiotherapy under supervision and, after they develop their skills sufficiently, the physiotherapist offers them opportunities for autonomous therapy situations.

Guiding dialogue only becomes possible when the expert has expertise and the will to act in the other person's best interest to further his/her professional growth (Schön 1986, knowing-in-action; Ojanen 2002). He/she must consider the learner's potential in relation to existing learning possibilities, and also how he/she can organise productive opportunities for the student's development.

Guiding dialogue (Figure 4) does not require full equality. Instead, the teacher or the physiotherapist needs to understand the prior experiences of the students and be prepared to create a supportive learning environment for them. Buber (1995) asserts that the educator has an opportunity to act in the best interests of students when he/she knows their capacity, goals and short-

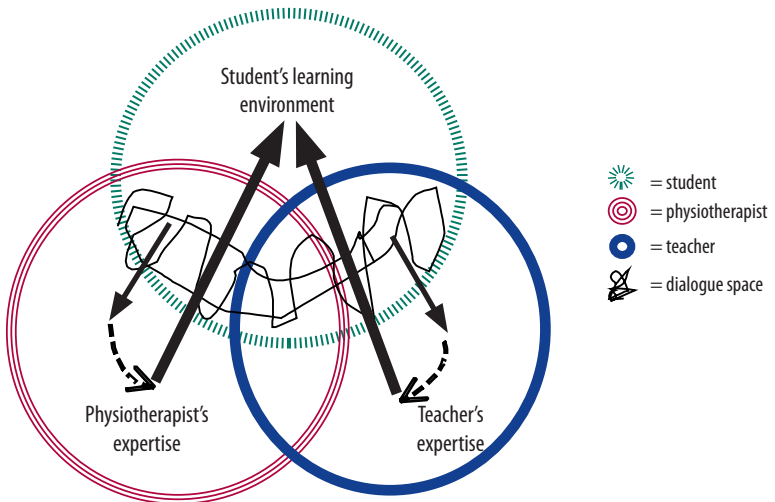


FIGURE 4. Guiding dialogue in the instruction process between teacher and student or teacher and physiotherapist

comings and how they interrelate. This can be compared with what Nonaka and Takeuchi (1995) observe about socialisation that enables the delivery of experiences to the other partner in a dialogue without verbal communication.

Discussion

The purpose of this article was not to cover all the discussion that took place during the cooperation process between working life and education. Instead, the focus was on speech that had the quality of dialogism as Bakhtin (1986), Burbules (1993) and Buber (1995) define it. This study explored the dialogical cooperation between people involved in constructing a problem-based learning environment.

The dialogical spaces that emerged from the data took the form of understanding dialogue, expert dialogue, inner dialogue and guiding dialogue. During informant interviews, dialogism was apparent in the respect for one another's expertise and experiences, in the reciprocal and focused content analysis, and in the ability to think together. These findings demonstrate that genuine dialogue between partners mutually activates autonomous reflection, which is driven, in turn, by partners' previous expertise and experiences. When each partner brings his/her own reflection to the shared discussion, they can together create new shared knowledge through reflective dialogue (Kolb 1984; Boud et al. 1985). In the data this new knowledge appeared, during the creation of the curriculum, as common understanding and shared solutions. It was evident in the formulation of problems, in the new ideas for implementing education and in the choices made for providing an optimal learning environment for students.

Dialogical cooperation and the four types of dialogue discussed in this paper are important tools for the development of partnerships between education and working life. Dialogue makes it possible to challenge traditional hierarchical modes of action in developing educational programmes (Isaacs

2001). Continuous dialogue makes it possible for professionals from education and working life to achieve common goals (Sarja 2003). Collaborative dialogical discussion offers opportunities to exploit the expertise of all participants. This is why dialogical discussion works as a tool for creating new common knowledge and new common viewpoints (see Silkelä 2003). The results of this study establish dialogical cooperation between partners in education and working life as a fundamental prerequisite for developing PBL education. Dialogism helps to create education that is relevant to the needs of working life and has the potential to develop working life. It is only through dialogical cooperation that problem-based learning can be understood as a pedagogical approach that integrates education and working life.

The starting point for this study was the unquestioning acceptance of statements made by the informants (Holstein & Gubrium 1994). Despite the impossibility of acquiring such data in authentic situations, the results of the study are congruent with reality. Every informant described concretely and in detail the communication that took place during the cooperation process. This is why it was possible to examine the nature of communication in relation to different types of dialogue. The incongruity of the informants' answers adds validity into the results. To confirm the data, the informants were asked to check the summaries of notes.

My own active role in working with the partners may have affected my interpretation of the data. However, I found the dual role as researcher and active partner more beneficial than harmful, since these roles allowed a fuller understanding of content and meaning than would have been available to an outsider. Being an insider allowed close contact with the reality of the studied phenomenon (Aittola & Kallio 1991; Vilkkä 2005).

During the analysis it became clear that the reflective dialogue used to develop education did not only develop the learning environment. Active, shared reflection was shown to advance the learning and professional development of each participant. These are the reasons it is essential that everyone involved in developing education should understand and implement dialogism and dialogical reflection. In conclusion, I would argue that only after dialogical cooperation between education and working life is it pos-

sible to talk about problem-based learning as a pedagogical approach that integrates education and working life.

This article focuses on dialogue between education and working life in planning and implementing the PBL environment. Two further areas meriting future research in the area of PBL and dialogue are an analysis of the types of dialogue in PBL tutorials and an examination of the relationship between dialogues in PBL tutorials and work settings.

WORKING OUT A TEXT

– PBL tutorial participants as knowledge constructors in international business studies

As I was interacting with the empirical material I produced for my PhD study ‘Negotiating interdiscursivity in a problem-based tutorial site’ I understood how hard it was for PBL tutorial participants to regard themselves as active knowledge constructors rather than passive recipients parroting the objective knowledge produced by the mainstream business and management textbooks. This article is based on these notions. The aim is to describe and analyse how students pursuing international business studies try to make sense of the textual material they have studied for a closing PBL tutorial. I am especially interested in exploring how students position themselves with regard to knowing. The empirical material I drew from is derived from a videotaped PBL closing tutorial at Helia Business Polytechnic during the autumn of 2001. At this time, the students had only had one semester of PBL.

A problem-based learning tutorial discussion as a site for knowing and interaction is constructed, negotiated and renegotiated continuously during an international business programme. Students produce discursive practices of knowing, language, modes of interaction and social identities within the domain of international business. They use various resources from a wide variety of cultural and social realms in creating these practices. I am partic-

ularly interested in gaining a glimpse of how students negotiate knowledge and knowing when exploiting the material they have studied during the independent knowledge creation phase. My goal is to indicate how challenging it is for them to question the information expressed in textbooks and how tight the conventions are that endorse the contents of business and management textbooks as the dominant, neutral, natural, and taken-for-granted discourse of international business.

The structure of this article is as follows. First, I explore the goals of the PBL tutorial script. By PBL tutorial script I mean the tutorial procedure (the steps or the cycle) which structures the tutorial interaction. PBL provides a fairly firm and yet reasonably effective script to guide the interaction of a collaborative group towards the completion of their task. The tutorial participants are invited to negotiate their roles within this script and to introduce sufficient flexibility to the tutorial modes of interaction.

I am particularly interested in how the students are instructed for the self-study phase and how they orientate themselves towards various sources of information. The sources that are mainly used in international business education are Anglo-American textbooks and other popular management books describing business operations. I therefore analyse how the international business textbooks are seen to have been constructed and what kinds of reader positions they offer to their student-readers. These reader positions are generally revealed when students talk about their learning in the tutorial discussions. Earlier, I studied (Alanko-Turunen 2005) how these students invite and negotiate various genres and discourses within a tutorial site, and in this article, I concentrate on analysing one closing tutorial discussion which exposes the variety of discursive resources international students draw on during the early phases of their PBL studies. Finally, I discuss the role and status of international business studies in enabling certain discourses of business to dominate curricula in general and a tutorial discussion in particular.

PBL tutorial participants setting learning objectives and the direction of their self-study in a tutorial context

The starting point of PBL is that learning occurs when active and independent learners work collaboratively with problems in a tutorial setting, reflecting their assumptions and the premises of their thinking and actions. In the tutorial group setting, learning and problem-solving are facilitated by a tutor. A tutorial should provide a safe setting in which students can explore, reflect and attempt understanding, rather than seeking to learn and remember the right answers. This setting involves several phases depending on the PBL script adopted by the curriculum. The major difference between these scripts are that the Maastrichtian seven-jump procedure (Schmidt 1983) rests more on the cognitive approach to learning which underlines the significance of the rational problem-solving process and individual knowledge construction. Furthermore, the role of assessment is not explicitly embedded in the learning process (e.g. Poikela 1998). The cyclical models of PBL emphasise the experiential approach to learning as well as the role of continuous assessment and evaluation (Poikela 1998; Poikela 2003).

The PBL tutorials take place within a certain model of PBL curriculum. Savin-Baden (2000) has examined various models of PBL curricula and concluded that they can be differentiated by the ways in which knowledge, learning, and the role of the student are created within them. The positioning of knowledge or knowing in the PBL curriculum is revealed by the ways in which triggers are expected to be solved, processed and managed, as well as the through the assessment processes. Curriculum development is thus based on the stances teachers have taken when planning the processes; they have had to commit themselves to certain ideas about knowledge, learning, and the roles of students and teacher. The demands of the world of work have also been dominant in PBL curriculum reforms. Quite often it has been the practical side of PBL that has encouraged teachers to transform their curricula, leaving theoretical curriculum discussions aside (see Lindén & Alanko-

Turunen in PART I). The scripts and roles PBL provide, are seen as simple and straightforward tools to be used without theoretical considerations.

The various phases of the PBL script guide the tutorial group's work from the initial clarification of terms in the learning trigger, through a phase of problem definition, to a phase of brainstorming in which they express their initial ideas. Students have to elaborate on their initial ideas and critically assess what they know and what they do not know. Finally, they have to compose individual learning objectives for self-directed study. During this fifth phase of the tutorial script, they agree on their joint learning objectives. They also have to reach an agreement regarding their approaches to acquiring information: what kinds of resources will they study? The self-study phase is usually 2–4 days long and contains not only individual study with textbooks and articles, but also resource lectures, workshops and expert interviews depending on the theme (e.g. Alanko-Turunen & Öystilä 2003, 107). The starting point of the self-directed study phase is that students learn to schedule their studying, find relevant sources of information, read the sources according to the set learning objective and challenge the sources based on the logic of the arguments presented in the read materials. Furthermore, students are expected to process the material they have studied by producing notes and concept-maps. These summaries help them to present their meaning-making to the others in a rapidly progressing tutorial discussion. They are also expected to bring along to the tutorial topics they found difficult to understand. Students who master critical information retrieval, processing and assessing skills can be described as information literate (see e.g. Ruokolainen 2005).

During the closing phase, students discuss and synthesise the results of their self-study in order to gain a deeper, more detailed understanding of the processes and phenomena underlying the problem under study. Students are invited to elaborate their understanding by probing, structuring and socially validating. The effectiveness of the closing phase depends, according to students, on the amount and nature of students' explanations, application and integration of knowledge, discussion of counter-related differences of opinions and measured guidance of the group discussion (Visschers-Plei-

jers, Dolmans, de Grave, Wolfhagen, Jacobs & van der Vleuten 2006). The more advanced students are expected to deconstruct the multitude of ways in which scientific knowledge is created and what positions writers of certain disciplines take when employing certain concepts and pre-understandings. They should pose problems and examine the assumptions underpinning the knowledge they have studied. Critical students, it is assumed, will question naturalised truths and understand the contestable nature of knowledge and the power/knowledge relationship.

Textbooks as learning resources – the reading positions offered

Conventional business education is usually presented as if the skills and competences it promotes are acultural, ahistorical and unrelated to the power relations that shape life in organisations and society. Graduates are equipped to undertake assignments, carry out instructions and work with others, but they are not necessarily able to analyse or critique a situation in which they find themselves or information which has been given to them.

The most important information sources employed in international business education – unless students have former experience of business operations beyond that of being customers – are textbooks and popular management texts written by famous managing directors of companies or gurus in specific fields. Business textbooks appear to give a rather homogenised and value-free picture of society so as not to present any uncomfortable controversies to the students (e.g. Perlmutter 1997; Grey 2005). Textbooks about marketing, especially, appear to portray it as a neutral tool. A considerable portion of these textbooks is dedicated to introducing the student to a specialised vocabulary of concepts and definitions. Hackley (2001; 2003) even goes so far as to claim that marketing textbooks carry epistemological bacteria, that infect students after their first encounter with them. He points out the immediacy, the simplicity, the directness and the practicality of mainstream marketing textbooks. If, thereafter, one adopts a tone or style

of argument which does not coincide with this, students and lecturers find it quite easy to comment that ‘this is not marketing’.

International business knowledge is in danger of becoming a series of pre-packaged information fixes, often understood as the creation of a particular expert, with a slightly unusual yet memorable name such as Kotler, Hofstede or Trompenaars. Watson (2004, 239–254) encapsulates this phenomenon in an article aptly entitled ‘Motivation, that’s Maslow, isn’t it?’ The training of international business practitioners has not been tied to certain theoretical traditions; rather it has been shaped through general and universal, mainly Anglo-American textbook recipes (Eriksson 1999). The Anglo-American dominance of textbooks reflects particular social constructions of the business world, usually written by white, middle-class male professors. This recipe-like format approach seems to transform business discourses into McCommunication (Block 2001, 117–133) which underlines not only the fact that the process relies on a framework which over-rationalises communication, but also that this framework is commodified and spread around the world. McCommunication could be understood as the framing of communication as a rational activity committed to the transfer of information between and among individuals in an efficient, calculable, predictable and controllable manner via the use of language, understood strictly in linguistic terms (syntax, morphology, phonology and lexis). The spread of McCommunication is manifested in the worldwide sales of popular management books. Students of business and management are likely to become accustomed to this type of discourse and learn from it how to communicate in business contexts.

Roberts (2005) has elaborated a similar line of thought regarding the development of textbooks. She has named it the Ritzerisation of knowledge, referring to the book *McCommunication (sic!) of Society* by James Ritzer. The Ritzerised academic text involves repackaging existing knowledge and associating it with a popular brand. Rationalising the production of academic texts leads to highly readable texts for students but, at the same time, when the market judges the success of ideas and information, then the market determines what information is available to students. Students, accord-

ing to Roberts, spend time reading highlights of edited great works instead of more challenging works that would demand more from a student reader. Knowledge-lite as opposed to a broad and rich knowledge base seems to be the flavour of the month in higher education.

Textbooks address their readers, and position them in ideological relations through various grammatical and lexical devices. Texts operate pragmatically through the use of pronominalisations, modal auxiliaries, and the selection of speech acts such as questions and commands, injunctions and orders. These lexical and grammatical choices construct different relations of power and agency between readers and writers, and between students and textbooks (e.g. Luke 1997).

Fairclough (1995) claims that reading positions are constrained and limited by the nature of the text. Even though business and management textbooks are written for a particular reading position, texts are nevertheless open to a multitude of readings and it is the reader's task to produce these meanings. Readers produce meanings from the linguistic and visual elements in texts by taking one of the three typical reading positions that are offered to the reader (e.g. Luke 1995; Hall 1980). The first reading position is called the preferred reading position. Here, the reader adopts the invited or intended reading. The second reading position is the alternative, negotiated position, where the active reader partly shares the preferred reading code although recognises some discrepancies in the text. She may modify the text in a manner which reflects her own interests and experiences. The third reading position entails reading against the grain; the authority of writer is challenged and the reader analyses the text by positioning the writer and what the writer assumes of and from the reader (e.g. Ellsworth 1997). Furthermore, the reader recognises the silences and marginalisations in the text and identifies biases and contradictions, and she may also deconstruct the text with other perspectives such as a critical or a feminist frame of reference.

Students should be able to read the textbooks with critical questions in mind. The guiding question is normally the learning objective collaboratively set in the PBL tutorial discussion. Consequently, learning objectives have

a central impact on how students approach and study the chosen theme (see e.g. Abrandt Dahlgren & Öberg 2001). Moreover, the form of the learning objective is dependent on the nature of the problem in the trigger. It should provoke debate and demand that students take a stance. Therefore, a student should also formulate her own questions in accordance with the collaborative learning objective in order to understand how the writer is producing a social construct of multiple discourses. Therefore, she has to identify from the beginning what the writer is intending to construct in the text, and what kinds of arguments she develops in order to support her case. When reading the text, students should be invited to write up their notes in order to reconstruct the main lines of the arguments and their take on these arguments. The processing of the text challenges them to take full responsibility for the information they bring back to the tutorial discussion, instead of merely being neutral reporters of other people's texts.

Setting the scene and methodology

The PBL curriculum of the International Business Programme (Liibba) was introduced in spring 2001 at Helia Business Polytechnic. Prior to this, extensive development work had been carried out by an active group of teachers in order to plan the contents and the methods of the reformed curriculum. The curriculum model of that time could be categorised more as PBL for professional learning than PBL for interdisciplinary understanding, although the development process has now been geared to this new direction. According to Savin-Baden (2000; 2006), with this model of PBL, students learn to solve problems and become competent in applying this ability to other kinds of problem cases and situations within given frameworks. In this way, the students develop critical thinking skills for the world of work, often interpreted fairly narrowly as the ability to use problem-solving abilities in relation to propositional knowledge as a means of becoming competent in the work place. The problem with this model is that students do not necessarily com-

bine the concepts of skills and know-how with cognitive content and professional judgement. Although the PBL script for the tutorial setting employed in this programme is mostly based on the Maastrichtian model, it has been elaborated by the introduction of an eighth step (assessment), as well as by an emphasis on continuous assessment during the whole process.

The Liibba curriculum consists of modules which last a semester. The tutorial discussion studied here is from the second semester and is centred on the theme of 'Establishing Business Ventures in the Global Environment' (24 ETCS). The students worked around a sub-theme of 'Identifying and Building Customer Relationships', which had a certain marketing and intercultural emphasis, for 8 tutorial sessions. The goal was to introduce the students to the realm of international marketing. This particular sub-theme was selected for the study because of my own professional and educational background in marketing, which made ideas conceptually manageable (see Holliday 2002, 38). My understanding of the tutorial themes assisted me in following the chains of thoughts and references presented by the tutorial participants. In this article I concentrate on analysing just one closing tutorial discussion which I videotaped and transcribed. The learning objective the students had set for the closing tutorial discussion was 'How do we build an international customer relationship?' The trigger, from which this objective was formulated, was not produced in collaboration with companies, unlike the rest of the triggers belonging to this sub-theme.

The videotaped tutorial consisted of 12 students and a tutor. The number of students in PBL tutorial groups was defined by the financial resources allocated to the Liibba programme. None of the students spoke English as their native tongue. The analytical approach I employed in reading the transcript and the memo students produced after the tutorial is informed by critical discourse analysis (Fairclough 2003; 2001). I was not so much trying to reconstruct the discourses the students drew from in the tutorial, as to pinpoint the relations, positions and representations that were constructed among the tutorial participants regarding knowledge and knowing. What makes Fairclough's CDA framework appropriate for this type of analysis is its outlook on texts as intertextual – made of other texts – and its multifunc-

tional viewpoint in which three social functions are achieved concurrently (representations, relationships and the constitutive properties of texts). Critical discourse analysis involves a transparent movement back and forth between microanalysis of the text exploiting textual and semiotic analyses, and macroanalysis of the social interactions and power relations that texts build.

Reconstructed positions and relations to international business knowledge

The learning objective of ‘How do we build an international customer relationship?’ had guided the students’ period of self-study from Thursday afternoon until Tuesday morning. The required reading list for this theme included books by Czinkota-Ronkainen, Kotler and Jobber. Some articles were also handed out on the resource lecture where an overview was given of some of the cultural frameworks applied in international business.

The Liibba students started their closing discussion by strongly referring to the concepts and terms they had read, rather than combining their reading to focus on the problem they had formulated based on the trigger of the Finnish businesswoman in Singapore. The discussion was guided by an active discussion leader (DL) who tried to involve certain students in the discussion. These students seemed to be the ones who were accustomed to being active. The students were trying to understand how to build an international customer relationship.

Excerpt 1

- 15 DL Yes, I read a different book
It is about (xxx)¹public relations and there was something about building trust – It says it is built on information and and if both sides have it, then they can build trust, but there are other things like (xxx) protection, credibility, confidence, harmony and seeking for mutual understanding and then there is trust [...] *(Reads from her notes, shows the cover of the book to the others)*
- 16 Nelly I thought it was said pretty well in a couple of sentences that the trust is the beginning of everything. It is difficult to create and easy to destroy, so and in the trigger they talked about(.)was it this one(.) they wanted to know the boyfriend and stuff like that.
 So in this one, they say it is not a waste to talk stuff like that, 'cause that kind of builds the trust if you know where you went to school what you(.)she studied and what kind of background does she have. It is better for the trust if you know nothing about this partner.
 So they put like another point of view we thought it was funny that they wanted to know all about her personal stuff but here it says it is useful.
- 17 Heidi Yeah, I found out that (.) in this business instructions(.)this is Business in Singapore that and there is just about what you are talking about trust and in Singapore they like had to build on really personal relationship they concern it really important when making a business deal and they must genuinely like you before they can feel ease with you and do business with you. *(She shows the pile of papers she has printed from the internet, looks at her papers firmly and, in the end, looks at her peers)*

The main sources of knowing seemed to be books and summaries printed from the internet. Students felt they did not need to mention the sources

¹ Transcription conventions:
 (xxx) one or more words are inaudible or unclear
 (.) a brief pause
 [...] some material from the original transcript has been omitted

in detail: it was enough to show the cover of the book or a pile of papers to make them legitimate sources. The names of the writers were not mentioned nor was their credibility as information providers judged. The discussion leader encapsulated her reading in a list of words and no one questioned the concepts or terms. It seemed enough simply to express these terms. Nelly tried to involve herself in the discussion by seizing on the term ‘trust’. She did not specify her source either, she only noted, that ‘it was said pretty well’ or ‘they say’ and assessed the source as reliable. She attempted to combine her reading with the prior discussion by explaining how the book provided a different outlook for understanding the meaning of building trust. The contents of the book were not challenged; they were reported in a neutral manner in the tutorial. Rarely did the students submit ideas from the book as ‘the author argues’ or ‘the writer suggests’. Heidi simply stated that she found something on the internet and proceeded to share it with the others. Knowledge seemed to be regarded as something found and received – it was definitive and neutral. The relationship between the authors and students was distant, and tutorial participants gave authority to these writers by ensuring that quotations came directly from their books. Hence, neither editing nor reconstruction work was undertaken. The position of the student was thus that of a reporter of authorial information, a quiet acceptor of submitted information or a passive listener. She could also be marginalised in the tutorial if she could not explicitly contribute information based on the written materials that were required reading.

During Heidi’s turn (17), one could also identify the hortatory genre of many popular management books. This genre is evident in texts where the author seeks to persuade the reader to fulfil commands that are given in a discourse. This is usually achieved by first establishing the credibility of the text producer. Then a problematic situation is presented and the text producer issues one or more commands which can also be softened to suggestions of varying urgency. Finally, the text producer moves to motivation for action. (e.g. Longacre 1992.) In terms of taxis, the way clauses and sentences are related to each other, the syntax of the hortatory genre seems to be predominantly paratactic, with one clause or sentence constituting an addition

to the others. These hortatory lists are thus easily memorised, and facilitate the transition from prescription to action. (e.g. Fairclough 2003, 152.)

In the following extract (Excerpt 2) the students had renegotiated the PBL script as one of the participants, Boris, was not content with the structure of the discussion. He was subsequently appointed by the DL as an assistant discussion leader. He had problems in taking the role as he also wanted to be the main contributor to the discussion.

Excerpt 2

- 105 Boris I could start with Hofstede's four dimensions, first the power distance. As we can see, Singapore is very high and Finland more low – power distance, ah anybody know what it is? (*waits briefly for an answer, but continues quickly*)
It is just the level of hierarchy (*draws a vertical line in the air*).
It is strong hierarchy where the boss is really the boss[...]
When I read this stuff and what you asked about Germany I always thought and read that Germany is really hierarchical (*has problems in pronunciation, grimaces*) country, and here I read that power distance is really low, I don't believe that! I see it in the structures of our firms.
Do you have anything about that (*looks straight to the tutor*)?
- 106 Nelly Can it be it says here that it is West Germany, could it be that is has been(.)?
- 107 Boris No.
- 108 Nelly No, it's been like that for long time.
- 109 Boris It has been more extremely in the West Germany. I don't believe, that it is true, but.
- 110 Nelly So, it is more probably like a guideline just(.)
- 111 Boris So(.)could we talk about(.)
- 112 Kaius (*His talk overlaps with Boris*) Maybe it is that the power distance is not that big in Germany, but there is like a structure which is really important, do you know what I mean?
For example in the Latin countries where the power distance is very big there are many levels. (*looks at Boris*)
From how to say normal workers to the manager there are like tens of middle managers and like never this guy who is in the bottom can talk with the manager. There is always so many levels and the information gets through so slowly [...] because

- maybe you don't have power distance is that much but the structure
- 113 Boris If it is strong structure, with not so many levels, but between those levels there is really a gap, an obvious gap, it is not easy for the employees to jump over one level and talk directly to a boss – he would be afraid of doing this (*Kaius shows in gestures, and saying 'yes' that he understands*)
- 114 DL How about Indonesia?

Boris showed in Excerpt 2 that he had reflected on the issue and compared his experiences and the contents of the book. He questioned the argument presented in the book and tried, first by looking at the tutor, to find a solution regarding the incongruity. The tutor did not intervene in the discussion but waited for other participants to probe the matter. Nelly was ready to point out that the source referred to a study made in West Germany, not in united Germany. Boris was not content with this explanation and still insisted that he could not believe the source. Nelly tried to work as a mediator in relation to this question, using low modality, and defined the status of the source as a guide giving general outlines. In this way, she did not dismiss the information presented in the book. This seemed to dampen the discussion for a short while.

Boris continued to lead the discussion to the next dimension in Hofstede's model, but Kaius wanted to pursue the previous topic. There were, at this point, two active discussants negotiating positions as sense makers. Others were left to follow their reasoning. Kaius and Boris did not consult the resource book in order to find out how Hofstede had argued his case, which was based on a survey he had conducted and the factor analysis he had carried out. Neither did they assess the logic and argumentation of Hofstede's study. They did not look for material that would have challenged Hofstede's results (e.g. McSweeney 2002; Williamson 2002). They remained at the level of accepting various conceptions, but did not take an active stance in assessing the arguments in order to construct a more developed understanding or a solution to the problem identified in the learning trigger.

The following excerpt shows how the students related to the topics they had discussed up to this point and how they entered them into the memo.

Excerpt 3

- 226 Nelly Maybe we covered it all?
 227 Kaius I don't think so (.) because this is so big, huge, we could talk like five hours about this (.)
 228 Recorder It is difficult to put all the relevant things in here (xxx) make it a little bit longer (*others agreeing and saying 'yeah'*)
 229 Maria I don't think it has to be that long because we have had to study this thing at home maybe it could be like a reminder in the memo, some key phrases like, you don't have to write it all over again (.) we have to really know these before we come here and not to read them from the memo, that is not(.) It is all here (.) (*looks at her papers, others agree with her by saying 'yeah'*)

At the end of the tutorial the students summarised the contents of the discussion, and the recorder produced a recap of what had been said up to that point. Nelly, in turn 226, using a low modality, suggested that 'Maybe we covered it all?' This suggests the idea that learning is about covering certain concepts and ideas from various materials – a phenomenon that is neatly described by Margetson (1994) with the expression 'coveritis syndrome'. Becoming an international business person was construed as knowing the 'right' terms and concepts. The students were anxious about whether they had achieved this. Kaius tried to position himself as understanding the scope of the studied area, but others did not accept this idea. The recorder worried about how to write down all the important terminology. Maria, meanwhile, reminded everyone about the role of the closing tutorial and the need to be prepared for the discussion. She stressed the importance of learning the major concepts even prior to the discussion, thus the role of the memo was constructed as simply a reminder of key phrases. This seemed to create the idea of the tutorial as a forum for students simply to tell one another that they had

‘covered’ the required material, and therefore knew the subject; discussion, arguing and sense-making were marginalised at this point of the tutorial.

The brief memo produced by the recorder of the tutorial was consistent with the reporting tone of the tutorial discussion. The memo consisted of a list of topics that had been covered: trust, the phases of developing a customer relationship and the four dimensions of culture-related values outlined by Hofstede. It was interesting to note that these themes were written in a de-contextualised manner, drawing once again from the textbooks rather than from the actual discussion that took place. What was totally missing, were the examples and personal experiences shared in the tutorial. These were not understood as valid sources of information, to be recorded in the memo. Furthermore, the discussion about understanding the learning objective and solving the problem was also absent from the memo.

Discussion and concluding remarks

My goal was to provide some glimpses of the tutorial discussion in the early stages of implementing PBL as a pedagogical approach in an international business curriculum. I have taken a somewhat critical stance in my construal of the tutorial discussion. By studying the tutorial closing session I have represented the social practices present there at that particular time. One has to bear in mind that it may take as long as 18 months for students to grow accustomed to and feel comfortable with identifying themselves as knowledge constructors instead of information reproducers.

What seemed to count as international business knowledge in the early phases of discussion in the PBL tutorial were the objective facts represented in mainstream business books (cf. Kaksonen in PART II). These were granted the status of neutral information; they were authoritative and persuasive in their constructions of the identity of the future businessperson. Their content was reproduced almost verbatim time and time again in the tutorial. The dominant discourses of business textbooks offered the students

the identities of passive reproducers of received knowledge. Business literature operated as a powerful machine in the tutorial. The employment of a new pedagogical approach, such as PBL, did not immediately lead to new means of understanding and making sense of the content. Even though students had problems to be solved or they had to apply the information to the case company situation, they seemed to prefer to stick to the order of reporting the concepts from the book and then, if time allowed, tried to apply them to a case. The content of textbooks appeared to be produced in a way that seduced the student-reader into taking a special reading position. This position ought to be resisted by introducing students to an oppositional or misreading of materials. Students should be encouraged to ask, for example, why this current organisational reality is promoted in these texts; why this reality and not another; and what ends are served and not served by this version of reality (e.g. Korpiaho & Päiviö 2004).

Business and management education in general, and the textbooks in particular, seem to socialise students into a view of what is normal and natural in the world. Business education could be taken as a symbolic indicator of possession of particular sorts of values, a particular code, rather than possession of certain skills. It offers entry into a code of business – a basis for communication. This business script offers positions, orientations and a sense of community. The role of business faculties is to legitimise this language. (For more see Grey 2005.) While PBL is often advocated as a progressive methodology, the PBL literature demonstrates little interest in using it to promote the kind of criticality associated with examining assumptions underlying accepted knowledge and the professions' power to maintain the status quo. (e.g. Hesketh 2005.) In addition, Yanar (2001) maintains that it is quite possible that the representative of the educational institution, in this case the tutor, might genuinely invite the students to participate in knowledge construction. However, it is also possible that she might unintentionally expect the tutorial participants to base their knowledge on the prevailing knowledge claims that are intertwined with the dominant mainstream discourses.

Crump and Costan (2003) even imply that business education relies on a system of closed pedagogical objects which create and sustain a fantasy world in whose mirror future managers see themselves as privileged experts able to comprehend and manage the complexity of work organisations. The notion of closed pedagogical objects involves the reduction of learning to simplistic, unreflective schemata. The tutorial discussion should endorse the understanding that studying business is a fully discursive activity that should be critically challenged, scrutinised and deconstructed from various perspectives.

THE REPERTOIRES OF THE TUTORIAL DISCUSSION AS RESOURCES FOR COLLABORATIVE KNOWLEDGE CONSTRUCTION

In this article I describe how the repertoires of the tutorial discussions can be resources for collaborative knowledge construction. It is important to study tutorial discussions because tutorials lie at the core of PBL (Poikela, E. 2002a). The research context in this study was the programme for kindergarten teachers at the University of Tampere. The data were video recordings of tutorial discussions which were examined using discourse analysis. This article is a part of my PhD degree, which was made possible through the support of the Academy of Finland and the “Life as Learning” project award for the ProBell research group.

Starting points

Rapid changes in working life and other areas of our post-modern society are bringing challenges to education. Key questions to study are: What kind

of competence and expertise is needed in working life now and in the future? How is expertise understood? Where is expertise produced? Another important concern, especially in the area of academic education, is how to develop a connection between education and working life and how to establish a connection between theory and practice. (Tynjälä & Collin 2000.) It is important to discuss how education can reveal new directions and function as a developer and innovator of working life practices. Recent views on the nature and development of expertise emphasise problem-solving skills (Bereiter & Scardamalia 1993), collaborative skills (Iedema & Scheeres 2003), participation in learning communities (Lave & Wenger 1991) and participation in creating new knowledge (Bereiter 2002; Bereiter & Scardamalia 1993; Hakkarainen, Palonen & Paavola 2002; Tynjälä 2006).

One pedagogical challenge in developing academic education and the curriculum is how to develop connection with working life, and how to integrate learning at work placements with theoretical studies (Ahola 2004; Collin & Tynjälä 2002; Tynjälä & Collin 2000). Problem-based learning (PBL) is one approach to connecting education and working life. Many studies of collaborative learning have been made in school environments and in computer or web-based learning environments (see Arvaja 2005). However, there is little research on collaborative learning or knowledge construction in the PBL environment (see Alanko-Turunen 2005).

The Department of Early Childhood Education at the University of Tampere has followed a PBL-based curriculum since the year 2000 (see Nummenmaa, Karila, Virtanen & Kaksonen 2006). During 2000–2006, learning at work placements was integrated into every year of the curriculum and into some of the courses offered by the programme. Thus PBL was used not only for theoretical studies, but also for learning at work placements. The theoretical background includes the idea of a close relationship between knowledge and action (Dewey 1999/1929), and solving problems can act as a bridge between work and theoretical studies (see Poikela, E. & Poikela, S. 2005b). In my view, knowledge can also be seen as a collaborative construction process that takes place in work tutorials. In this study, the theoretical background is linked to social constructivism (Burr 1995). Here, the concept

of “collaborative knowledge construction” refers to discussion in which a small group constructs new knowledge while solving a problem or carrying out a learning task (cf. Dillenbourg 1999).

The purpose of the research, data collection and the method of analysis

In this article the focus is on the question “How do different repertoires act as resources for collaborative knowledge construction?” The specific research questions are

- What kinds of repertoires do students use in tutorials, when they talk of knowledge?
- How do students use these repertoires in constructing collaborative knowledge?

Research data

The data collection methods were observation and the video recording of tutorial discussions. The research data comprises nine tutorial discussions that took place over three learning-at-work periods among five tutorial groups. The data collection was conducted during 2004 and 2006. The focus of the research and the analysis is on the seventh and eighth phases of the tutorial procedure. The total number of students participating in tutorials was 49. The number of students in each tutorial varied from 6 to 12. The same tutor was present in all tutorials for practical reasons. In discourse analysis, the purpose is not to compare different persons, because the analytical unit is not a person, but a repertoire system. My orientation to collaborative knowledge construction has been social constructionism (Burr 1995). From this perspective, language has a constructive task; it does not simply offer a

picture of reality, it is a part of it. (Potter & Wetherell 1989, 173; Suoninen 1993, 49.)

Data analysis

Discourse analysis is often regarded as a loose theoretical framework, which can be interpreted and used in a number of different ways. In this study I have drawn on ideas from the tradition of discursive psychology. My interest was in seeing how students used language and constructed knowledge within the course of tutorial interaction (Potter & Wetherell 1989). Many terms from discourse analysis (repertoire, discourse, frame) are used to describe what is constructed on the basis of the data. I have used the term “repertoire” because it allows more effective analysis of everyday talk than official language (Jokinen, Juhila & Suoninen 1993, 26–28). People have various versions of reality and one person can use different repertoires in a discussion about one topic. (Jokinen et al. 1993, 112–113.)

Repertoires in collaborative knowledge construction

The students typically used nine different repertoires in talking about knowledge in tutorials, which I named as follows: *text, observation, remembering, agency, criticism, difficulty, consideration, interpretation and goal-means repertoires*.

In the **text repertoire** the students described seeking and locating information in books, on the internet or in other written sources. In this repertoire the students gave summaries and listed items; they also used expressions such as “what I found in a book”, “what the books say”. Elements were constructed in passive and static terms. During this style of talk students considered their position in relation to the target as that of outsiders. The

questions presented in this repertoire often took a passive form: “Was it said ...?”

In the **observation repertoire** students described physical environments, practices and the actions of children and adults. In this repertoire the position of the speaker was that of a spectator and a listener. The observation repertoire was characterised by subjectivity, and thus it included talk about experience, drawing on such expressions as “There was ...” and “I noticed ...”. The questions in the observation repertoire took the form of “Did you see ...?” and “Was there ...?”

In the **remembering repertoire** – which was characterised by passed time – students recalled personal, individual and concrete events from childhood. Their own position was considered from the point of view of a child actor. Verbs tended to be in a past tense and there were expressions such as “It was ...” and “I remember when ...”. The students talk about the past events using narrative and reporting tenses. In this repertoire students also talked about their feelings and occasionally employed strong expressions.

In the **agency repertoire**, students talked about their actions and solutions. Here, it was possible to accomplish things. A feature of this repertoire was the use of “we” and action was described in terms of “an opportunity to act”. The position of the speaker was considered from the viewpoint of an actor. In the repertoire there were expressions of feelings such as “I am lucky” or “Sometimes I had to make irritating decisions”.

In the **criticism repertoire** it was the problems of the action environment that made an impact. With this type of talk students sometimes employed strong expressions: “It was stuck” and “It never happened”. There were occasional expressions of feelings, and the style of talk was narrative. Here, students made frequent use of the present tense and also of negatives. The criticism repertoire was often characterised by the use of softeners; to tone down a criticism, students referred to the opinions of others and to the conditions or frequency of the phenomenon.

In the **difficulty repertoire** students described their actions when confronted with difficulties, and such descriptions invariably included such expressions as “It is difficult ...”. Students often used negatives when de-

scribing difficulties and the feelings which were related to these difficulties were sometimes communicated with strong expressions. Many students expressed the need for support from the mentor in these difficulties. In the difficulty repertoire students often talked about children's individuality and how to take it into consideration during their actions. Experiences of difficulty were also connected to planning. In the difficulty repertoire the style of talk was at the level of individual situations and environments.

In the **interpretation repertoire** an explanation or meaning was found for phenomena. This repertoire included expressions such as "To my mind ..." and "It is like this because ...". In the interpretation repertoire the style of talk was that of personal interpretation, either of individual cases or at a general level. I refer to the explanation of individual cases as *situational* explanation and of generalisations as *conceptual* explanation. In these explanations the value dimension of an issue can often be seen. The interpretation repertoire seems to require either a text, an observation or an operation towards which the interpretation is directed.

In the **consideration repertoire** the picture of the phenomena was hazy and contained many possibilities. The style of speech could indeed be described as the repertoire of possibilities. Typical forms of expressions included "Could it be ...?", "Perhaps ..." and "I will think about it". In this repertoire students talked both about individual cases and at a general level. The consideration repertoire also included rhetorical questions. Furthermore, there were speculative questions which were based either on imaginary or real situations in the consideration repertoire.

In the **goal-means repertoire** the students' aim was to improve their own actions or practices. This repertoire sometimes applied to the individual case and was sometimes an expression of objectives and means at a more general level. The verbs of the repertoire were in the conditional or present tenses and the forms of expressions were sometimes strong, including modals such as "I must" and "I should". In this repertoire the adult's pedagogic role was stressed. In addition, the repertoire was typically normative by nature and contained a value dimension.

How the repertoires were used

When analysing the use of repertoires a range of functions were observed. It was possible to identify four different styles of speaking on the basis of these repertoires: *repeating*, *applied*, *inquiring* and *developing talk*. While some repertoires were constructed alone, others were integrated into other repertoires. These repertoires were the text, observation, remembering and agency repertoires. The repertoires that appeared in a solitary form were giving a summary, stating or repeating, and describing.

The function of the repertoires was mainly information transmission. I refer to this kind of repertoire as **repeating talk**. Next, I will describe the repertoires which were used on their own. In addition to information transmission, the text repertoire was used for emphasising a lack of experience. The observation repertoire was used to describe the interests and behaviour of the children and to transmit action ideas to other students. As well as transmitting information and describing feelings, the remembering repertoire was used for entertainment purposes, for creating a positive atmosphere in the group and for maintaining group solidity. In addition to information transmission, the agency repertoire was used for the description of students' own means. Except for the text repertoire, the talk was at the level of individual cases.

These repertoires may become integrated into other repertoires. When the text repertoire was integrated with the observation repertoire, the talk was applied. I refer to this integrated talk as **applied talk**. Students sought examples to illustrate observations made in the text repertoire or to supplement the text repertoire. These illustrations were used to confirm the research results or theories that had been indicated in the text repertoire. I refer to such integrated repertoires as **inquiring talk**, where the repertoires were connected to interpretative or consideration repertoires. Together, the text, observation and also the criticism repertoire were used to criticise theories that had been presented in books. When an interpretation repertoire was attached to text and observation repertoires, conceptual explanations

were sought from the book. In such cases the text repertoire might be connected to the consideration of ethical questions.

The observation and interpretation repertoires contained, an explanation or a contention regarding the observed matter, and thus served as a means of argumentation. Together, the observation and consideration repertoires were used to make comparisons and to support or overturn earlier considerations. The observation repertoire was also connected to the agency repertoire. In this case the observations served as a starting point for a new action. The information that was received through the observations was utilised in the planning and realisation of the action.

The remembering repertoire, in connection with the interpretation repertoire, served to offer a meaning or explanation. When the agency repertoire was used in connection with the interpretation repertoire, the meaning of the student's own actions was justified. The connection to the consideration repertoire meant that different possibilities for action were thought about beforehand, during the action or afterwards. In connection with the goal-means repertoire, new targets or means were set for individual action and for solving difficulties. The difficulty repertoire was integrated into the goal-means, agency, interpretation, and consideration repertoires. On the one hand, difficulties were specifically encountered through the action; on the other, action subsequent to the difficulties was explained, as students described how the difficulties had been resolved. The interpretation repertoire revealed the reasons and significance behind the difficulties. In the consideration repertoire, however, solutions to the difficulties were thought about beforehand, during the action or afterwards. In the **inquiring talk** the repertoire was produced on the one hand at the level of individual cases and on the other at the level of general phenomena. I refer to the level of the individual cases as **horizontal talk** and the level of general phenomena as **vertical talk**.

In analysing the use of repertoires I found two combinations of developing talk which were used for describing the present situation and for examining problems or difficulties which were seen and encountered. This type of talk also produced an aim to improve or develop the situation at the level of

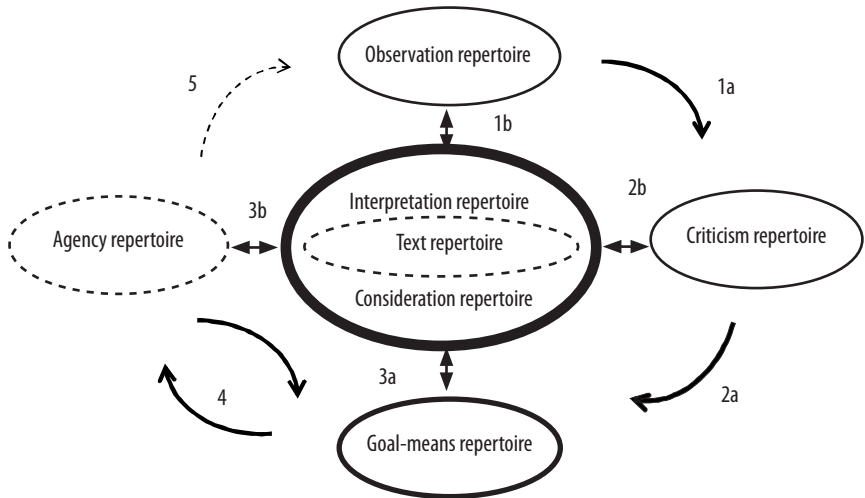


FIGURE 1. Displacements in developing talk in relation to the acting environment

action. One of these combinations of talk applied to the individual level and the other to the environmental level. The following figure (Figure 1) depicts developing talk at the level of the acting environment.

Figure 1 illustrates the collaborative knowledge construction process. The repertoires with bold lines are, in my view, the places where it is possible to move from the level of individual cases to the level of general phenomena in tutorial discussions. By means of common interpretation and consideration, and by using conceptual explanations, it is possible to achieve an understanding of the essence of the phenomenon under discussion. Furthermore, in the goal-means repertoire it is possible to produce potential knowledge which is directed towards the future. Students can make use of this knowledge in new situations and activities. Although I have numbered the process of displacements, the order of displacements can vary. Furthermore, all repertoires in Figure 1 are not found in all developing talk. The agency repertoire, for example, may be missing. Several group members can participate in producing these repertoires.

In Figure 1 collaborative knowledge construction begins with the observation repertoire in which a student describes the conditions or events of the environment. One can move directly from the observation repertoire or through the interpretation repertoire, to the criticism repertoire (displacements 1a or 1b and 2a). In the criticism repertoire a student describes problems which he/she has observed in the environment, and from this repertoire the student can move either directly to the goal-means repertoire (displacement 2a) or to the interpretation or consideration repertoire (displacement 2b) in which he/she can explain or consider the reasons for the phenomenon being criticised. In this interpretation and consideration process there can be many participants, in which case it is possible to examine the phenomenon from several alternative viewpoints. The talk that has been produced in the interpretation repertoire can either be situational explanation or the text repertoire integrated with conceptual explanation. In this way, it is possible to produce a common reserve of knowledge regarding the essence of the phenomenon. Furthermore, shared reflections also are possible in this process. From the interpretation repertoire the student can move back to the observation repertoire and the criticism repertoire (displacements 1b and 1a). This produces new critical observations. From the interpretation repertoire the student can move either to the agency repertoire or to the goal-means repertoire (displacements 3b or 3a).

When moving to the agency repertoire, the student describes how he/she has tried to act in the environment criticised earlier. Possibly he/she moves, at this stage, back to the interpretation or the consideration repertoire (displacement 3a). Alternatively, the student can move from the interpretation repertoire to the goal-means repertoire (displacement 3b). In this displacement the process tutor with his/her questions is an important initiator. The goal-means repertoire includes the consideration of different alternatives. The new, collaboratively constructed knowledge reserve is a potential resource for the student in new situations and actions (displacement 4), in which he/she can make observations for new collaborative knowledge construction (displacement 5). I illustrate the processes occurring in Figure 1

with examples from the research data (1a, 1b, 1c and 1d)¹. These examples are from the second tutorial during the learning-at-work period for third-year students. The theme of the study period was “Advancing Expertise in Early Childhood Education” and the object of information collection was “continuity in the planning and actions of the day care centre”.

Example 1a

313	student 51	well, so, <i>we have</i> a water project going on <i>there</i> , <i>supposed</i> to be going on, <i>but</i> so it
314		is, when here is something, it was <i>stressed</i> last time, that the <i>source is children</i> , but,
315		it isn't, actually, they have <i>decided it beforehand</i> that they will take it, so <i>not</i> so
316		many <i>children's thoughts</i> are taken into consideration that they have <i>decided</i>
317		<i>beforehand</i> what they will include in the project and they have planned beforehand
318		what will be done each day ...((the description continues))
323		...then I still asked the mentor what she
324		thinks about that the way the continuity is realised, so she asked “what”
325		((<i>laughter</i>)), <i>in other words</i> , it has not <i>become conscious</i> in a way, so surely
326		somehow
327	tutor	yy-y
328	student 51	so one progresses <i>logically</i> and knows <i>what must be done</i> but <i>not consciously</i> take
329		into consideration how <i>children's idea's</i> could be considered ((another critical
330		episode is following))

In line 313 student 51 produces an observation repertoire by telling others that there is a water project going on. He/she uses the expression “we have” which implies that the student is a part of the day care centre. On the other hand, s/he uses the expression “there” which can be interpreted as a distancing cue, showing that the student is not involved in all actions. The expression “supposed” signals the approach of the criticism repertoire into which the student moves, in line 313, with the word “but”.

However, before this criticism, the student moves to the interpretation repertoire (line 314) and points to an earlier tutorial and to a talk about taking the children’s ideas into consideration. The student uses the word “stress” and so emphasises the importance of the children’s ideas and, at the

¹ The symbols in the transcription are: (.) =a brief pause; (2) = a pause in seconds; *...*= a low voice; (...) = some material from the original transcript has been omitted; ((...)) = analyser’s comment.

same time, justifies the criticism he/she makes. In lines 315–318 the student describes the questionable action in the criticism repertoire. The core of the criticism is, on the one hand, the fact that decisions have been made beforehand, and on the other that attention has not been paid to the children's thoughts in planning the project. The student repeats the concept "beforehand" which can be interpreted as showing the importance of the phenomenon being objected to. At the end of the narrative description, in line 325, laughter arises which can be interpreted as an expression of irony about the concept of the project. This interpretation is strengthened by the expression "in other words", in line 325, with which the student, in a way, interprets his/her earlier laughter. At the same time he/she is moving towards the interpretation repertoire. The student indicates that the reason for the fact that continuity is not realised, is that they are not aware of continuity. By using the concept "become conscious" the student implies that education should be conscious in nature. In line 328, the student softens the criticism by telling the others that the action does however progress logically. By using the concept "must" the student feels that the action in the day care centre is based on the orientation about what must be done. By repeating the concept "consciousness" (line 328) the student is underlining its importance. In line 329 the student moves on to the goal-means repertoire and describes the desired situation in which the children's ideas are taken into consideration. In Example 1b student 51 continues his/her earlier description.

In line 346 student 51 moves to the action repertoire and describes his/her action as a proposition maker. At the same time, the student moves back to the goal-means repertoire and describes, in lines 346–347, how he/she would have liked to develop the water theme. In line 348 the student returns to the criticism repertoire and describes, in narrative form, his/her discussion with the nurse. The description ends in laughter which can be interpreted as an ironic and critical response. In line 351 the student moves to the consideration repertoire which is apparent in the expressions "been thinking" and "could be". Furthermore, the student tells the others, in line 351, using the goal-means repertoire that the goal is to offer the children the opportunity to play. At the end of the sentence the student moves to the criticism reper-

Example 1b

346	student 51	I <i>suggested</i> that it would be nice to make, when there is such a small room, so one could put in there some things related <i>to the water theme</i> , so one could make a room, where children could play, so the nurse said that “Yes, yes, we have been thinking about such a thing too, but it is not suitable for play” that there are such tools so that children can visit there but they cannot touch them ((<i>laughter</i>)) I have <i>been thinking</i> if it <i>could be organised</i> there that there would be something <i>to play</i> with, what sense would it make to just pop in there...((discussion about tools continues))
347		
348		
349		
350		
351		
352		
353		
368	student 51	...(.) <i>it would be good</i> to have such a room, that it could have been utilised then, for example, for this project
369		
370	tutor	<i>it would be good</i> then if the play environment were changed with the <i>project</i> and theme
371		

toire, culminating in the strong rhetorical question “What sense would it make ...?” In line 368 the student moves on to the consideration repertoire with a value expression “it would be good”. The consideration repertoire is connected to the interpretation repertoire where the project is used as the reason for the student’s intentions. The tutor indicates like-mindedness by using the same concepts as the student (line 370) and confirming the viewpoint of the student. The goal-means repertoire of the tutor is a general level expression about how one should act in theme or project work. At the same time, the tutor produces a conceptional justification for the goal by using the expert terminology of early childhood education. In Example 1c means are examined for realising continuity.

The tutor presents, in line 601, an open question in the goal-means repertoire. The question indicates that thinking and exploring possibilities “could create” a change in the situation that was described earlier. In line 605 the student enters the goal-means repertoire by means of the conditional “if”, and states how it would be possible to act in the situation. In line 609 the student moves on to the consideration repertoire as he/she suspects that it might be difficult. Student 45 continues to suspect this – an attitude which is signalled with the conjunction “and” and with the rhetorical question. The suspicion is directed towards the personnel and their attitudes regarding the matter. With the “but” conjunction in line 611, the student moves to

Example 1c

601	tutor	<i>could</i> continuity <i>be created</i> there anyway, in some way, what do you <i>think</i> or do
602		you others <i>think</i> (1) that in such situation how is it <i>possible</i> to get continuity (2)
603		between the situations
604		(2)
605	student 43	... <i>if it is possible, if</i> the following
606		matter is decided, <i>if</i> it possible to change a little and listen to the children, what
607		arises from them
608	tutor	so
609	student 43	but it can be *difficult* in a way.
610	student 45	so <i>and</i> how will the others usually react, if they have decided that they do
611		everything to the end <i>but</i> that <i>based of my experience I would recommend trying</i> to
612		discuss things in small groups for example to talk somehow with the children and to
613		write on paper ((discussion of means continues))

the goal-means repertoire and, based on his/her earlier experience, recommends a discussion in a small group. Thus the student refers to his/her own action which he/she uses to argue the method recommended earlier. In the last example (example 1d) the tutor brings conceptual explanations into the discussion.

Example 1d

633	tutor	yes, so often in that <i>theme working</i> is that if they really have gone to swim, then
634		it is possible to return to that experience and at the <i>age of the preschool education</i>
635		it is very useful, for example, just by drawing, to describe their experiences and
636		their own thinking and then it is possible to ask them about it how it was there....
637		((tutors talk about means continues))

642	tutor	...so there is however, continuity if one thinks that they would draw their
643		experiences and the children could still talk about it, and if it were possible to pick
644		from it some good ideas and then it could be organised so that <i>child-centred action</i>
645		could take place at many levels too.

In line 633, the tutor uses the expertise terminology of early childhood education when speaking about the theme work. He/she continues to describe how this is achieved in the goal-means repertoire in lines 634 and 635. In his/her argument the tutor draws on the terminology of development psychology, referring to the “age of the preschool education”. In lines 642–643 the tutor continues to think up ideas for means using the goal-means reper-

toire. Finally, he/she moves to the interpretation repertoire in dealing with the concept of child-centred action. In this interpretation, the tutor argues that child-centred action can be carried out at many different levels. Figure 2 describes the developing talk at the personal level.

Figure 2 is similar to Figure 1 with the exception that in Figure 2 there is the agency repertoire instead of the observation repertoire and the difficulty repertoire instead of the criticism repertoire. Figure 2 describes developing talk in relation to the action of an individual. Collaborative knowledge construction begins with the agency repertoire. From this repertoire the student moves to the difficulty repertoire or to the interpretation repertoire. After the difficulty/interpretation repertoire, the student usually moves to the agency repertoire in which he/she describes how he/she tried to resolve the difficult situation with action. After this he/she moves to the goal-means repertoire and there he/she can find new means for acting in the future. It was typical that students first described problems in the environment (Figure 1) and then difficulties in action (Figure 2).

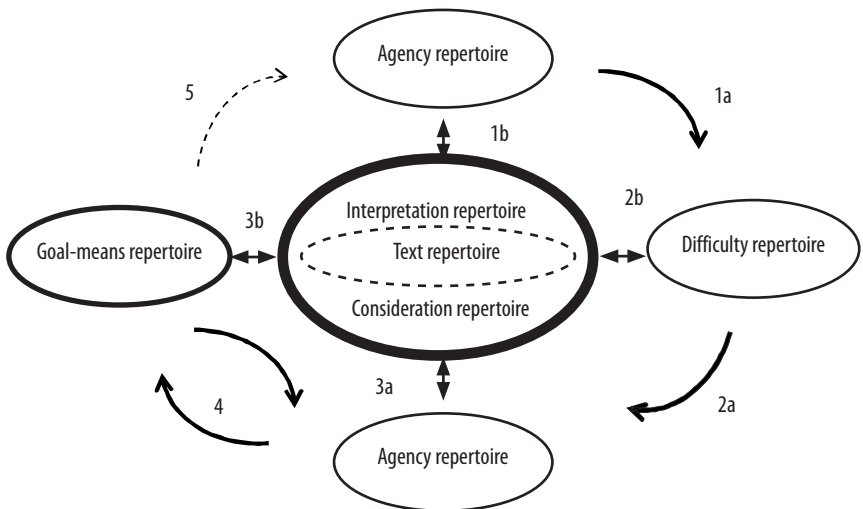


FIGURE 2. Displacements in developing talk in relation to the action of an individual

Discussion

In this article I have examined collaborative knowledge construction in tutorial discussions. First, I described the repertoires used by the students when they talked about the subject of knowledge. Then, I described the uses of repertoires and their integration with one another. I identified nine repertoires which described four different categories of talk: *repeating*, *applied*, *inquiring and developing talk*. There were two combinations of developing talk based on the integration of repertoires. One of these applied to the individual level, and the other to the environmental level.

First I will interpret some separate repertoires which have appeared in the analysis and, after this, concentrate on developing repertoires arising from the data. The text repertoire appeared both independently and when integrated into other repertoires. When using the text repertoire students sometimes regarded experience as “a source of correct information”. The importance of experience was seen in the data with regard to separate repertoires. The students talked about their earlier work experiences so as to offer examples, explanations or meanings to the subjects under discussion.

The text repertoire was integrated into many other repertoires and, in my view, this integration is a question of interaction between theory and practice. The integration of the text repertoire with the observation and interpretation repertoires signifies that a conceptual explanation is given to phenomena. I named the two modes of explanation in connection with the interpretation repertoire: *situational explanation and conceptual explanation*. The situational explanation is typical of a student’s way of talking and the conceptual explanation characterises the talk of the tutor. One purpose of collaborative knowledge construction is that, in a tutorial, these two modes of explanation ways can come together. With a contextual explanation the level is that of individual cases and contexts, whereas a conceptual explanation is at the level of general phenomena and a common understanding of the subject.

In the observation repertoire the student described experiences and information that he/she had observed on the basis of seeing and hearing. I wish

to emphasise the fact that these descriptions were not empty observations, but included both conceptual and practical elements (Miettinen 1998, 88). This operation was not always conscious (see Tynjälä, 1999), however. Furthermore, the observations were guided by theory partly because the learning tasks involved the acquisition of information, which was based on literature about the phenomenon. The significance of the observation repertoire is in the fact that it serves as a starting point for the critical repertoire.

In the remembering repertoire, personal experience information was communicated to other students. I see the importance of the remembering repertoire in tutorials as a means of maintaining and promoting the atmosphere and cohesion of the group. A positive atmosphere is a key aspect of the collaborative learning (Tynjälä 1999). This repertoire serves as a supplement to the information garnered from books. The remembering repertoire was particularly characteristic in the talk that took place during the second study year. This was partly due to the study module where play was the subject under examination; most students probably had clear childhood memories of games and playing.

The talk in the criticism and difficulty repertoires revealed the safe atmosphere of the tutorial and students dared to talk about the problems and difficulties they had encountered in learning at work. These repertoires also include tacit knowledge (Polanyi 1966). Specific difficulties are encountered in action, where the functional dimension of the knowledge becomes emphasised. The critical and the difficulty repertoires serve as forces that promote and develop action. In my view, the importance of feelings will also become evident in knowledge construction. Feelings can also be seen as promoters of action aimed at change and development (see Mezirow 1991). In connection with the difficulty repertoire, the mentor role was as a discussion partner and as a support. The results of earlier observations show the importance of mentoring in supporting the student's reflection process (Lähteenmäki 2005).

The goal-means repertoire was directed towards the future, and in this repertoire a normative tone could occasionally be perceived. It was a repertoire that also uncovered values about what needed to be aimed at and the

kinds of methods that were appropriate. Thus, the goal-means repertoire also contained the ethical dimension of the knowledge. Being directed towards the future, the goal-means repertoire also included potential information which could be used in the future. In the goal-means repertoire the adult's pedagogic role was emphasised – an important dimension when considering the development of the student's growing consciousness.

On the basis of the analysis of data, interpretation and consideration repertoires lie at the heart of the knowledge construction process: they are integrated into text, observation, critical, difficulty, goal-means and agency repertoires. These can be seen as manifestations of the reflective process. Students talk about their observations and interpretations/considerations before action (*reflection for action*), during action (*reflection in action*) and after action (*reflection of the action*) (see Poikela, E. 2005a, 24–25). It seems that reflection after action is the most common mode of student talk in tutorials. The difficulty of reflection during action was expressed by some students. In the students' repertoires, different contexts of reflection were produced: thinking alone, with the mentor, with the tutor and in the tutorial group (see Poikela, E. 2005a, 22–23).

The location of reflective talk at the centre of the collaborative knowledge construction process supports the view presented by Poikela E. (2005a, 25) that the model of experimental learning presented by Kolb (1942) should be supplemented with regard to reflection. Analysis of the models for developing talk reveals that cited experience does not seem to initiate developing talk. Instead, it is the critical repertoire and the difficulty repertoire that predominate. In this respect, I share Dewey's (1933/1910) view that disturbing the established action, in other words a problematic situation is what initiates a reflective process.

In tutorials is it possible, through developing talk, to rise from individual cases and situations to the level of general phenomena, and in this way, to construct collaborative understanding. Collaborative discussion, therefore, produces hypothetical knowledge which can be brought to bear on future situations. The role of the tutor is significant in this reflective process (see Poikela, S. 2003, 302). The movement to the level of general phenomena was

a bold step, facilitated by, among other factors, the consideration of questions and conceptual explanations offered by the tutor. Sometimes this kind of general-level talk was also performed by the student. Furthermore, I would also point out the importance of the value dimension that was produced in the goal-means, interpretation and consideration repertoires. It is an essential part of the expertise required when working in education. (Karila & Nummenmaa 2001; Niemi 2006.)

Looking at the results of this research, the diverse character of knowledge is immediately apparent. Furthermore, even though the focus of my study was the collaborative knowledge construction process, an individual model (Figure 2) could also be identified from the analysis. In my view, individual and collaborative knowledge construction are integrated with one another (see Järvinen, Koivisto & Poikela, E. 2002). Therefore, the tutorial has a dual role in the process of constructing collaborative knowledge.

THE SIGNIFICANCE OF GROUP DYNAMICS IN PROBLEM-BASED LEARNING

– experiences of PBL tutors in higher education

Introduction

Successful small-group learning in problem-based learning relies on functional group processes. However there has been limited research on problems experienced by PBL groups and no studies have been conducted on problems as perceived by both students and tutors in the same context (Hendry, Ryan & Harris 2006, 609). The factors behind group dynamics are rarely researched in problem-based pedagogy. Jern and Hempel (2000, 68–69; see also Mpofu, Stewart, Dunn & Schmidt 1998, 421–422) have studied PBL research and concluded that small group dynamics have been overlooked in the context of PBL. Most researchers interested in PBL do not emphasize the significance of psychological phenomena within the group as a part of the learning process and group processes as a part of a tutor's task.

Studies underline the fact that PBL tutors have to be aware of group dynamics and group processes, but do not reflect on what group consciousness means in the PBL context. The impact of the small group phenomenon has not been identified as a part of a tutor's expertise. Teachers and tutors often believe that the group process will automatically develop during the PBL cycle. As I am interested in the construction of group consciousness and the significance of group dynamics in the successful implementation of PBL,

the aim of this article is to examine the experiences of PBL tutors in higher education. I wish to explore how tutors describe their experiences of problem-based learning and the significance of group dynamics in these experiences. First, I present the experiences of the PBL tutors which I have divided into two areas: the advantages they feel PBL offers when compared with a conventional curriculum and the challenges they face in working with PBL. At the same time, I explore the role played by group dynamics in these experiences. I also refer to other studies, whether they support my results or not. Finally, I reflect on the significance of group dynamics as a factor in the successful implementation of PBL and present some suggestions as to how tutors and students can learn about group dynamics in order to develop learning and collaboration in tutorials.

The essence of group dynamics in problem-based learning

There are many theories about the development of group dynamics, but fundamental to all of them is the notion of groups as social systems. A society can be defined as a collection of individuals, and a group as a subset of these individuals (Carley 1991, 331). Group dynamics are said to occupy ‘the middle ground’ between the person and the society, because it is the small group which reveals the secrets of how the person forms and is formed by the social environment (Tennant 1997, 107). A system is composed of elements in interaction. When group members interact with one another, they form a social system, with attendant group dynamic processes. Group dynamics are the forces that emerge and take shape as members interact with one another during the life of a group. These dynamic forces are the product of both the here-and-now interactions of group members and what members bring to the group from the larger social environment. (Toseland, Jones & Gellis 2004, 13.)

Group dynamics in the PBL context mean that the phenomena of the group can be exploited in the tutorials in order to develop collaborative

learning. The PBL tutors have to take care of group cohesion, norms and the mutual regulation of group goals and interaction. Collaborative learning plays an important role in PBL. Interactions within the group stimulate several cognitive processes, elaborations and co-constructions which may lead to deeper understanding. Elaboration is the process of considering a piece of knowledge in a richer, wider context. Co-construction of knowledge is the shared thinking process of students supporting themselves to reach a shared understanding by means of interaction with one another. While there is a great deal of knowledge about these processes in PBL at an individual level, there is little research that focuses on the cognitive interaction processes influenced by collaborative learning. (Visschers-Pleijers, Dolmans, Wolfhagen & van der Vleuten 2004, 471.)

Tutoring in PBL has two components: facilitation skills and content knowledge. The learner-centred approach of PBL means that, for tutors, content knowledge should be subordinate to proficiency in group leading. Thus, effective tutors promote student learning by creating a supportive environment which encourages active participation from all members of the group, by monitoring the quality of learning through questions and feedback and by encouraging the development of students' meta-cognitive skills. Both knowledge of subject matter and process facilitation skills are necessary but not individually sufficient characteristics for effective tutors. The tutors with content expertise are helpful only if they also have the skills to manage group dynamics and group learning. (De Grave, Dolmans & van der Vleuten 1999, 901–906; see Albanese 2004, 20.)

PBL tutors have to lead the development of group dynamics that facilitate member participation and satisfaction while simultaneously enabling the group to achieve its goals. A tutor has to be conscious of group processes, including both interactive and collaborative processes. Some of these processes are rational, while others are irrational. According to Jern (1998), leadership in a work group means that the leader has an opportunity to positively affect group members' thoughts, feelings and actions in order to achieve a common goal. The group does not automatically promote learning; in the worst cases it can prevent it. In the PBL context tutors have to bear responsi-

bility for integrating collaborative and individual learning at the same time. (Hmelo & Evensen 2000, 5.)

The advantages and challenges of PBL as experienced by tutors in higher education

The purpose of my research, of which this article is a minor part, is to explore the concept of the role as a collaborative learning process, the role of the teacher as a group leader, and to develop understanding of group dynamics in the learning process, especially in higher education. The research problem is how university teachers experience and describe their role as group leaders and how this role changes during and after studies in university pedagogy. I have 14 informants, who work as teachers at the University of Tampere. They participated and completed a training program in university pedagogy (15 credits) in 2001 and 2003. Six of the informants are PBL tutors.

In my research I interpret the data and the meanings which emerge from it according to the hermeneutic method. The research is based on the premise that there are several truths and that the truth depends on the observer's standpoint. I am interested in the rules with which social realities are constructed and the meanings which are given to them. I am not looking for the historical truth but for verisimilitude (Bruner 1990, 19). The chosen paradigm is social constructivism and the method of analysis is according to hermeneutic principles. My data consists of personal learning plans, portfolios, learning diaries, other independent tasks, and theme interviews which I conducted about one year after the program. The extent of my data is 480 transcribed pages. I have coded my data using the NVivo program and categorized it using qualitative content analysis.

In the article I explore the experiences of PBL tutors in problem-based learning. All the tutors have several years of experience both as teachers and as PBL tutors in higher education. The data analysis from the interviews

and other empirical material led to a range of insights into the work of PBL tutors, especially with regard to the advantages and challenges they felt PBL offered. To guide the subsequent discussion, the main findings of the study are presented in Table 1.

TABLE 1. PBL tutors' Experiences of Problem-based Learning

Experiences of Problem-based Learning Described by PBL Tutors in Higher Education	
The Advantages of PBL	The Challenges of PBL
<p>Learners' holistic self-development</p> <ul style="list-style-type: none"> • Development of learners' self-direction • Development of learners' ability to work in groups • Ability to respond to working life challenges <p>PBL tutors' role as group leader and learning at work</p> <ul style="list-style-type: none"> • Tutors' learning • Tutors' satisfaction and enjoyment as group leaders • Collaboration and improved teaching <p>Opportunities to develop the curriculum and relationships through dialogue</p> <ul style="list-style-type: none"> • Development of the teacher-learner relationship • Transparency of the learning process • Learner-centeredness 	<p>Learners' inability to commit themselves to the collaborative learning process</p> <ul style="list-style-type: none"> • Problems in interaction between learners • Learners' unreadiness and non-commitment • Skipping phases of the PBL-cycle <p>PBL tutors' inability to lead group processes</p> <ul style="list-style-type: none"> • Tutors who are not committed and do not understand the PBL process • Tutors who are too careful with, or cannot lead, group processes • Tutors who do not understand group dynamics training <p>Problems in the PBL curriculum</p> <ul style="list-style-type: none"> • An unsuccessful scenario • Changing PBL groups after every study block in order to avoid group problems

In accordance with the aim of the article, the following sections are dedicated to a discussion of the significance of group dynamics in PBL. The quotations in the article, which are examples of PBL tutors' experiences, have been translated from Finnish into English.

The advantages of problem-based learning

According to tutors working in higher education, the advantages offered by PBL can be divided into three categories:

1. Learners' holistic self-development
2. PBL tutors' learning at work
3. The opportunity to develop the curriculum and relationships through dialogue

Learners' holistic self-development

According to tutors' experiences, the PBL curriculum developed students' self-directed learning, their ability to work in groups, and their ability to respond to working life challenges. All the informants had also worked as teachers within a conventional curriculum and were well aware of the different roles played by learners and tutors in these two systems. According to the tutors, PBL learners developed a superior ability to pursue lifelong learning, superior skills in the acquisition of information and a higher degree of intellectual autonomy. The learners were also more active and motivated, and they had developed skills in learning to learn. The PBL curriculum had created new opportunities for empowering students. Earlier, the students had been more passive and simply tried to memorize learning material for examinations.

The self-directed learning pointed out by the tutors did not refer to learning alone, but to learning with and from peers. In problem-based learning the students developed an awareness of the value of hearing different perspectives from a group of individuals (see Palmer & Major 2004, 130).

Somehow they are discussing things, they are discussing them more constructively and produce and create the knowledge in a different way in the groups than in those days when we didn't have PBL. And PBL has also influenced many kinds of group work and, in this way,

you can see the advantage of PBL – the students are more active and more autonomous in creating knowledge overall. (Henriikka)

The tutors also noted that, with the PBL curriculum, the students learned to work in groups. They developed their ability to interact and also their group work skills. They learned with and from their peers, developed the ability to engage in constructive dialogue and to take on roles. In contrast to the calm environment of traditional classroom instruction, tutors described how PBL offered opportunities to rehearse different kinds of roles. Working within these roles supported the development of interaction skills and self-knowledge. The tutors allocated formal roles (mainly discussion leader, recorder and, sometimes, observer) to the students participating in PBL tutorials. However these were not the only roles which emerged in tutorials; role forming began as soon as the group gathered. Within the learning group the roles can be divided into social and task-oriented roles. Both role types improve the aim of a group, although it is rare that one person can hold both roles at the same time. (See Hammar Chiriack 1999, 13; Alanko-Turunen & Öystilä 2004, 115–116; Poikela, S. 2003, 64–65.)

Role skills are really developing there. What this means is that they can always take or adopt new roles in new situations, maybe changing these formal roles is effective and helpful as well. (Pasi)

Similar conclusions have been drawn from many studies during the past 15 years. For example, Harvard Medical School's evaluation of a PBL curriculum compared PBL students on the two-year preclinical component of the programme with their peers who had been randomly allocated to the traditional programme. They found that the PBL students reflected more on their learning, memorised information less than their peers, and preferred active learning. Interpersonal skills, psychosocial knowledge, and attitudes towards patients were better among the PBL group and PBL students felt more motivated and satisfied with their studies. PBL students reported significantly greater autonomy and were surer of themselves in handling uncertainty. (Moore, Block, Style & Mitchell 1994, 983–999.) PBL students'

self directed learning skills were enhanced and basic science concepts were better integrated into the solving of clinical problems, compared with students in the conventional curriculum (Norman & Schmidt 1992, 557–565; Schmidt, Norman & Boshuizen 1990, 611–621).

PBL provides a basis for networking, individual empowerment, replication of organizational behaviour and the use of higher order intellectual skills. It is possible to develop a leadership model that focuses on the interactive and collaborative skills of all members of groups and, at the same time, on the personality of an individual learner. The students learn interactive skills whether or not their group functions well. Acting in groups also promotes learning process in situations where the groups are failures. According to my data some tutors emphasized the learning process in cases where the group work was unsuccessful (e.g. Palmer & Major 2004, 120–132). Other tutors, however, did not exploit the learning potential of these situations.

The PBL tutor's role as a group leader and learning at work

All the informants described the desired role of the tutor in PBL as different from the role of the teacher in a conventional learning system. The tutor has to change roles from being an expert to being a group leader with a constant focus on the students. The advantages experienced by tutors in this role were improved learning and satisfaction, as well as collaboration with colleagues, which served to improve teaching. The tutors noted that they had fun in successful tutorials and that they learned both substance and pedagogy. The tutors stated that teaching in the PBL curriculum was more challenging but, at the same time, more interesting. Also, the lectures had become more enriching once the students had grown more active – learners asked difficult questions to which there was no right answer.

All my informants accepted two essential roles for PBL tutors: facilitating learning via motivating and activating, and leading the group processes to ensure that the students maintain focus (see Jones, Donnelly, Nash, Young & Schwartz 1993, 207–215). However, the tutors did not share the same opinion

on how to achieve this or what the role of the tutor should be in supporting the learning process in PBL (e.g. Dolmans & Wolfhagen 200, 253; Law 2006, 1). Some felt that the tutor was unable to exert an influence if the students were too passive or insufficiently motivated. Others saw the tutor role as playing a key part in the success of problem-based learning.

Then it is easy, easy for the tutor and it is fun and, most of all, the tutor learns herself too. (Maria)

But, for example, the lectures are extremely challenging, because the students have been activated with tutorials about the theme of the lecture, and they have prepared for it and really are interrupting and asking questions. In the past everyone was able to go and give a lecture. The person was just given the old transparencies and then he read them out and nobody asked anything and that was it. The students just copied in a hurry. And the main problem was that there was nothing in the lectures that you couldn't read in the books. (Ari)

70% of students participating in a PBL course regarded the tutor's role as essential to the success of the PBL process (Zimitat, Hamilton, DeJersey, Reilly & Ward 1994). According to research by Nieminen, Sauri and Lonka (2006, 64–71), however, the tutor role was not seen as being so essential to the success of the learning process experienced by learners.

The opportunity to develop the curriculum and relationships through dialogue

According to my informants, the PBL curriculum improved cooperation between teachers. They had to plan and integrate studies together, and this also increased cooperation in other areas and improved the sense of community overall. The tutors also described the PBL curriculum as transparent and improving the interaction between teachers and students. The tutors made the students' acquaintance and saw potential learning difficulties and other problems. It was also easier for students to make contact with the teachers,

and they also came to talk with teachers in contexts other than learning situations.

When I'm tutoring in problem-based learning, I don't lapse so often into these conventional positions. As a tutor it is easier to get more intimate and have more personal contact with the students. (Pasi)

In our PBL system, the tutor sees and notices those students who have difficulties. (Ville)

The students also come and make contact easily outside lectures. For example, when you are just walking along corridors they come and ask questions, but it is not always very easy to give the right answers. They have become more motivated after using PBL. (Ari)

Also, according to other studies, PBL does not increase teaching time; rather it changes how this time is spent. For example, using problem-based learning uses up to 40% more time in working with students (Bligh 1995, 342–343). One effect of the transparency of a PBL curriculum is that the attitudes of teachers and the atmosphere of cooperation create a safe and motivating learning environment, and also increase learner-centeredness (Wolf, Randall, von Almen & Tynes 1991, 182–190).

The challenges of problem-based learning

The challenges of PBL experienced by PBL tutors in higher education can be divided into the following categories:

1. Learners' inability to commit themselves to the collaborative learning process
2. PBL tutors' inability to lead the group process
3. Difficulties within the PBL curriculum

Learners' inability to commit themselves to the collaborative learning process

The essence of problem-based learning, according to the informants, is that students work collaboratively on understanding the problem. Collaborative learning relies on functional group processes, and does not result from simply meeting as a group (see Faidley, Evensen, Salisbury-Glennon, Glenn & Hmelo 2000, 132). However, groups do not always function collaboratively or in a self-directed manner. Tutors noted that, although students develop self-direction, the causes of their inability to participate in collaborative learning mostly arise from problems in interaction between students. Students have different kinds of personalities: they may be too passive, or too dominant, or too different in other ways from one another. Some students have a free-rider mentality. Sometimes students receive critical but unconstructive feedback from peers and become offended. They are unused to working in groups and tutors are unused to helping students develop these skills.

Other reasons mentioned by tutors are students' unreadiness and non-commitment, and also a tendency to ignore the phases of the PBL-cycle. Learners may not understand the reasons why the teacher does not convey new information via lectures. They are asked to adopt a vastly different paradigm of learning to that in which they typically feel comfortable, while at the same time they are asked to learn new material. This may add up to a potentially significant set of obstacles. These difficulties alter the way in which the motivational benefits associated with PBL are perceived. The students may also complain about their busy schedules and explain that they have other activities. Sometimes they may be absent from the tutorial for no apparent reason. At other times, they have not done their learning task because, for them, only exams have significance in earning marks for studies. In addition, the subject hierarchy may also exert an effect on their motivation.

... and the students, they can be terribly different kinds of people, and then conflicts easily occur. (Pasi)

In the worst case there can be eight passive students in a tutorial. And then, it is very difficult to work as a tutor, if the whole group is passive.

In a small group, if there's just one dominant student, then (...) the others might be relieved, that's fine, that person can do the work for us. There's some discussion but mainly only one person is talking, the others don't need to. But someone giving a monologue is not good for their learning. (Helena)

A study by Tipping, Freeman & Rachlis (1995, 1052) reveals that the observed group dynamics do not necessarily match those, which are reported by tutors and learners. Their data, collected from observations and videotapes, revealed a lack of interaction and involvement. Some students were totally passive during the tutorial, with communication directed mostly towards the tutor and, in one extreme example, a student was actually sleeping. In one group, where there was only one female member, she was chosen every time for the role of recorder. In these groups there was no cohesion, goals were not articulated and there was no evidence of reflection on any aspect of group behaviour. My data was collected almost 10 years later, but PBL tutors at the University of Tampere reported similar kinds of phenomena. It may be the case that in one tutorial there are eight silent and passive students. Also, there may be no discussion about the learning goals and no reflection at all.

PBL tutors' inability to lead group processes

The tutor's role includes creating a supportive group climate, encouraging the involvement of all students and addressing group problems when they arise (see Hendry et al. 2003, 609; Moust, Volder & Nuy 1989, 737; see also Hak & Maguire 2000, 769). However, not all tutors understand the importance of the tutor's role in the success of group work within the PBL context. The reasons they cite for tutors' inability to lead group processes are tutors' non-commitment to the PBL process and a lack of understanding regarding the significance of the group process.

All the informants totally supported the PBL curriculum, but they knew of other tutors who were missing 'the good old days' of the conventional curriculum. Informants gave examples of colleagues who did not trust the stu-

dents and tried to alienate themselves from the group situation. Informant tutors had heard stories about tutors who read newspapers during the tutorial or talked on their mobile phones. Some tutors felt that it was impossible to influence those tutors who did not understand the PBL process. Others expressed the view that it is very difficult to simply lead the process if they are experts in the subject area.

However the informants who had confidence in PBL were often over-cautious or simply could not use the dynamics of the group. The tutors, despite some group dynamics training, did not always facilitate reflection on group dynamics. Such failures in group processes may be regarded as failures in the provision of appropriate learning support concerning tutor facilitation of group processes, and in establishing a successful psychological model of interaction within the group.

Although the tutors expressed interest in tutoring, they were sometimes uncertain about what tutoring involved, or felt that the function of tutor did not correspond to their own conception of teaching. Since most teachers in higher education have primarily had lecture-based experience, they have had hardly any role models for tutoring; their expertise lies in the discipline in which they have been trained. They have been trained as lecturers or subject-matter experts with detailed knowledge about scientific truths or discipline-specific mechanisms, and are assumed to be able to deliver this knowledge to students via lectures. With this background, it is understandable that many feel uncomfortable with the tutor role in PBL. (See Dolmans, Gijsselaers, Moust, DeGrave, Wolfhagen & van der Vleuten 2002, 173.) In this kind of situation the tutors concentrate on what they themselves are doing. They themselves become the focal point and activities are based around the tutor. At the same time they cannot be aware of what is happening in the group, and this hinders the learning process.

Some PBL tutors have misunderstood the role of the tutor, thinking that they are not allowed to say anything. They sit totally silent, not using gestures or offering verbal feedback. Eventually, they become totally uninvolved. Giving feedback and intervening has proved very difficult, especially when the tutor needs to give constructive criticism. Often tutors may observe the

situation and think that they should intervene, but then they have remained silent too long and the right moment has passed.

Teachers often think that they should know everything and find situations where they do not rather threatening. When they move to the role of the PBL tutor, they know in their conscious mind that facilitating is the main issue, but previous experience runs so deep that the role of conventional teacher as an information giver surfaces unobserved and reveals their instinctive attitude towards learning.

In tutorials the informants mainly offered students the roles of discussion leader and recorder, but seldom that of observer. They chose an observer mainly when there were problems in the group. Sometimes the tutor chose a dominant student as an observer for one session, so that the student would also listen to others.

Sometimes you notice, as a tutor, that there is a student in the group who never says anything. Sometimes you have to intervene and it's one of the most difficult tasks, because it's a very delicate issue. When is someone talking too much? And there you can really see your professional skills – you are reacting too late. You notice that something happens and that you should have intervened there and then. But then you keep following it and somehow it's too late, it's over. (Maria)

If the group doesn't work, you can choose observers who will report afterwards. But I have never been thrown into a situation where I had to use them. Or perhaps I just couldn't, but anyway, I haven't noticed that I needed to. (Ari)

I think that there are also tutors who don't care about the group, who are just going through the motions (...) it is a certain nonchalance. They really don't put their heart into the process. (Maria)

Other studies (see e.g. Dolmans & Wolfhagen 2005, 261) report similar findings, which suggest that with PBL curricula attention needs to be focused on under-performing tutors.

Difficulties within the PBL curriculum

The problems described by tutors working in the PBL curriculum were over-easy or over-challenging scenarios, cases or starting points for tutorials. The scenario or the starting point is very important in the success of a PBL tutorial. If a scenario is too easy, the tutorial becomes boring. Then again, if a scenario is too challenging, the students do not advance in their studies because of a lack of basic knowledge. The unsuccessful scenario was the only challenge that was not dependent on group dynamics, which is why I do not deal with the issue in more detail.

The other problem tutors pointed out with regard to the PBL curriculum was the principle that the groups have to be changed frequently because of conflicts between group members. It is fairly common with PBL programmes that there is an attempt to resolve group problems by changing group members. Some tutors felt that this is very useful for the group process, while others thought that they did not have any other alternative, there being no group expert available to assist when problems occurred with group dynamics.

If we had the same PBL groups for a long time, then we should need help à la Linköping. If there arise difficult conflicts, someone should come and support us. But this can be one reason, why teachers don't talk very much about the problems in their own groups. They know that the group is soon at an end, it doesn't take a long time. (Henriikka)

Some tutors mentioned their relief when the group was disbanded; they felt their problems were over. However, this also meant that the groups had no opportunity to learn to resolve group problems for themselves. Differences in opinions, disagreements and questioning create significant material for learning in collaborative meaning negotiations (see Mifflin 2004, 446–446). In future work teams they will not be able to change groups every time conflicts occur, nor will they be able to change the members of the group.

Conclusion: the significance of group dynamics in successful implementation of PBL

The main difficulties of PBL, which the tutors described, concerned group dynamics. The learners or tutors have not been involved in the PBL strategy, nor could they study in groups – either as peer members (learners) or as a leader (tutor). According to the tutors, the principle reasons for overlooking group phenomena were that PBL groups are short-term groups and that group change would guarantee well-functioning groups (see Jern & Hempel 2000, 68–73).

Learning in groups is not a panacea for learning problems, especially if tutors are unaware of group dynamics. The tutors stated that conflicts between individuals and contradictory situations may cause problems in PBL which they feel powerless to resolve. Although the aim and the main principles of PBL are to develop learners' self-direction, this cannot take place without group leadership and learning support. PBL lays the responsibility and the control of the learning process essentially at the feet of the student. In changing from a subject-based discipline to an integrated PBL curriculum, it is often difficult to anticipate and accept the need for learning support in non-discipline areas, such as group dynamics.

The fear that less content may be covered if too much time is devoted to group processes may be a measure of the difficulty associated with transition from subject-based learning approaches to PBL. Some teachers fear that they are becoming group therapists. In any case, faculties need to accept that PBL involves a slower start-up in terms of the discipline-based content that is covered. This may be due to the development of important hidden skills, which will ultimately facilitate deeper approaches to learning (see Greening 2006, 9).

Gijsselaers and Schmidt (1990, 95–133) find a causal relationship between tutor involvement in PBL and group processes, which in turn affects student motivation towards learning. Such motivation is very important to the successful implementation of PBL. The tutor has to have the ability to lead the

group so that every member is competent and can make important contributions to the group's effectiveness. Individuals in the group need to feel the satisfaction that comes from being involved with the learning process. In order to activate co-construction of knowledge, the tutor has to pay attention to encouraging students' questions, reasoning and resolution of conflicts within the tutorial group (Visschers-Pleijers et al. 2004, 477).

The PBL tutor's approach influences group work in different ways. The tutor's approach should be characterized by a focus on the students and on what is happening in the group, rather than on the tutor's own actions and thoughts, an approach Silén (2006, 373–383) characterizes as 'presence'. The ability to be present is possible when knowing is rooted in 'a lived body'. The tutor has to deeply understand the ideas of PBL and the underlying theories, and their own learning processes should be ongoing as a result of tutor training and experiences at work. Even awareness of the physical body plays a prominent part in achieving a deeper understanding of the embodied nature of ways of being in a group. The tutor's way of being in a group, how the tutor treats the students as people and what is discussed and takes place in the group is very important to the course of events and the way in which the tutor is perceived. This, in turn, affects the students' learning processes – whether they tend to be passive or whether they realize that they need to study more. The tutor who activates the learning process leads the group without dominating or controlling and intervenes at the appropriate point. A tutor who hinders the learning process is dominating, takes the initiative, has difficulties in allowing the group to take responsibility, does not give feedback, has decided what conclusion the group will reach, is unwilling to accept criticism and suppresses the group's views. (Cf. 380.)

Tutors need training, particularly training in group leading, in which the most important ideas are to communicate supportive messages with the whole body and to have the courage to intervene at the appropriate time. It is better to devote less attention to what should or should not be said, whether to remain silent or to think about how to intervene, and just be interested and present. Supportive tutors question what learners say and give constructive criticism. They listen but are not silent, and they trust the students. It is

essential to experience the learning processes in PBL both as a learner and as a tutor. Feedback from learners and colleagues and systematic reflection on the tutor's role are essential parts of the tutor's own learning process.

Problems with group dynamics and threatening situations can be sources of learning, and to overcome them gives tutors more courage to intervene at the appropriate time. When confronted with difficulties in group work, teachers tend to choose solutions which are familiar from their own experience and resort to the teacher-directed model. These solutions are not effective in improving group work and negative experiences will persist. Instead, tutors should hold on to the underlying educational philosophy of PBL when resolving problems arising from group work by choosing actions which are consistent with the student-directed view of education advocated by PBL. (Dolmans, Wolfhagen, van der Vleuten & Wijnen 2001b, 884; Hmelo-Silver & Barrows 2006, 24–25.) Tutors possessing group-dynamics skills are more appreciated by students than tutors who lack these skills, irrespective of the quality of a tutorial group's performance. A tutor who evaluates group dynamics on a regular basis together with students is seen as performing better than a tutor who does not. (Dolmans, Wolfhagen, Schepbier & van der Vleuten 2001a, 473–476.)

The aim of this article was to explore the experiences described by PBL tutors in higher education, and also how the significance of group dynamics is involved in these experiences. According to my data, the significance of group dynamics is essential in the PBL process. According to PBL tutors' experiences, the reasons for ill-functioning groups were not difficulties concerning substance but with group dynamics. The only issue which affected the success of PBL and was not dependent on group dynamics was a poor scenario as a starting point for the tutorial. All the other issues whether advantages or challenges, were related to group dynamics. In my data all the informants found the main challenge in PBL to be the unworkability of groups, either because there were very different personalities within the group or because tutors were unable to lead group processes.

It is noteworthy that the difficulties, which the tutors described, were not actual strategic problems with PBL, but problems with PBL implementation.

The challenges tutors experienced in PBL were not caused by PBL strategy, but by other factors which would have been avoidable had the main principles and philosophy of PBL been followed. The tutors may have had knowledge of how to lead the group process but they lacked sufficient skills – and especially courage – to intervene at the appropriate time. Tutors may also have been aware of the significance of group dynamics, but found moments of conflict too difficult to handle.

If the group is to work effectively, some effort must be directed towards achieving this aim and facets of group dynamics need to be given recognition within the course. PBL programmes should direct effort into tutor training and into training students and tutors to improve group productivity. This could be achieved, for example, by prompting students and tutors to evaluate the tutorial group's productivity on a regular basis. Developing a range of strategies to encourage optimal group functioning and to stimulate student learning should therefore be a major focus of tutor training (see Groves, Régo & O'Rourke 2005, 2–8).

On the other hand, the advantages which all the tutors emphasized were the development of learner-centeredness and the creation of the collaborative learning culture. Although the group was not being used to its full advantage, the tutors felt that, compared with the conventional curriculum, PBL had changed the teaching culture and advanced students' self-directed learning.

PART III

PROBLEM-BASED LEARNING AT WORK

Cook and Brown (1999) have criticised the Western view of knowledge according to which knowledge is perceived as something owned only by an individual. They argue that knowledge can also be in the possession of group or organisation, employing the term "the generative dance" to describe how tacit and explicit knowledge may be owned by an individual and a group. Consequently, rather than focusing on the individual learning process, recent studies on learning and professionalism have taken note of the interaction that occurs between an organisation, professional teams or a network of experts. The shared interpretations of duties and relevant core competencies, as well as the working cultures of the communities have become subjects of interest.

Learning at work is based on the assumption that workers can learn through work by participating in its everyday practices and by reflecting on their experiences. Work-related conceptions and models of action go through changes and take on meaning, especially in everyday working situations. Consequently, they form a central arena for developing both individual and socially shared interpretations of the work. The activator of learning at work is often changes in the everyday life of the working community and the ensuing problems which appear, for instance, as changes or lack of clarity in the workers'/staff members' job descriptions, routine and formality in activities, or as invisibility of differing professional expertise. This raises the need to evaluate what kind of expertise is required in each working context and how the relevant individual and shared expertise should be developed.

Knowledge processing in the context of the work community is a very complex and varied phenomenon. Different resources of knowledge also include different types of knowledge which are not easily attained. Knowl-

edge and knowing can be hidden and found in different activities, functions and resources within an organisation. The real challenge for problem-based learning is to create a curriculum and learning environment in which students learn to reflect, to construct, to use and to evaluate the complicated knowledge environment of work organisations. Education and work are integrated in the PBL curriculum which is cross-disciplinary and based on the need for multi-professional competence in working life. The strategic idea of PBL is the development of a new kind of curriculum based on problems derived from professional work and a new way of teaching and learning in formal education. These basic principles of PBL can also be used in developing learning at work and developing work culture. (Karila & Nummenmaa 2001.)

The aims and specific research questions concerning PBL at work were:

- *How do individual and multi-professional knowledge and competence arise and develop in everyday work situations within the context of education and work?*
- *How do the processes of knowing and learning change during the professional development of tutors?*

Esa and Sari Poikela's article '*Learning and knowing at work – professional growth as a tutor*' deals, on a general level, with the processes of learning at work, and then offers an analysis of the tutor's work as a process of learning at work.

Anna Raija Nummenmaa and Kirsti Karila describe in their article '*Collaborative planning in a multi-professional day care centre*' the applications of problem-based learning in the collaborative planning process within the context of early childhood education.

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LEARNING AND KNOWING AT WORK

– professional growth as a tutor

In this article, we will analyse the challenges of tutors' work and the complexity of the learning and knowing processes necessary for continuous professional development within the framework of problem-based learning. Firstly, we will describe the theoretical basis of learning at work from the point of view of experiential learning (Järvinen & Poikela 2006). Secondly, we will present the process model of learning at work based on the integration of individual, shared and organisational learning processes (Järvinen & Poikela, E. 2001). Thirdly, we will briefly describe the special nature of tutoring and analyse both the tutor's work and the work community, utilising the process model of learning at work (Poikela, S. 2005). Our aim is to explore the learning and knowing processes in which knowledge is created within the framework of problem-based pedagogy. The data was gathered from the Faculty of Medicine at the University of Tampere and from the Department of Physiotherapy Education at the Pirkanmaa Polytechnic. These were the case organisations examined in Sari Poikela's ethnographic

research focusing on the development of tutor competence and knowing. (Poikela, S. 2003.)

The term problem-based pedagogy will be approached from the teacher's and tutor's perspective. PBL gives new meaning to the teacher's role since, within the framework of problem-based pedagogy, the facilitation and guidance of learning play an important role. There is a shift in the nature of the teacher's work from acting as a supplier of information and manager of learning, to becoming a facilitator, supporter and a resource for learning. PBL also requires redefining the teacher's work and the content of the curriculum.

Experiential and reflective learning at work

The idea of experiential learning has its basis in many approaches to the study of cognitive development, but its main roots can be located in Dewey's (1938) and Lewin's (1951) views of learning. Dewey emphasised the importance of experience in the learning process, but he also described the problematic nature of the experiential process. Jarvis (1987) categorised different types of experiences and stated that experience can be both a matter of routine, which is based on tradition, external authorities or circumstances, and it can also be a reflective activity. Järvinen & Poikela (2006) emphasised the "here and now" nature of experience and the key role of feedback processes that are essential factors for understanding and guiding learning activities at work.

Kolb described experiential learning as a process that combines education, work and personal development. Experiential learning represents the workplace as a learning environment which can be linked to formal education (Kolb 1984, 4–5). The work of Dewey, Lewin and Kolb contains a critique of formal education; for them, experiential learning is a powerful alternative. Nevertheless, they do not actually study the informal learning that takes place at work. In some less well known studies, however, Kolb (1988,

68–88) does present the role of experiential learning working methods in the development processes of high-level professionals.

Experiential learning can be understood as its own theoretical orientation and, because of this, it is understood as the basic idea for understanding learning at work. Experience is the starting point for learning, but also the result of learning activity. Moreover, learning is, in itself, experience. Recognising, conceptualising and managing learning at work is linked to the ability of the actors to reflect, that is to observe, find and be aware of the organisational processes that generate learning and knowing. (Järvinen & Poikela 2006.)

Many of the developers of experiential learning theory have concluded that reflection is the crucial stage of the experiential learning cycle, and that it requires a thorough-going analysis (e.g. Boud et al. 1985). Reflectivity has been studied as a major factor in the learning and development of adults in both critical education (e.g. Mezirow 1981; Kemmis 1985) and activity theory research (Engeström 1987). Experiential learning theory is criticised for focusing too lightly on the reflective process, for making the relationship of reflection with experience seem unproblematic, and for detaching experience from its socio-historical context. (Järvinen & Poikela 2006.)

Kolb (1984) describes reflective observation as one phase in the cycle of experiential learning; it is the observation and consideration of experience at hand or gained earlier. This can be done alone, with peers or with a facilitator or supervisor. Reflective observation has a tensional relation to the learner's external function, and requires the active experimenting of learning. So, the meaning of reflection is to maintain the learning activity between doing and thinking. Although Kolb does not give a clear answer to the question of whether reflection is possible during the action, it must be the case because doing, applying or experimenting cannot lead to learning without observation. The result of the reflective learning process is a new experience which includes resolving and rebuilding emotions and social expectations, and the transformation of new knowledge structures.

According to Mezirow (1981; 1991) reflection is a prerequisite of learning. Reflection starts from observation and the naming of feelings, affections and

emotions, and it can rise to the level of theoretical reflection. Reflection focuses on the substances and processes of function and also on assumptions, values, beliefs and knowledge structures underlying that function. The core of adult learning is reflection that is prerequisite for the transformation of meaning schemas and perspectives, leading in turn to new action. Reflective learning is not only linked to learning about previously existing objects and functions; it is also linked to producing new knowledge.

Mezirow emphasises the meaning of reflection particularly on a personal level. Boud, Cressey and Docherty (2006) focus the discourse of reflection away from the personal context and stress the importance of reflection among groups in organisations. They describe reflection as an integral part of work, a necessary element in evaluation, sense-making, learning and in the decision-making process in the work place context.

According to E. Poikela (2005) the key to understanding learning at work lies in the relationship between the concepts of reflection and context (see Figure 1).

The concept of reflection has usually been associated with individual psychological factors in learning, but it can equally well describe social factors determined by the activities of a group, organisation and even of a society. In working life and work organisations, reflection should be defined in its actual context (Poikela, E. 1999). When this is done, reflection can be defined more precisely as a form of thought, knowledge acquisition or knowledge

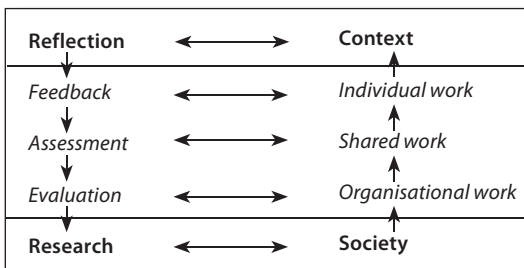


FIGURE 1. The contexts of reflectivity
(Poikela, E. 2005)

production, depending on whether work and learning are examined in the context of individual, group or organisational work.

Reflection and research constitute the general conceptual conditions for the analysis of the phenomenon, learning at work. The concepts of feedback, assessment and evaluation which are located between reflection and study in Figure 1 are intended for the classification of learning and knowledge-formation phenomena occurring within the work organisation. Without reflection it is not possible to understand the feedback, assessment and evaluation activities. Neither can research be done without reflection, but the context in which it belongs is society and its institutions, which produce knowledge for organisations and people. (Järvinen & Poikela, E. 2001.)

Learning in the contexts of individual, shared and organisational work

Reflecting does not simply mean conscious thinking as Eraut (1994) assumes, for example, when he denies the possibility of reflection in action. Schön (1983) notes that action always includes gaps and situations enable thinking. So reflection has two dimensions (see Figure 1). The first dimension is connected to immediate action and concerns reflection *in* action. The second dimension is connected to the gained experience and concerns reflection *on* action. Boud et al. (1985) describe reflection also as careful planning for action. Reflection is not only involved in the phases of active experimentation and reflective observation, but also in the phase of abstract conceptualisation. Acquiring new knowledge, adapting concepts and their uses, modelling and planning are essential parts of preparation for future action. McAlpine et al. (1999) emphasise that the reflection taking place during this preparation is reflection *for* action. In their model, reflection is emphasised within meta-cognitive aspects. Also, Mezirow (1991) states the focus of reflection is not only on the content but also on the assumptions and beliefs regulating the action.

Kolb (1984) argues that his model is universal and suitable for learning activities in any context, especially the context of work. The cycle describes

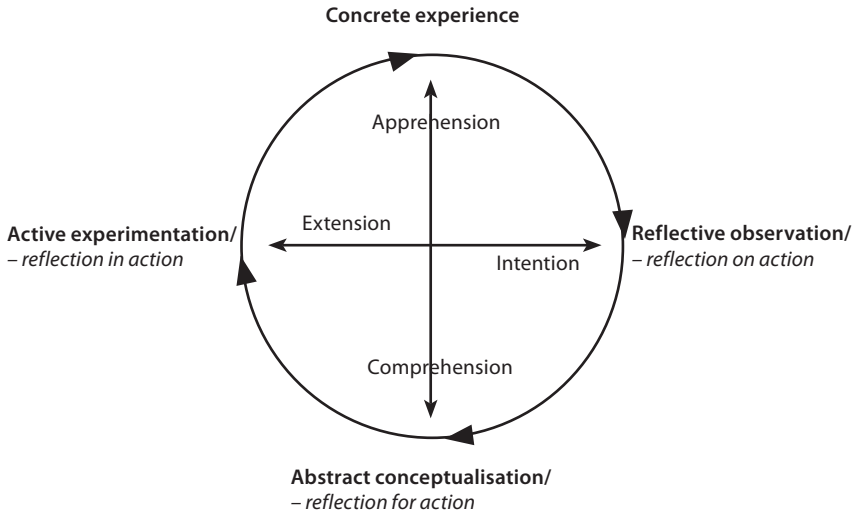


FIGURE 2. Reflection and experiential learning
(Poikela, E. 2005, 25)

the individual's action and is applicable for explaining learning at work in its *individual context*. Because the concrete experience is both the starting point and the outcome of the learning process, experience is rather an object of observation, conceptualisation and experimentation than a part of reflective action. In other words, reflection is not located in the outcome or object of action; it is embedded in action that produces learning contextualised by time, place and situation. This also means that reflection does not only describe the psychological conditions of individuals, but it also describes the conditions determined by the social actions of groups, organisations and even a society.

The above description bears an analogous relationship to Nonaka and Takeuchi's (1995) well-known organisational knowledge creation model. The difference lies in the perspective: instead of focusing on learning, Nonaka and Takeuchi analyse what they call SECI processes (Socialisation – Externalisation – Combination – Internalisation) functioning in *the context of shared work*. Corresponding concepts (sharing members' experiences

– dialogue or reflecting collectively – networking new knowledge – learning by doing) can be found in some writings by Nonaka (1994) and Nonaka and Takeuchi (1995, 70–72). They cannot be found, however, in the diagrams they drew to illustrate their ideas, the function of which is primarily to delineate the processing of knowledge.

Nonaka and Konno (1998) also tried to show the context, time and place for the realisation of the SECI process, which they describe with the Japanese term “Ba”. This refers to a physical, virtual and mental state in which the creation of organisational knowledge becomes possible. Socialisation is a person-to-person occurrence, in which implicit knowledge is transferred from one employee to another in various face-to-face situations. In the externalisation phase, the group plays the decisive role. In the combination phase, the group systematises what they know and joins new knowledge to it in line with common goals, and then this knowledge passes between groups in a network. In the internalisation phase, the individual has the leading role once more, but the new action model becomes established as a *modus operandi* for the groups and the whole organisation, thus embracing the entire organisational culture.

The description of shared learning developed from Nonaka and Takeuchi’s model bears an analogous relationship to Crossan, Lane and White’s (1999) organisational learning model. According to them, organisational learning begins with intuition formation and continues within the subsequent stages which are intuition interpretation, integration into shared activities and institutionalisation as an established practice.

Intuition formation is very closely connected with the latent or pre-conscious action processes going on in the organisation. It cannot be explained from the viewpoint of a single individual’s action because work processes are shared between individuals and work groups in *the context of organisational work*. Intuition interpretation begins with the charting of an action’s conscious elements. The interpretation process also affects tacit knowledge, which has to be transmuted into linguistic form. On the individual level, interpretations contain contradictions, and these have to be resolved within the group in a way that everyone can understand and approve.

It is the shared language and shared interpretation which makes knowledge derived from intuition the property of the organisation, which results in the integration of the interpreted knowledge as a part of collective activity. Integration expresses the work community's continuous internal communication through shared work practices. The establishing of new work practices results in their institutionalisation, by which is meant the routines, structures, systems, strategies and formal frameworks which ultimately direct the organisational behaviour of individuals.

Crossan et al's model fills in what was missing from Nonaka and Konno's aforementioned description of Ba. The model emphasises the role of learning's feed-forward and feedback processes, which form the links between the levels of an individual, a group and an organisation. However, they see the links as if they were only a matter of systematic input and feedback mechanisms. In our view these links need to be understood as the processes fostering learning and knowing simultaneously between and within the different contexts of the work organisation. In the next section we will try to clarify this view. (Järvinen & Poikela 2006.)

Learning and knowing processes in the work organisation

The models of Kolb (1984), Nonaka and Takeuchi (1995), and Crossan, Lane and White (1999) intersect in way that makes it possible to outline the process model of learning at work (c.f. Järvinen & Poikela 2001). Kolb's cycle aims at universality, in that its purpose is to explain the learning activity of an individual in any context whatsoever. Nonaka and Takeuchi's description illuminates the knowledge formation processes, which are essential for individual and collective learning. In Crossan, Lane and White's model the individual's intuition needs the group as its interpreter and transmitter, after which the knowledge acquired can be integrated and institutionalised as the property and a characteristic of the whole organisation. Learning at work can be condensed into the form of a process description (see Figure 3), in which social, reflective, cognitive and operational processes follow, affect

and refashion each other in a continuous process of learning (Järvinen & Poikela 2006.)

The key point in production learning and knowing is not what is happening “in the levels” of the individual, group or organisation, but rather what is happening between them. It is meaningful to talk about contexts of individual, shared and organisational work that link the action and learning processes defined by situation, time and place. The processes producing learning and knowing are presented as linking the corresponding dimensions of the above mentioned theories (see Figure 3).

<i>Social processes:</i>	Concrete Experience (CE) – Sharing Experience (SE) – Intuition Formation (IF)
<i>Reflective processes:</i>	Reflective Observation (RO) – Reflecting Collectively (RC) – Intuition Interpretation (II)
<i>Cognitive processes:</i>	Abstract Conceptualisation (AC) – Networking New Knowledge (NK) – Integration of Interpreted Knowledge (IK)
<i>Operational processes:</i>	Active Experimentation (AE) – Learning by Doing (LD) – Knowledge Institutionalisation (KI)

The social processes (concrete experience – sharing experience – intuition formation) entail the sharing of know-how, knowledge and experience between the individual, the group and the whole organisation. Learning requires participation; it also requires that the participants are able to influence developing activities.

The reflective processes (reflective observation – reflecting collectively – intuition interpretation) encompass the factors relating to the obtaining and giving of individual *feedback*, the *assessment* discussion of groups and the drawing of conclusions as well as continuous evaluation for promoting the development of the whole organisation. It is important that the managers of learning at work ensure that the assessment practices really are used and that they proceed smoothly.

The cognitive processes (abstract conceptualisation – networking new knowledge – integration of interpreted knowledge) concern the production,

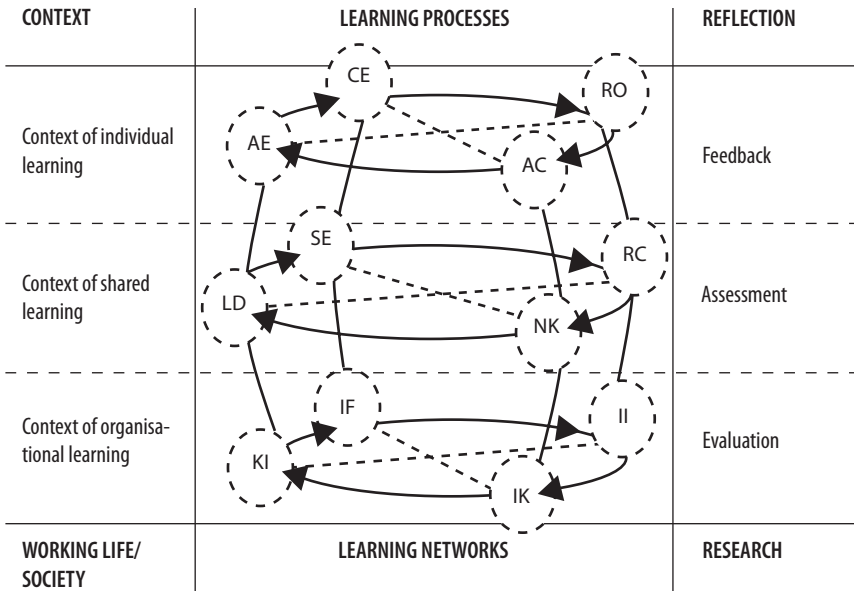


FIGURE 3. The process model of learning at work
(Poikela, E. 2005)

sharing, transfer and recording of knowledge and new models or concepts coming from the employee, group and whole organisation. Experience-based knowledge, to which has been added externally acquired knowledge, is at this stage refined into more general knowledge for the organisation's databases.

The operational processes (active experimentation – learning by doing – knowledge institutionalisation) contain continual experimentation and testing of new practices on the part of individual employees, work groups and departments. From the perspective of the organisation, this means that the new practices become firmly established.

The right side of a Figure 3 describes knowledge construction from the basis of reflection – feedback, assessment and evaluation. In this setting reflection has a dual meaning. On the one hand, reflecting produces knowledge for problem solving, development and innovation. On the other,

it works as a functional source of learning and new knowing for individuals, groups and organisations. Without knowledge, including tacit knowledge which is the target of reflection, learning cannot occur. In the context of individual work the driving force of organisational learning is feedback that individuals can gain by themselves or receive from colleagues, supervisors, clients or other actors. The assessment information produced in discussions has especial significance as a source of ideas, choices and conclusions in the context of shared work. It offers a way of achieving solutions to work problems owned by groups or individuals. In the context of organisational work, systematic evaluation information is gained in the form of inquiries, surveys and interviews which are a part of organisational knowledge creation and a precondition for an organisation's strategic decision making.

The examination of social processes involves the observation and assessment of learners' ability to act alone and with others, dependence on others' support, as well as their ability to act in a group both as a member and as a leader. Reflective processes reveal how the learner relies on different kinds of action procedures, how able they are to face problem situations or to seek solution models, and whether they display innovative creativity. Cognitive processes indicate knowledge possession starting from the ability to read instructions and obey them, continuing with the ability to form principles for action and use different tools, and ending with being able to manage work in a comprehensive manner. Operational processes show the structured and fluent performance of duties and action.

The new description produces a new kind of modelling, in which the organisation is seen as being made up of processes rather than levels and hierarchies. This makes it possible to understand, handle, combine and lead processes in an appropriate way. In the following, our aim is to analyse how simultaneous learning processes connected to an individual, group and organisation cross and intersect with one another in the context of work. A tool for examining these elements is the typology of learning at work as social, reflective, cognitive and operational processes (Järvinen & Poikela, E. 2001). We will also analyse the interactive relations between learning processes and different types of knowledge presented by Blackler (1995). The

data was gathered from the Faculty of Medicine at the University of Tampere and from the Department of Physiotherapy Education at the Pirkanmaa Polytechnic. These were the two case organisations in Sari Poikela's ethnographic research carried out during 1996–2001, a study which focused on the development of tutor competence and knowing, and also on the core elements of their work (Poikela, S. 2003). The data gathered during 1995–1997 was based on the observation of a number of tutorials (n=18) facilitated by five different tutors, and also on tutor interviews. In addition, three tutors wrote journals about facilitating tutorials (n=30) during the academic year of 1996–1997. During 2001, six experienced tutors were interviewed again. In this article, we focus on exploring and identifying the knowledge environment of tutors' work.

Objective knowledge, which can be divided into encoded and embedded knowledge, is not dependent on an individual. The types of subjective knowledge, either individual or collective, are referred to as embrained and embodied knowledge. Encultured knowledge emerges on the basis of other types of knowledge and this is why it is both objective and subjective in nature. The analysis of data is focused mainly on locating subjective and experiential elements of tutors' knowledge (embrained and embodied). However, encoded and embedded knowledge could also be located in the descriptions of different instructions, resources and infrastructure. If these forms of symbolic knowledge remain static, they may even, in the worst cases, prevent learning. On the other hand, if they are dynamically processed, they create preconditions and circumstances for learning new knowledge as a group (see Järvinen & Poikela 2001).

The processes of learning and knowing in tutorial work

Development as a PBL tutor is not only a matter of managing the techniques of facilitating learning or of designing problems. The development of teachers' knowing and competence has seldom been analysed from the point of

view of learning at work. However, according to the research data (Poikela, S. 2003), the essential factors proved to be how tutors acquired and processed knowledge indispensable to their professional development, and also how they learned at work.

The core of problem-based learning activities consists of meetings in tutorial groups or teams (of approximately 10 students) facilitated by a tutor who has the status of a teacher. Tutorials are usually held once or twice a week, and all other learning and teaching activities are constructed around these meetings. So, tutorials can be regarded as a dynamo which drives not only learning, but the entire PBL-curriculum. The role of the tutor is ambiguous and not easy to define since it might consist of many simultaneous roles and tasks that may even feel contradictory at times. As facilitators, PBL tutors are a part of the group themselves and, in this respect, one of the learners too. However, they are still in a position of power, acting for example, as evaluators of the learning results. It is important to become familiar with and to recognise the meanings and functions of tutors' different roles. (Poikela, S. 2003.)

When giving a lecture, teachers/tutors are experts and resources for learning, but in tutorials they facilitate learning. Tutors do not operate prominently and, under no circumstances, dominantly in a tutorial. They facilitate and challenge learning mainly by asking questions. Tutoring is probably the most challenging role the teacher can take on. This means that fundamental questions about oneself as a human being and as a teacher need to be carefully addressed. It is essential to evaluate the depth of one's own expertise regarding the substance of tutorials, as well as one's own ideas about PBL and its theoretical background. Being able to identify and guide the phases (or steps) of the problem-solving process is a starting point for acting as a tutor, but knowledge of PBL should not be limited only to this. Teachers themselves tend to see learning more a teacher-centred than a learner-centred activity, but this is no longer possible within the context of PBL. The role of tutor may feel strange at the beginning, and feelings of uncertainty and inadequacy are usual. Expertise is not determined only by knowledge of the substance, but by the ability to put this expertise to work. This is done

by asking good questions dealing with substance, and by guiding learners to reflect on their learning. (Silén 1996; Poikela, S. 2003.)

PBL changes the culture of learning in many ways. It changes the relation between learner and teacher, as well as the collegial relations between teachers, and it also impacts on the organisation. In the broadest sense, all the functions of an organisation have to be re-evaluated and re-organised according to the principles of problem-based pedagogy and learning. Otherwise, both the teachers/tutors and the students will end up in a state of frustration. Curricular development should become a collaborative process, continuously evolving, and integrating every single teacher into the process. Ideals and practices have to correspond with one another at the level of action. If the impact of these developments at the meta- and macro-levels of an organisation is disregarded, PBL can easily be misunderstood as a static construction arising from a doctrine or dogma, rather than as a transforming educational strategy. From the teacher's perspective, PBL demands fundamental reflection on one's own values and work practices. Consequently, development as a PBL tutor is not only a matter of managing the techniques of facilitating learning or of designing problems. The core of PBL goes deep into conceptions of knowledge and learning, and utilises these conceptions as tools for comprehension.

Experience, interaction and intuition as a source of learning – social processes

Experiences were obtained, shared and produced in different ways. When teachers started to act as tutors, the first challenge was how to establish contact with the tutorial group. Tutors were worried about their skills in facilitating learning, and were even unsure about their own expertise with the substance of tutorials. In the worst cases they felt they could even harm learning if they did not facilitate the group “in the right way”. Tutors also speculated on the effects of their non-verbal actions. The many aspects of the learning situation which appear in tutors' physical movements and actions became visible with this kind of embodied knowledge. Tutors' uncertainty

about their new role also affected the group, which made the students suspicious about their learning too. However, this occurred only during the first two years of running the PBL curriculum. Some tutors assumed that this was because they themselves as tutors had become more convincing, even empowered, as facilitators of learning. At the beginning, they felt they were more “tense and alert”. It was only little by little that they started to relax which, in turn, led to an atmosphere of openness and trust within the group. Tutors were able to analyse the group very skilfully, both in terms of the emotions and the moods of its members. For example, they felt they could sense something in the air which they could not exactly specify.

“How could I help the students come into the tutorial situation, work there and feel relaxed? And how could I do this for myself, too?”

Deliberate control of one’s own non-verbal actions is one part of embodied knowledge. One of the tutors realised she affected the interaction of the group unduly by simply nodding her head too often. In doing this she took too much power in the group situation, since students started to look at the tutor and address her rather than talking directly to each other. This is a good example of how tutors recognised the significance of tacit and embodied knowledge in their actions. It proved to be hard to give a verbal form to all the elements of subjective knowledge. So, the knowledge was more embodied or involved in actions. Tutors described the ways they could influence the creation of a “strong and positive” atmosphere in tutorials. Still, they found it hard to say aloud how their own actions could create such an atmosphere. This was linked to intuitions regarding the joy of learning when, at its best, the tutorial was described as a collective flow-experience enjoyed by all participants.

Even during the early stages of implementing the PBL curriculum, medical tutors started to mentor one another. However, this was not organised or planned in the first place, and one of the tutors described it more as “talking over a cup of coffee”. It was soon apparent that the freshman tutors could not be left alone, and the more experienced tutors started to establish a tutor training system. In this way, more experienced tutors were able to guide the

novice tutors. The tutor training formed a very important forum for obtaining, sharing and producing knowledge. Not all teachers were pleased that they had to change their traditional style of teaching. For this reason, the tutor training sessions also served as forums for handling and processing active resistance to change. One of the tutors described the atmosphere of the sessions metaphorically as “a continuing battle”. Tutors said that changing medical education was hard, even more difficult than “moving a cemetery”. It was important that a proportion of the tutors served as active agents for change in curriculum reform and that they were patient enough to train new novice tutors over several years. Some of the teachers were reluctant to participate in tutor training, but, little by little, active resistance was changed to acceptance. The tutor training and its development provided the most important forums for sharing common encultured knowledge.

Another important common forum, both in medicine and physiotherapy, was the curricular work which was a continuing process. Working alone, isolated from colleagues, was no longer possible because curriculum work forced all teachers to consider shared practices and procedures. Everybody had to argue and justify their opinions. At the same time, the opinions and thoughts of colleagues became more familiar than ever before.

“It happens in meetings, we sit down and talk things over and then we agree what everyone needs to do next. If you share your thoughts during the meetings then your own ideas get noticed more.”

More formal modes of cooperation were developed in medicine because there were so many teachers involved. Acting together, curriculum-planning groups produced collectively shared knowledge. At the start, the members of the groups hardly knew each other, and they knew little about one another’s areas of expertise. This sometimes led to misunderstandings and difficult situations. Earlier, teachers’ own areas of work had been protected too carefully and opportunities for collegial cooperation had been underestimated. Tutors, acting as trainers, had the idea that every novice tutor should have an older colleague observing and commenting on how the first tutorials were going. Some teachers did not want this because they felt it was tantamount to

inspecting their personal area of work. Little by little, however, most teachers began to understand the advantages of cooperation. Tutors describe the present situation as “positive and inspiring”. The doors of the curriculum planning groups are open and anyone interested can join the groups they wish to. The atmosphere of the groups is now much more open and relaxed than in the early years.

Feedback, assessment and evaluation as a source of learning – reflective processes

Subjective knowledge is processed through reflection. Reflection can be understood as the smallest unit of assessment in learning and producing new knowledge. Its aim is to produce new knowledge for learning and development (Poikela, E. 2004). The data richly revealed the elements of embodied and embodied knowledge described by tutors. This knowledge had been generated through observation and assessment over many years. At the start, tutors felt that the new kinds of practices and their new role of facilitator were very difficult, and they missed their former secure role as an expert on the substance of their subjects. This was connected with worries about ensuring that learners learned everything necessary – a typical desire for a teacher trying to explain everything in as much detail as possible.

“I feel that all the theories about acting as a tutor prevent my spontaneous action. Somebody said teachers need to find their own way of becoming tutors and to work continuously with their own role. Maybe I am right at the beginning and I need to accept that I am apprentice to a tutor.”

Over the years, these doubts about being a tutor were reversed. Tutors started to feel that acting as a tutor was more meaningful than giving an expert lecture, for example. Developing as a tutor meant passing through different stages. The primary concern at the beginning was being able to guide the cycle of problem-solving appropriately. Tutors felt this took most of their energy and they had difficulties in making challenging questions or making

comments about the group dynamics. So, this meant that encoded knowledge, which was, in this case, the cyclical model of problem-solving, supported the creation of embrained knowledge. The model, as such, was not static because tutors said it helped them to go through the problem-solving process smoothly and to guide the group more effectively even after several years. The model had the status of established practice and institutionalised knowledge, but it was submitted to a process of continuous reflection both individual and collective.

All tutors examined, at a fundamental level, the change from their former role as teacher to that of facilitator of learning. On the one hand, they sensed they were finding their own ways of being tutors only little by little. On the other, they acted with increasing fluency and felt more comfortable in their new roles. The duties of facilitator and expert meshed more satisfactorily, and the changes in approach forced by the new situation were not felt to be as problematic as before. At the beginning, tutors worried most about how they could help the learners in the best possible way. The development of tutors' skills can be regarded as learning through the interaction between experimenting and changing experiences. However, experimenting was not enough; a continuous analysis of one's own work was needed. It was essential to try to do better all the time. This guaranteed the creation of new intuitions as a basis for learning at work. For example, tutors noticed that it was not enough "to know" the processes of group dynamics; it was also important to influence and facilitate these processes in practical situations. At first, tutors felt helpless in the tutorial situation. This meant that symbolic embrained knowledge had not yet been produced as knowing and competence. So, the lessons about tutoring and acting as a tutor were not in balance. When more experience was gained, the phenomenon of group dynamics was found to be more interesting. Tutors also started to analyse their actions in more detail as "builders of the learning environment" and "supporters of the joy of learning".

"Well, the spirit or atmosphere has a strong effect. Sometimes it just so happens that everyone seems to be in a similar mood and they joke and have a good time. Still the learning issues are dealt with and there is

real progress.”...“I think we have been able to organise the first year well and things are functioning effectively. It gives students a sense that we, as teachers, believe in this way of studying. I see it like that. I sure hope it is like that and it is dependent on us.”

However, despite this experience, there were still situations in which tutors felt their knowledge and skills to be insufficient. Helping the group to synthesise and construct the new knowledge was one area that was particularly in need of development. The key words for acting as a tutor could be characterised as courage, trust and patience. Courage was needed so as not to intervene in the actions of the group too early. Tutors needed to wait and observe and to trust that the group was capable of rational work by itself. Tutors learnt to consider more closely when interventions were needed and what their purpose was. They became aware that in the worst cases tutors could even sabotage the learning if they made an unnecessary intervention. Tutors learnt to focus their interventions and noted the importance of framing good questions. Observing tutorials facilitated by fellow tutors was found to be an effective way of also developing one's own facilitating skills. After years of experience, some of the tutors saw their role more as that of a pedagogue than an expert on substance. So, the development of knowing and competence was enabled through the processes of assessment and reflection.

Many tutors used writing as a tool for personal reflection. Notes and journals were important for assessing both their own actions and the functioning of the group. Collective reflection was possible during tutor training and other common meetings. The experiences gained through training other tutors were also felt to be significant. The systematic observation of tutorials was even described as the most influential learning experience at work. Tutors saw the importance of giving and getting feedback both in tutorials and as part of collective action with colleagues. However, both the tutors and students needed to practise systematic feedback. Reflection needed focus and a realisation of what elements were essential.

A broader evaluation was possible with the continuous development and outlining of the curriculum which was undertaken every year. Unlike the

traditional curriculum, the PBL curriculum was not “carved in stone” for several years at a time. If shortcomings were noted, they were dealt with and corrected at once. The development of the curriculum on this new basis was noted nationally, and both organisations received public commendation in the form of awards for the quality of teaching.

Acquiring, creating and processing knowledge as a source of learning – cognitive processes

The cyclical model of PBL that structures tutorial work and learning is a representation of symbolic knowledge. During the early phase of the project, the model offered detailed direction regarding the actions of tutors and students. Following it gave tutors a sense of “doing things right” and, in this way, they gained a sense of support and encouragement for their work. Tutor guides and course manuals played a similar role, aiming to guarantee that all the tutors acquired and followed the same collective rules. The tutor guides were especially important in medicine because not all the tutors reflected on their work together in collective meetings on a regular basis. Tutors described this as “decent methodological management” and felt that carefully following the same procedure was needed at the start. Designing these shared instructions together was also a good indication of collective learning.

Also, cultural knowledge was created by using metaphors and parables. This can even be described as representing a collective state of mind inside an organisation, involving interaction and knowledge created and shared together. The social appearance of cultural knowledge was easier to locate and express than the values or the tacit collective knowledge of an organisation. The creation of cultural knowledge can be compared to organisational learning which begins with the creation of an intuition linked to the tacit or preconscious action processes of an organisation. The intuition is modified by shared language and by collective interpretation which, in turn, integrates it into the former knowledge of the organisation and institutionalises

it as part of the organisation's collective action. According to the data, the challenge was how collective knowledge and competence could be passed on to "the tutors of the next generation".

The management openly supported the curriculum change in both organisations. Although there was little increase in resources, as such, support from the principal and management was a very important factor in the success of the change process that took place in both institutions. However, the process of curriculum change was carried out in different ways. The tutors of physiotherapy guided their unit towards the problem-based curriculum one step at a time by integrating a new part of the study programme "with PBL" every year over a five-year period. Their unit was small and the change mainly affected the work of about ten teachers. Tutors felt that the management gave quiet assurance and support to the change. Tutors regarded the atmosphere of their unit as excellent and, after some initial fights, their cooperation had proceeded fairly smoothly. In medicine, the change influenced dozens of teachers simultaneously. The change became personalised as a strong faculty dean placed his full authority behind the change process. The differences in these change processes were linked to the ways the elements of cultural knowledge appeared in tutors' modes of expression. For example, the way in which implicit knowledge proceeded to explicit knowledge was expressed through metaphors.

"In earlier days, the teacher was sitting alone in a fully loaded boat almost sinking, and the poor teacher was trying to row with the last energy s/he had. After PBL, the tutor is sitting in a boat with a group and guiding while others are rowing and eagerly looking ahead."

Collective cooperation and learning did not mean that everyone was in agreement all the time. However, objections had to be dealt with and it was understood that everyone's opinions should be taken into account. Nevertheless, it was also the case that some teachers had to concede or accept an idea if colleagues could reason and argue their opinions more convincingly. The best part of cooperation was sharing both the positive and the negative experiences. Creating a good general atmosphere required the transfor-

mation of attitudes. Everyone had to realise that old habits and procedures needed to be changed because of PBL. There was a great deal of cooperation, although its intensity and style varied even after some years. Being open could be surprisingly difficult.

“Some colleagues are too critical of themselves and, because of this, they may even hide their own competence.”

Tutors’ development as facilitators was also indicated in the way they were capable of supporting learners’ growth with regard to autonomy, self-directedness and reflection. Also important was the way in which tutors managed to conceptualise their own actions and pass on their “know-how” to colleagues. Tutors themselves are also learners in the process of problem-based learning but, at the same time, they need to guide the learning skills of the students. If the tutor tries to give over-strict orders and instructions with regard to the learning process, it is possible that there will not be enough space for students’ self-directedness. So, the duty of a tutor is a very complex one. There is a need to trust the learners’ self-directedness, support their construction of knowledge and act as an active resource for learning. At the same time, it is essential to take care of the individual and collective development of expertise in problem-based pedagogy, both in terms of substance and new ways of acting inside the organisation.

Action, cooperation and routinising as a source of learning – operational processes

The application of problem-based pedagogy and the curriculum associated with it started to proceed more smoothly after more experience had been gained. The other side of the coin of “managing the method” is the threat of actions becoming too routine which, in turn, does not guarantee learning quality. This can be avoided by continuous assessment and reflection regarding the action processes. For example, the first part of tutor training in medicine followed a procedure tutors called “a cook book exercise”. The aim was to gain personal experience of being a member of a tutorial group.

The second part of tutor training deepened knowing and competence using an observation exercise followed by a process of collective reflection. The observation exercise was developed in such a way that an observation form helped to direct attention towards essential features of group dynamics and tutors' actions.

Important questions were raised when tutors considered whether a tutor always needed to be an expert on the substance of tutorials. Almost all tutors of medicine were practitioners of medicine themselves. Most of the tutors in physiotherapy were also physiotherapists, but this was not emphasised as a qualification to the extent that it was in medicine. In both organisations the work of the curriculum planning groups was carefully organised and involved participants in different roles. All the teachers of physiotherapy were evidently involved with PBL as tutors, expert lecturers and examiners because of their small number (about ten).

Sometimes old procedures in medicine conflicted with new ones. It had been mainly the professors who had earlier acted as examiners. After curriculum reform they still had this same role, but only some of them actively participated as tutors. For this reason, the question of exams and the criteria for evaluation were sometimes in contradiction with the principles of PBL. The former institutionalised roles as teachers and prevented the creation of roles as tutors or facilitators of learning. However, implementing PBL led to tutors gaining new experiences, interpreting them and, in this way, integrating new knowledge which, little by little, became institutionalised.

Fundamental organisational changes were faced by physiotherapy tutors when the former Institute for Health Care became part of the Polytechnic. The situation was challenging for individuals, the work community and the whole organisation. On the one hand, tutors felt the change, which lasted many years, was very stressful. On the other, the change was not simply a negative phenomenon because it continually drove the process of curriculum development.

“Next autumn we will have a new curriculum once again. So, this must be the normal state. We are doing it all the time and I guess we are used to it. Sometimes this feels like a burden. Now we are going to have a new

curriculum and new terms and conditions of employment for teachers. This is the fun we have been busy with. I think we have kept everything together surprisingly well and our gang has managed it pretty well.”

Collective processes could not be stabilised because the processes involved in knowing and action were in a state of continuous flux and testing. Organisational changes established a strict framework for the use of teaching resources. There were 35 teaching hours per credit at the beginning of the PBL curriculum and this was later reduced to 18–20 hours per credit. Tutors shared the opinion that, without PBL, they could not use that time effectively. Unfortunately, this meant that tutors had less time for their meetings together because they aimed to maximise the hours they were using for contact lessons. Changes in the terms and conditions of employment caused problems with resources. The compulsory teaching duties were no longer based simply on counting the amount of contact lessons, but all the duties undertaken by a teacher. Tutors felt positive about this change because they expected it to offer a better framework for cooperation and development work.

“We had a lot of cooperation even before, but now we do it even more. I think it is one really good point in all of this.”

Conclusion

We have analysed the formation of tutors’ professional knowing and competence from the point of view of processes of learning at work. At first, teachers were worried about their own role both as facilitator and expert and especially about their tutoring skills as a facilitator for the tutorial group. However, different elements of teachership began to be combined in more creative way as a result of tutors’ own reflections and the collective learning process. As a result, it was possible to move from a culture of working alone to a culture of shared work and genuine trust. The curriculum, which was constructed together, became a tool for reforming the whole culture of an

educational organisation. The change affecting individuals, the work community and the whole organisation was crystallised in the successful reformation of curriculum and work organisation. It was not a matter of the skills of the individual teacher or even of effective cooperation among some of the teachers, but a matter of fundamental development producing new pedagogical knowing and competence. The development work institutionalised in the form of a new curriculum constructed on problem-based pedagogy touched everyone in the work community.

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COLLABORATIVE PLANNING IN A MULTI- PROFESSIONAL DAY CARE CENTRE

– PBL as a strategy and a script for learning at work

Learning at work is often described as a continual problem-solving process. While work is seen as a major learning context, learning at work has been described as random, experiential, and often also invisible to the learners themselves. For this reason, it has been considered important to pay particular attention to the learning processes in the work community that enable more goal-oriented and conscious learning in the everyday work. The article discusses the applications of problem-based learning in the collaborative planning process in the work community. The study is a part of a wider research project '*Developing multi-professional expertise in the context of the day care centre*' (Nummenmaa & Karila 2006).

Learning at work primarily refers to people's everyday experiences at work. Particular attention is paid to how the various practices at workplaces affect the employees' learning in the context of work. Garrick (1998) links two main suppositions to the notion of learning at work. First, the everyday situations at work include versatile opportunities for learning. Second,

things learned via first-hand experience have a dynamic nature and they are open to versatile, new combinations.

Learning at work is often characterized as informal and random learning (Argyris & Schön 1978; Marsick & Watkins 1991; Tynjälä & Collins 2000). Both the notions of informality and randomness refer to the often unintentional nature of learning at the workplace. Experientiality is also an essential part of learning at work, visible in the employees' general difficulty in separating work and learning at work. According to Billet (1999), a majority of adult employees considers having learned much via experiences at work. When the employees are then further asked how this learning has taken place, it proves difficult to put the learning experience into words, or they start to present ideas about learning by doing, learning from others, and observing other people's work. According to Billet, learning is a result of the daily thinking and activities, as well as understanding the importance of the issues people are faced with in their lives (Billet 1999). As learning at the workplace as an entity is a multidimensional phenomenon, and no one approach exists to define or describe it, learning at work ought to be studied from various perspectives, depending on the context and the frame in which the learning is being studied (Boud & Garrick 1999).

Problem-based learning is often mentioned as the most important educational innovation of the past few decades, particularly in the area of professional-oriented training. Even though problem-based learning originated specifically in education, while processing issues related to working life, its applications still remain relatively little studied. However, there is increasing interest towards the opportunities of problem-based learning in the development of working life. In Finland, Jalava and Vikman (2003) were the first to introduce a wider scope of applications of problem-based learning in the development of companies and businesses in their book concerning work and learning in the enterprises. They justify the functionality of problem-based learning in new organizations and working communities, for example, by defining work that is oriented towards problem-solving as a natural part of people's everyday work. In their own lives, people constantly solve various daily problems, often without realizing that a number of their solutions are

problem-based. The people's former backgrounds, experiences, beliefs, and conceptions essentially affect this unconscious activity. In various group-level activities in work communities and organizations, the number of solutions and problems is manifold. In addition, a growing number of new dimensions can be reached with problem-based learning, as the people in the groups change. In the context of work activities, solutions are often sought for some unsatisfactory situation, which is to be eliminated or developed into a certain direction. (Jalava & Vikman 2003.)

Bereiter and Scardamalia (1993) define expertise as gradually proceeding and developing problem-solving in which the members of the community constantly reflect on their own activities and redefine their working practices. Problem-based learning at work can thus be primarily seen as a pedagogical 'script' that guides the process of learning at work. This notion contains the key processes for learning at work: the process of strong participation, the shared discussions on the significances and relevancies, the individual and shared knowledge formation, and developing the shared practices (Hakkarainen et al. 2002; Tynjälä 2006; Wenger 1998). The work process *per se* enables a more conscious learning process as well as making visible the knowledge based on experience and the tacit knowledge in the community. Problem-based learning must, however, also be seen as a more general development strategy that enables a new kind of culture of learning at work in the community, the evolution of the community into a community of learners (Nummenmaa & Karila 2006).

The employees do not always consider their own job or their workplace as a learning environment or a source of learning. Tradition has long dictated that learning and work take place in different places and institutions: work in the working place and learning elsewhere (Garrick 1998). For problem-based learning and its guidance in the workplace, it is essential that the members of the work community also learn to consider and recognize their workplace as a learning environment and to view it from various perspectives. Learning at work can be supported, for example, by the following forms of data acquisition: documenting and reflecting on their own work (for example, with work diaries), observing the work of the colleagues, taping one's work on

video and observing it critically; having shared conversations and negotiations, observing the operations of other working communities, interviewing (for example children, parents, the other people in the work community), familiarizing oneself with related literature and acquiring data from the Internet (see Fig. 1).

The process of problem-based learning in the workplace may in practice acquire various different shapes, depending on the organization – its basic function and the structure of the organization. Jalava and Vikman (2003) have applied problem-based learning in companies (for example, Nokian Renkaat). In our research, the organization was a municipal day care centre. The development and research object was the *collaborative planning process* for creating the early childhood curriculum for the day care centre. We sought an answer to the question of what challenges for learning at work there are related to a collaborative planning process and how problem-based learning can be applied in the context of work and in the processes of learning at work.

Our starting points were, among others, the research observations of Virkkunen, Toikka and Engeström (1997) on the key challenges from the perspective of learning and change in the work community: the crossovers at the boundary between planning and implementation. In our research, the key issue was the learning and the developing of a planning culture that is oriented towards new practices, and a planning working method. With the crossovers at the boundary between strategic reorientation and the renewing of everyday action practices, the everyday work in the work community is connected to developing strategic possibilities, the basis of which is formed, among others, by interpretations shared by the community of educators on the goals of education, on the views on the logic of the growing and developing, as well as on the importance of educational interaction and stimuli on early development.

The development context and the method

The day care centre that participated in the development study was a medium-sized municipal day care centre in Finland. There were 92 children in the centre, 15 employees with nursing and pedagogical tasks, and five groups of children based on the children's age. In each group of children, there were three employees, either kindergarten teachers or nursery nurses.

Shared planning had previously been conducted on two levels in the day care centre: on the level of the entire day care centre and in the groups of children. These planning meetings had had clearly distinct tasks and goals in the pedagogical planning in the day care centre. The participation and action of the employees had also varied, and kindergarten teachers were usually responsible for pedagogical planning.

However, new challenges have emerged in the planning work in day care centres the national basics of early childhood curricula were published in Finland in 2003 and they operate as the national tool for guiding early childhood education in order to develop early childhood education arranged and steered by society (National Curriculum Guidelines on Early Childhood Education and Care in Finland 2003/2005). It is recommended that municipalities create their own specific early childhood curricula. Similarly, day care centres are expected to create day care centre – specific early childhood curricula. From the perspective of the working culture and the educational practices of the community, the specific ways in which day care centres start to proceed their plans are of particular importance.

Faced with the challenge of development, the participating day care centre started work on its own early childhood curriculum by applying problem-based learning.

The research was conducted as a case study using the methodology of a participatory and developing action research (Keating, Robinson & Clemson 1996). The development process was launched in August 2004 and it ended in November 2005. The goal of the research alongside the development process was to discover elements that enable a change in the planning culture,

and, more generally, opportunities for learning at work and its conditions in the everyday activities in the day care centre.

The approach of our action research was practical, participatory, and it involved the aim of developing one's own work. The research emphasized communality and shared reflection. In a development work based on the reflective method, the organization is not given turnkey solutions, but instead, assistance is provided for studying, analyzing, and understanding its operations and problems (Greenwood & Levin 1998).

The study also strongly highlighted participation and action. The members of the community participated in every phase of the research. The action research included a number of cycles of learning at work, activities, observation, and assessment (Carr & Kemmis 1986). The script that ultimately organized the learning and the process related to the action research was the problem-based learning cycle (see Fig. 1), and the related problem-solving process formed a natural reflective spiral of action research (Heikkinen & Jyrkämä 1999; Nummenmaa & Karila 2006).

The basic principles of PBL at work were:

1. Learning proceeds in groups on the basis of jointly perceived and set problems, jointly formed conceptions and by critically evaluating previously searched information (Boud 1999; Poikela, S. 1998).
2. Learning takes place in the normal working context and the information that is needed to solve problems is acquired in many different ways (i.e. by documenting one's action, reflecting, interviewing colleagues, from literature etc.).
3. The staff members' diverse knowledge and competencies are resources that are taken to practice by using a guided and participative learning process – by working in tutorials.

4. Common discussions and solving the problems/questions rising from the staff members' own work conditions motivate people to acquire and produce new knowledge.
5. The individual knowledge and competencies of the group members are put to use as the group negotiates and constructs a shared understanding and solution for the problem in question.
6. The learning process is guided, phased and assessed at every stage of the process.

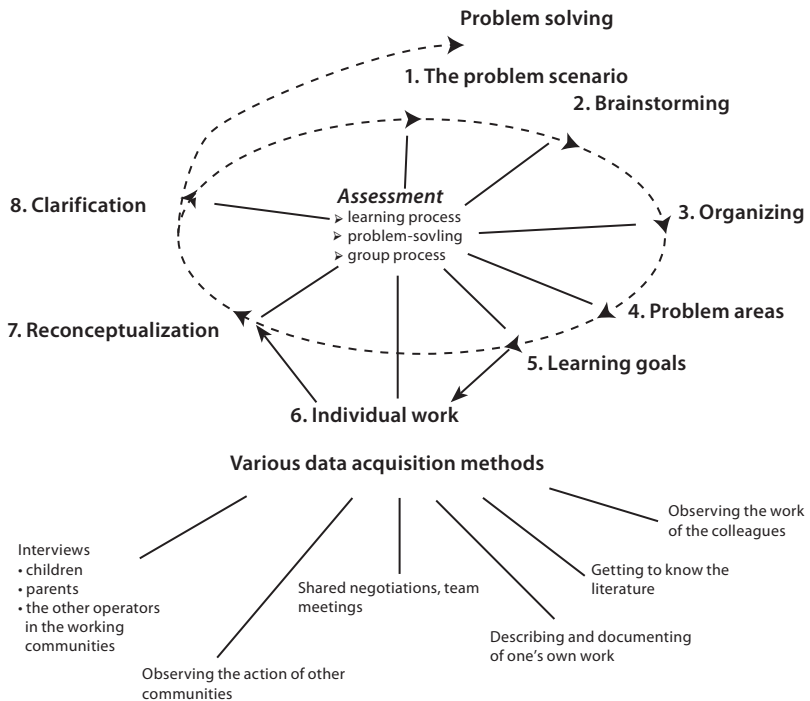


FIGURE 1. The PBL learning cycle and various methods of acquiring information

7. Assessment and feedback have generally a central role in learning processes. This is because the problems occurred e.g. in work processes usually have to be solved by sharing individual and joint experiences.

Prior to the launching of the development process, the work community empirically studied the basic principles of PBL and the processes of problem-based learning at work. The basic scenario that guided the operations and acted as the start up situation was the early childhood curriculum of the day care centre. The PBL process was divided into two cycles and into eight operational phases with individual goals (Fig. 1).

The work always proceeded on two levels: in the PBL sessions shared by the entire work community, as well as in the team-specific sessions. *In the PBL process of the entire work community*, the problem scenarios were discussed with the entire work community present. The staff gathered in a joint meeting once a month, after the work day at 5:15–5:30 PM. In the first phase of the PBL cycle, the staff worked on the problems together. In the phase of independent action, the action shifted from communal work to the level of teams, which meant that the teams used various methods to acquire information and thus proceed with the problem-solving process. After the independent data acquisition, the work community again gathered, and the data acquired was applied in the second phase of the cycle to reconceptualise and clarify the learning tasks. In the mutual meetings of the work community, researchers of the developmental research acted as PBL tutors. Teams of three were organized and they operated independently without tutors, who nevertheless acted as resource persons throughout the entire process.

In a PBL process that is realized as team work, teams formed of the staff working with the groups of children in the daycare centre act as the learning group in the scenario work. In the first phase of the scenario cycle and during the independent action, the teams operated with the problem scenario *independently alongside everyday work*. As the cycle shifted into its second phase, the problem-solving process proceeded to the level of the entire work

community, and the teams gathered to form common understanding of the issue to be discussed – the target of learning at work.

The process proceeded from a wide problem scenario to reorganized issues that operated as the learning targets for the day care centre employees and gradually formed a guiding framework for creating the early childhood curriculum. Table 1 describes the learning targets faced by the work community in the shared process of creating the early childhood curriculum, as well as the main goals of working.

TABLE 1. The goals and targets of learning at work related to the early childhood curriculum

TARGETS OF LEARNING AT WORK	KEY LEARNING GOALS
1. What is the early childhood curriculum all about?	To orient to the basic task of the early childhood curriculum
2. What is included in the early childhood curriculum?	To think about the contents of the early childhood curriculum
3. What is our day care centre like?	To build a shared image of the day care centre
4. What is good education like in our group?	To study and explicate the common base of values
5. What kinds of established practices are there in our team?	To study the operational practices
6. On what kinds of conceptions of development and learning, as well as nursing and education are our practices based?	To study and explicate the conceptions of development and learning as well as the educational principles
7. On what kinds of structures is our day built, and what are its problems?	To start working on the group-specific early childhood curriculum
8. How is the day at the day care centre structured for each group of children?	To work on the group-specific early childhood curriculum
9. What is the connection between communally built values and targets and the operational practices?	To form a common early childhood curriculum for the day care centre

The data collection was also partly integrated as a part of the PBL process. The following data have been collected during the process.

- A. The staff's *tutorial discussion* was observed;
- B. *Individual descriptions* dealing with own work practices, work orientation, beliefs related to the child's development, early childhood education;
- C. *The teams' common descriptions* dealing with their work practices, work orientation, beliefs related to the child's development, early childhood education.

In a separately organized data collection the following methods were used:

- D. *The daily activities of the teams* (the community of practice) were observed during the process;
- E. The members of the teams were *interviewed individually*;
- F. Each team was *interviewed (group interview)*.

In accordance with the principles of action research, the data produced during the PBL process has been analysed and used as a resource for learning through the process.

Results

Figure 2 presents a summary of the learning processes that emerged during the planning process involving the entire day care centre personnel. It is based on the individual interviews as well as the team interviews carried out in the closing phase of the project. Interviews were analysed using a data-based method.

In particular, the employee interviews emphasized three major experiences: mutual conversations and problem-solving had become more fre-

quent, a shared language had been created in the work community, and the participation and the commitment of the entire personnel (nurses as well as teachers) had increased. In the employees' reflections, the three aspects are closely interrelated. As the number of mutual conversations increased, a shared language also started to form. A shared language, in turn, facilitated the commitment of the entire personnel in their contributions to the planning and implementation of the early childhood curriculum, as the issues had been reflected and understood on a deeper level in the shared conversations.

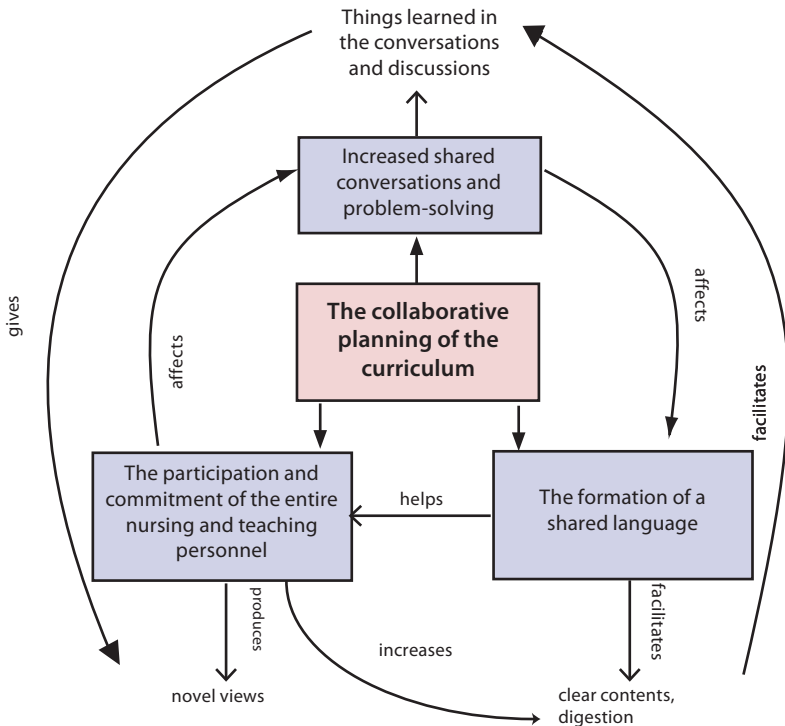


FIGURE 2. Learning processes that resulted from the collaborative working on the early childhood education curriculum

In a multi-professional day care centre, there are employees with different educational backgrounds and educational levels. This means that shared conversations and tasks also helped the members of the work community learn from each other. The employees reported that the shared conversations brought whole new aspects to the issues discussed and thus enriched the operations of the work community in the day care centre.

Our development study applied problem-based learning (PBL) as a script guiding the learning at work. In the interviews, the employees clearly emphasized the *opportunity of learning a problem-based way of working*. It created a strong dimension of true participation and equality, challenged the employees into the processes of learning at work, and acted as an arena for enabling common, shared knowledge formation: *"I'm very happy about this, in a way it has forced us in a good way, it's given the framework and the opportunities for the work community."*

Solving problems related to problem-based working and the work itself can thus be considered an inquisitive working method in which experts analyze their own work individually and together and reflect on the justifications for their solutions and the development of their working practices and the social contexts of their work (Järvinen & Poikela 2000; Karila & Nummenmaa 2001). Work in the fields of early childhood education is a strongly context-bound phenomenon. Developing the everyday work, the expertise, and learning at work cannot thus be studied as separate from their context. Learning is seen as a relationship of experience and context as represented by the individual ways of orientation towards the job, the individual and communal forms of processing information, and the prerequisites created by the organization. Individual learning is a prerequisite for group learning, similarly to the learning of individuals and groups necessary for learning in communities and organizations (cf. Järvinen & Poikela 2000).

Along with the opportunity of problem-based learning, the employees also highlighted its *challenging nature as a working method*. From the perspective of developing work and solving the related problems, the challenging issue was to shift the working method and apply it as part of the everyday problem-solving situations as a natural reflective professional practice. Inte-

grating learning and problem-solving as part of everyday practices enables individual development into an expert while working. In applying such a method, learning and using the knowledge would thus form an intertwined process (Tynjälä & Collin 2000).

The staff members considered important the *process orientation* of problem-based learning which helped the employees form positive attitudes towards the continual working on the early childhood curriculum. This likeness to a process lies within the fundamental core of an early childhood curriculum, as new work teams and groups of children enter the day care centre annually. In such situations, it is important to renegotiate the working practices and the educational principles. Meanwhile, adopting an attitude of constant processing oriented the employees towards continual learning and improving of one's work. In conclusion, it can be stated that process-type working with the early childhood curriculum deepened the staff's understanding of the importance of the early childhood curriculum, the conceptualization of their own work, and constructing a common language in a multi-professional day care centre community.

Some final remarks

The context of our developmental research was a Finnish day care centre. Day care centres are multi-professional work communities where people with different kinds of formal education and professional competences meet and work together. The potential of multi-professionalism has, however, not yet been taken advantage of. Instead, different kinds of educational and experiential backgrounds of the employers have functioned to produce the work communities more as insecurity about each occupational group's competence strengths and work tasks. (Karila & Nummenmaa 2001.)

The purpose of our developmental research has been to understand and to model learning at work in the frame of reference of problem-based learning. As a starting point of learning was the common planning and implementa-

tion process of the early childhood curriculum (ECEC). The process was guided by the use of PBL as a script of learning. In conclusion, we can present a few central working principles and challenges for learning at work.

First and foremost, the point of departure is the assumption that high-quality learning develops within the *context* in which it is planned and implemented. Early childhood curriculum development, therefore, begins with an open examination of the prevailing situation and practices. Secondly, the curriculum development process produces a system of learning based on collaboration – a learning partnership. A learning partnership is an internal process of the workplace community between individuals in general, between individuals in teams and between the teams. Thirdly, curriculum development is based on the principles of problem based learning. The process takes advantage of the staff's personal experiences, through which interpretations about the curriculum are collaboratively produced. According to Wenger (1998) it is a question of *learning as experience* with shared meaning making.

The implementation of the early childhood curriculum means above all adopting new community practices – *learning by doing*. The curriculum development process produces new and further develops the old tools for the improvement of teaching, learning and the work culture. On the personal level the most challenging learning is *learning as identity work* – the adoption of learning at work and planning collaboratively as a part of the own work-orientation.

Developing and maintaining a collaborative working culture requires participation in and commitment to the shared operations to reach a certain goal. Wenger (1998) describes participation as an active process which contains the mutual ability to recognize significances and relevancies and to discuss them. In this process, the members of the community also constantly shape each other's conceptions. While participation shapes the experiences (identity) of an individual, it also shapes and alters the communities themselves.

According to our observations, particularly the processes of participation, discussions on the significances and relevancies, and the formation of

shared expertise form the core of the creation of a working culture that is related to collaborative planning. As a result of these processes, it is now also possible to renew the existing practices related to the organization and planning of the work. At the personal level, the learning process also enabled professional development in the community, and as a result of this, new dimensions were found for one's individual work.

PART IV

ASSESSING FOR LEARNING AND KNOWING

The contextual and constructive perspective of knowledge requires close examination of assessment and evaluation. If we assume that the knower cannot be separated from the known, we need to ask what place objective, unbiased evaluation has in the curriculum. From the point of view of self-directed learning, the focus of assessment and evaluation is the promotion of further learning.

Reflection and assessment lie at the core of the PBL process because the quality and the results of learning depend on the learner's ability (with the help of the tutor) to set goals and to find the means for engaging in personal and collaborative learning. *Assessment* is an integral part of the learning process and primarily focuses on that process. Usually, the learning results are *evaluated* when a student moves to the next step or stage of training or to the profession as a novice. In PBL, assessment is connected with every phase of the learning process. In this way students learn self-assessment and, also, to set their own aims and criteria. Generally, a high quality of work is achieved only through assessment which is focused on process (Poikela 1998, 2002; Nummenmaa & Perä-Rouhu 2001).

The development of professional competencies is based on the processes by which they are produced. The change in the evaluation paradigm can be noted as a transition from scientific measurement to judgemental assessment (e.g. Hager & Butler 1994). Scientific measurement emphasises objective results, whereas judgement is interested in the processes producing results. Judgemental assessment is analogous to contextual analysis (Pettigrew 1985) which begins by describing the process explained by the outer and inner contexts of organisation. One of the tasks of this analysis is to develop criteria for judging learning processes and the outcomes of action. Such

judgemental criteria have been applied in some areas of vocational education in Finland. The competence-based skill tests are developed on the basis of contextual knowledge and learning (Nuotio & Backman & Pernu & Sisättö 2001; Poikela 2002). Those who develop skill tests and those involved in the pedagogy of problem-based learning have a great deal to offer one another.

The aim of the project was to develop a new paradigm for assessing learning processes and evaluating competencies at work. The following research questions were addressed:

- *What is the basis and the purpose of evaluation in PBL pedagogy?*
- *How do we evaluate knowledge and knowing in the different contexts of education and work, and how do we integrate assessment strategies which deal with work and education?*

Esa Poikela's and Sari Poikela's article '*Developing context-based assessment within the framework of problem-based learning*' approaches assessment and evaluation through different paradigms and introduces the idea of context-based assessment (CBA).

Anna Raija Nummenmaa's, Kirsti Karila's, Jorma Virtanen's and Helvi Kaksonen's article '*Interpretations of expertise as a framework for the PBL curriculum and assessment*' deals with the relationship between the curriculum and the assessment.

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DEVELOPING CONTEXT-BASED ASSESSMENT WITHIN THE FRAMEWORK OF PROBLEM-BASED LEARNING

Our post-industrial society is increasingly becoming an auditing society which is not only controlled by norms and financial resources, but also by the knowledge produced by individuals and communities. Assessment too can be seen as undergoing a transition from scientific measurement towards judgemental assessment (Hager & Butler 1994). While, the focus of the scientific paradigm lies only on results measured as objectively as possible, with the judgemental paradigm the focus is on the process of producing results. Hence, subjective factors should be taken into account.

Boud (2000) argues that assessment and evaluation involves identifying appropriate standards and criteria and making judgements about quality. The purpose and methods of assessment and evaluation should be extended and seen as an indispensable factor in all forms of lifelong learning. These ideas can be compared to the classification of generations of evaluation presented by Lincoln and Guba (1987).

What distinguishes problem-based learning (PBL) as a technique and, even more so, as an educational strategy, pedagogy or even philosophy are the changes needed in the whole learning environment. Defining PBL as pedagogy implies a framework which holistically considers the organisational context, curriculum content and design, and the teaching and learning approach. Sari Poikela (2003) states the developmental work with PBL does not end after first curricular changes but continues even after many years. Continuous development of pedagogical processes and systems of assessment and evaluation are needed. In this process, organisational factors also play an essential role.

The aim of our article is to consider the basis for developing assessment and evaluation in problem-based learning (PBL) both in the contexts of higher education and learning at work. The article offers a starting point for further development and research, making explicit good practices and quality factors connected with evaluation and pedagogy within the framework of PBL. Empirical data referred to in the article has been gathered from four group interviews, or rather discussions among participants, involved in a Professional Development Programme on Problem-Based Learning (PBL-PD). These discussions were conducted in January 2005. Each group had 5–6 members and discussions lasted from 45 to 60 minutes. The thematic structure was specified on paper for the groups, and discussions were transcribed and then thematically analysed.

Quality assurance, assessment and evaluation

Chen (2002) emphasises the need for quality assurance in the context of problem-based learning. His ideas have been shaped by over twenty years of experience in implementing PBL at the University of Newcastle, Australia. Since the organisational environment around PBL is also influenced by quality assurance demands, it is important to ensure that the responses protect and promote the PBL approach to teaching and learning. Internation-

ally, PBL programs have been developed over the course of at least five “generations”. The practitioners of PBL have evolved from novices to mentors to instructors of the next generation. This process is still in its early phases in Finnish higher education.

When implementing quality assurance with regard to practice, it is essential to articulate a number of questions: Why are we using PBL? How are we implementing PBL? What are the objectives for our PBL approach? How do we gather evidence that we are (or are not) achieving objectives? How do we act on the feedback we receive about our processes and performances? Chen states that if these issues are clear, the actual “model” of PBL that we use becomes secondary. Quality assurance should be integrated into PBL practice so that documented processes demonstrate quality attributes, many kinds of data are gathered to provide evidence of performance, and practices are monitored, reflected on and improved constantly (Chen 2002).

Parjanen (2001; 2003) analysed the problematic points in the quality assurance system at the university. He noted that the relations inside the system are normally discontinuous and that this same problem also seems to affect polytechnics. Most of the feedback information passes between teacher and student. Although this relation is important, insufficient feedback and assessment information flows between colleagues, directors and the administration. In this case, the whole assessment system becomes dysfunctional. Squires (1997) asks a key question: “When we are evaluating teaching, are we evaluating the right things?” It is difficult to find a unified and shared basis for evaluation and quality if teachers see the functions of teaching in many different ways. An effective quality system should cover all the levels of an organisation and even the senior directors and leaders should receive feedback from the “grass roots” level. This means that the role of the management is very important in enabling a functional quality system. In addition, Parjanen recommends the continuous development of quality systems used to evaluate teaching and learning.

Raivola (2000) presents a hierarchy of evaluation concepts. He defines evaluation as the broadest concept, followed by accreditation, audit and assessment. In international discussion this hierarchy is not always uniform,

but it clarifies the relations between the different levels and practices of assessment and evaluation. Comprehensive evaluation and auditing systems are needed to gather information both for use in educational policy and for developing education and learning processes. New kinds of evaluation systems are needed to face this challenge. Raivola emphasises the contextual factors of quality and states that quality always relates to things and objects; it is multidimensional and unique for every product and for the process creating the product.

Generations of evaluation and a paradigm shift

Lincoln and Guba (1987) divide evaluation into four historical periods or generations. The first generation of evaluation started with the testing of mental abilities and the performance potential of recruits to the US army after World War I. This also led to the testing of quantitative performance in the field of education as behaviouristic ideas about learning and teaching increased in popularity. This first generation of evaluation still exists in various forms of testing.

The second generation of evaluation is linked to Ralph W. Tyler and his ideas about evaluating goals and aims which eventually became criteria for evaluating all functions. Here, the focus of evaluation was directed towards programs and organisations instead of the individual. Since the setting and achieving of goals was dominated by organisations, the aim of evaluation, it was argued, should be to describe and present the strengths and weaknesses of the programme in relation to the goals and aims set by an organisation. However, the relevance of these goals was not evaluated.

The third generation of evaluation began to see the evaluator him/herself more as a judge facing the very difficult task of trying to draw clear conclusions from gathered data. Concepts of “merit” and “worth” were emphasised which led to discussion about values and the justification of evaluation from

a wider perspective. Money and the comparison of costs and resources also become essential factors for consideration.

The fourth generation of evaluation started to emerge during the 1980s as a result of criticism directed at former evaluation procedures and practices. It became evident that the “truth” found by an evaluator is not shared by all the individual actors inside an organisation. For this reason, the evaluator’s main task is to produce *feedback* and *assessment* knowledge for the audience (actors inside an organisation) and by doing so, broaden the perspective to include common practices. The evaluation can and should be responsive. This means that the starting point for evaluation is the local context and the actors inside that context.

The difference between the third and fourth generations of evaluation is so striking that it is appropriate to call it a paradigm shift. The former models were based on ideas of objective knowledge and a monism of values. The fourth generation sees knowledge as a socially structured phenomenon. Inside an organisational context, the meaning of condensed and abstract systems of symbols and the shared meanings they hold become essential. At its best, this leads to a deeper understanding of shared practices and to organisational learning. (Lincoln & Guba 1987.)

Hager and Butler (1994) also describe the changes in evaluation paradigms regarding the concept of assessment. The shift in *assessment paradigm* can be seen as a transition from scientific measurement towards judgemental assessment. The focus of the former lies only on results measured as objectively as possible. With judgemental assessment, the focus is on the process of producing results, which allows subjective factors to be taken into account. Boud (2000) argues that assessment involves identifying appropriate standards and criteria and making judgements about quality. The purpose and methods of assessment should be extended and regarded as an indispensable factor in all forms of lifelong learning.

Esa Poikela (2003; 2004) finds an analogical relationship between judgemental assessment and contextual analysis. According to Pettigrew (1985), the starting point of an analysis is in the *description of the process* explained by the external societal context and by the internal organisational context.

One of the tasks of analysis is to develop criteria for assessing activity and its effects on the process as a whole. Poikela presents the idea of context-based assessment (CBA) which requires that situational and contextual factors are carefully considered. This offers a very broad perspective on *assessment process* and also facilitates the development of quality systems.

The theoretical basis for developing ideas about contextual assessment and quality systems in problem-based learning can be found in experiential learning. This approach provides a framework and a starting point for further development and research, making explicit good practices and quality factors connected with evaluation and pedagogy. (Poikela, E. & Poikela, S. 2005.)

Zones and mirrors for assessment

According to Kolb (1984), reflective observation is an essential part of a learner's activities. In this way, *reflection* can be seen as a factor which unites the processes of learning and assessment (see Poikela, E & Poikela, S. in Part III). The learner is not only the owner of the learning process, but s/he also owns the processes of assessment. The learner's ability to assess his/her own knowing is the most important factor in understanding and influencing the situation and the context of action. Process assessment creates a basis for guiding self-assessment and for evaluating the outcomes or products of learning activities (see Figure 1).

The core of Figure 1 shows the cycle of experiential learning with reflective observation as an essential part of that process. *Self-assessment* occupies the central zone of the core, *process assessment* the middle and *product assessment* the outer zone. Between them are the boundaries needed for developing the learner's assessment skills.

We have applied the idea of context-based assessment in planning and implementing the Professional Development Programme on PBL (PBL-IT). Assessment was the focus of studies which examined the constant process

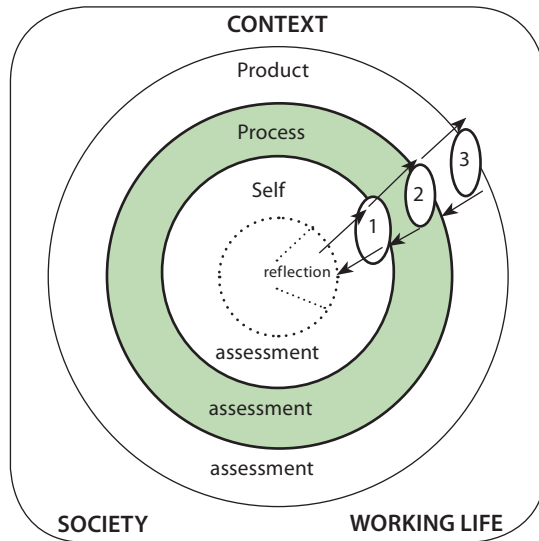


FIGURE 1. The mirrors of the assessment process

assessment taking place in tutorials. Evaluative feedback was gathered during a different phase of study, for example, with questionnaires consisting of open questions, and reflective group discussions were organised in January 2005. There were four group discussions lasting between 45 to 60 minutes with 5–6 participants per group. Although there was no interviewer in these sessions, groups had written instructions for discussion and one member was given the role of chairperson. Group members knew each other well and we felt that the presence of an outside interviewer might restrict rather than facilitate discussion. This proved to be the case because participants' written instructions included assessment themes about individual, collaborative and organisational learning, and experiences of different types of working methods of the PBL-PD studies were asked. Discussions were recorded and transcribed to allow qualitative thematic analysis. Discussions took place at the time participants were finalising their development project reports. The

feelings about writing the final reports were an important matter in the discussions of every group.

In the following we analyse what kinds of issues and concerns about assessment and the curriculum arose in the group discussions, and how these can be set within the framework of the zones and mirrors of assessment.

The first mirror

The boundary between self- and process assessment provides a *mirror* which helps learners to develop reflective skills for assessing themselves, their performances and their relations to other actors. The most essential mechanism for reflection is *feedback*. Learners can observe themselves and others in action with the help, for example, of a study or work journal. They can receive and consider instant feedback from the supervisor, other students or work colleagues, and from the peer group. Improving self-assessment and process assessment skills is important both for teachers and students. Because PBL demands skills of reflection, interaction and collaboration, effective tools for improving the quality of individual and shared learning processes are needed.

The most typical and acute issue regarding evaluation in group discussions was the dynamics between self- and process assessment. The different purposes of feedback and assessment were raised. At its best, it was a dialogue where both students and teachers alike gave and received feedback. During the PBL-PD programme, teachers were able to gain a deep sense of how it felt to act as a student in the process of problem-based learning. At the same time they could experiment with giving and receiving feedback both from the perspective of the student and from that of the teacher.

“Somehow there should be an aim for some kind of instant assessment. So assessment would produce data for all the partners at the same time this assessment situation takes place. I do not find any other kind of medicine, because if it is done afterwards, I think it is not done at all. There is really no time for that. Surely it is the most difficult thing to

organise a means of assessment that would allow the whole business to go like this.”

“I think this assessment has taken place in many ways. It has been a concrete lesson that it is not only teacher or facilitator who does the assessment, but I feel that I have gained a lot of feedback from my fellow students. This is a new kind of thing... we have learnt to give feedback to each other.”

Assessment produces data that both parties need. Self-assessment and process assessment were not considered an easy task, but it came to be considered an essential part of learning. If assessment was not conducted participants felt something was missing.

The second mirror

The aim of the mirror between process and product assessment is to examine the means involved in setting goals and the *criteria* for achieving them. Usually the setting of goals and assessment criteria is not carried out in cooperation with the learners. Rather, it is assumed that the learners' task is simply to accept them and act accordingly. In order to improve motivation, commitment and responsibility for reflective learning, the premises and means of assessment need to be made explicit. Even if the criteria already exist, learners need to recreate them in order to engage in the processes of learning and assessment.

According to the group discussions, the integration of process and product assessment in the PBL curriculum proved to be problematic. Finding means of assessing learning outcomes was difficult. Teachers felt they should give more feedback, but giving feedback and assessment was not sufficiently resourced in teachers' individual work plans. Instead, the pressure for giving feedback as a norm was experienced.

“It is not genuine student-centeredness if, for example, evaluation is done in such a way that it guides the student to a situation in which only one possible way of acting is left.”

“All kinds of assessment material are gathered, but that’s it. What is then done with this assessment material?”

“Well, the allocation of these certain duties, in a way, has been problematic. I think we would like to give feedback and actually we know damn well we should give it much more.

One of the teachers stated that the authenticity of student-centeredness is tested by the style of evaluation. The large amount of evaluation data was considered problematic. The question was also raised as to the use of evaluation data gathered, for example, with a feedback form if only one teacher knows the content of the feedback. Documented feedback is seldom public and shared, and it does not guide development. However, PBL demands transparency: the processes of learning, facilitating and assessment need to be shared with and between students, teachers and experts.

“It might be necessary that the whole process should be considered and planned in another way. So the development should begin with evaluation and not from teaching where we consider only what content is needed. Of course this is important too, but evaluation is not often considered from the point of view of how I could develop learning with assessment in the best possible way.”

The boundary zone between self- and process assessment was clearly emphasised in teachers’ reflective discussions. There was a feeling that the problems involved in these matters would have to be resolved before it would be possible to move to an evaluation of the problems linked by process, outcomes and context. There were few direct references to the boundary zone between process assessment and outcome evaluation – such comments had to be read between the lines.

The third mirror

The third mirror exists between product assessment and contexts (society and working life), meaning that learners are engaged in a process of relating their own actions and achievements to the requirements of working life and society. Employers are interested in the *competence* of the learner. They expect that employees are competent not only in technical skills, but also possess social and learning skills. The main question here concerns the examination system and the ability of an examination to measure exactly what is needed in working life.

The integration of product assessment within the context of working life is related to students' professional knowing and competence. Knowing can be characterised as a process involving decision-making and problem solving while accessing increasing amounts of tacit knowledge located in individual, group and cultural knowing. As with explicit knowledge, tacit knowledge is owned not only by individuals but by communities of workers and by the whole organisation.

Measuring knowing is difficult because tacit knowledge becomes visible only in fluent personal or shared actions. Therefore, it is understandable that, in such circumstances, assessment is focused on measuring the outcomes of actions. However, this kind of assessment is ineffective from the point of view of learning. Learners are left alone with their difficulties because they do not receive enough information about their knowing. Furthermore, those involved in developing education are also left without the relevant information they require.

An assessment concentrated on measuring qualifications has its own mirror *only* between the products and contexts. This results in a control system focusing on the individual qualifications of learners secured by very detailed examination. Instead of this, an assessment system based on generating learning and knowing provides an opportunity for examining learning processes within the whole education system, and for justifying the pedagogical changes needed. (Poikela, E. 2004.)

The dynamics between the evaluation of outcomes and context was not much discussed in our data. However, the need to develop the assessment and evaluation system as a whole was considered important. The purpose of assessment as a guiding factor in learning had been clearly internalised, and the need for development in the long term was understood. Problem-based pedagogy was regarded as a potential source of further opportunities.

“You get to know students better and see their development and maybe assessment is easier when it takes place over a longer period. If it is only a one or two study week period, it is difficult to evaluate such a short period, but over a longer period you can see the wholeness.

“Assessment and evaluation practices have been an important issue for me. So, that you see the purpose of evaluation in learning. How important it is in this PBL. And how is it going with us? Well I cannot say it is forgotten, but we have not used all the possibilities available to us.”

Teachers felt a tension between existing reality and their own needs for development. They had a greater desire for development than their organisations allowed. The number of students in teaching groups was increasing and resources of time, money and staff were being reduced. Clearly, circumstances were not very encouraging for the implementation of a new pedagogy. Nevertheless, the implementation of problem-based learning was felt to be meaningful. Many teachers stated that their pioneering spirit had produced results and, little by little, they had gained space for their ideas and even resources for development. Instead of complaining about the lack of resources, attention should be focused on planning and strategies for development. The reformation of curriculum work should start with exploring and mapping the competence and knowing required in this specific professional field.

Assessment and evaluation is a fundamental part of the education process, and it is essential to take them into account during the phase of planning the curriculum. The successful implementation of the PBL curriculum needs goal oriented and persistent development work at all levels. The rocks and pitfalls on the road to change need to be anticipated and new possibilities have to be realised. In other words, assessment and evaluation should

not be restricted only to the shared processes taking place between students and teachers. It is imperative to evaluate how the work community is capable of developing its practices and how it functions in relation to the surrounding work environment and to society as a whole.

Conclusion

The experiences of teachers participating in the PBL-PD programme reveal and reinforce the need for context-based assessment and planning. Planning processes supervised from top down are seldom effective because of the simple fact that the roles of partners and actors in the process of pedagogical development are not sufficiently taken into account. The problem of programmes that are constructed to be imposed top down is in the fact that planning work is assumed to be owned more by administrative than pedagogical staff. Shared planning is needed at different phases and levels. Stakeholders in the process must also include those persons whose work is reorganised in the process. Through problem-based learning many teachers are becoming genuine facilitators of learning, so it appears unlikely that there will be a return to the earlier style of teaching.

“It is difficult to know what will happen during the next five years. Continuing change seems to go on and certainly many other things will be waiting to happen after five years. What will some problem-based learning look like in five years’ time? I don’t know but I know there is no returning to the traditional old way.”

The principles and criteria of assessment and evaluation have necessarily to be described in the PBL curriculum. In this article a useful theoretical tool for developing assessment practices is described as “zones and mirrors of assessment”. This enables further research and the development of procedures for self-assessment, process assessment and the evaluation of out-

comes, which benefit learners, facilitators and designers of curricula, as well as developers of organisations.

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INTERPRETATIONS OF EXPERTISE AS A FRAMEWORK FOR THE PBL CURRICULUM AND ASSESSMENT

The starting point for the development of the kindergarten teacher education curriculum has been the interpretation of expertise and knowledge that is required in the field of early childhood education. In problem-based learning, assessment has been seen as an important factor that guides the learning process, both in the contexts of education and working life. Although, the primary focus of assessment is on the learning processes, the assessment processes that empower students are also emphasised. And it is here that reflection and self-assessment play an important role. During the periods of learning at work, in other words practical training periods, mentors give

students feedback about their knowledge and competencies. This feedback is not only important for the students' learning process, it has also played an important role in developing the curriculum.

In this article we will describe the general framework of the curriculum. In addition, we will present results from our empirical study dealing with assessment. The data comprise the students' (n=42) self-assessments of their knowledge and competencies during the previous practice period. Students' self-assessments will then be compared with the assessments made by their mentors (n=21).

The present study is a part of a larger evaluation study on curriculum development, in connection with which we have gathered systematic data from the evaluations of four student groups and their mentors. The research also covers the students' placements in working life and offers an assessment of problem-based learning from the perspective of the challenges posed by working life.

The research case

The curriculum is defined, here, as advance planning of the goals and objectives of teaching, the content of instruction and the organisation of teaching, methods and assessment. The curriculum becomes concrete in various models of curricula that implicitly include different assumptions about knowledge and learning, and that usually result in different pedagogical decisions and assessment methods. The starting points, objectives and principles included in a curriculum influence the learning environment and the assessment of learning. (Bernstein 1990; Goodson 1989; Pinar et al. 1995.) When a curriculum is developed from the perspective of learning processes, what is described, in addition to the basic goals and content, are the learning processes that the instruction aims to bring about. In this case, a curriculum is a sort of a "miniature world of learning", an environment where the learning processes gradually change, teach and educate an individual. (Ropo 1991.)

Allan (1996) has described the general qualifications that university education ought to offer students. He divides these into three groups: subject-based knowledge and competencies, transferable skills and general academic competencies. Transferable and general academic skills include competencies such as critical thinking, reflection, knowledge management, group work abilities and communication skills. These competencies are also qualities that experts are expected to have in working life (see also Atkins 1995).

The basis for developing the problem-based curriculum used in kindergarten teacher education has been the interpretation of early childhood education as a science and as a practice¹. The aim of a university education is to develop students' scientific thinking. This enables an expert to understand working life situations theoretically and to use research-based information in dealing with real-life challenges. Scientific thinking also makes it possible to develop new working methods, which will be one of the most important challenges for expertise in the future. Scientific thinking, orientation towards the future and competencies for working in a changing environment are important core areas of expertise.

The core knowledge and competencies of a kindergarten teacher include interpretation of the social and cultural contexts of early childhood education. This requires an understanding of the social and philosophical starting points of education, as well as their evolution throughout history and also of future developments. With the help of such understanding, an expert in early childhood education is able to clarify his/her own pedagogical thinking and the values they are based on, and to combine his/her views with those of others working within the education community, such as parents and co-workers.

Seeing education as a socially and culturally changing phenomenon helps kindergarten teachers to use their expertise in education to build towards a

¹ The bases of curricula have been described in the article Karila, K. & Nummenmaa, A.R. (2002). *Asiantuntijuuden ja oppimisen opetussuunnitelmalliset tulkinnot*. In A.R. Nummenmaa & J. Virtanen (toim.) *Ongelmasta oivallukseen. Ongelmaperustainen opetussuunnitelma*. Tampere: Tampere University Press, 17–31. Our description of expertise is based on this article.

successful future. Special attention must be paid to the changes in the work of kindergarten teachers, and therefore, one of the central issues of the curriculum is that students learn knowledge that will enable them to analyse changes in their future work as experts, and become aware of the need to develop competencies and knowledge.

Working in complex and quickly changing situations requires an expert in early childhood education to have a strong ethical orientation. As a teacher of young children it is necessary to make constant choices and to take responsibility for them. Therefore, the development of reflective thinking is essential for developing the expertise required by a kindergarten teacher. Being aware of one's own values, reflecting on one's actions and questioning these helps an expert to see alternative solutions and to make decisions, even in situations involving conflicting viewpoints.

Understanding early childhood education as a pedagogical phenomenon sets certain requirements regarding competencies. Pedagogical expertise is one of the core areas of expertise demanded by early childhood education. Kindergarten teachers are expected to have knowledge about learning content that supports children in building their view of the world, and about how to pedagogically use this in a way that is appropriate for each age group. In a productive learning environment, children can create their view of the world by working actively together – either with other children or with adults.

Early childhood education is a cooperative activity. In every situation, the kindergarten teacher works in an educational interaction with other adults and in the educational culture built by them. This means forming educational partnerships with the families of children and cooperating with other experts and professionals. Table 1 summarises the central competence areas and the core competencies of kindergarten teacher education (Karila 1997; Karila & Nummenmaa 2001, 33).

TABLE 1. The central knowledge and competency areas and the core competencies

Central knowledge and competency areas	Core competencies
Contexts of early childhood education	Contextual competencies
Early childhood education	Educational competencies Competencies in caring Pedagogical competencies
Cooperation and interaction	Interaction competencies Cooperation competencies
Continuous development	Reflective competencies Knowledge management

During the various stages of the education programme, students, tutors, teachers and mentors have assessed the students’ development, competencies and knowledge in the central areas of expertise required by early childhood education. Particularly important, from the perspective of learning, have been the various self-assessment processes involving students (Rust, Price & O’Donovan 2003).

According to Savin-Baden (2004), assessment is one of the most controversial questions in the research on problem-based learning today (see also Boud & Feletti 1997). The central question seems to be the relationship between learning and assessment. Even though assessment is, according to Boud (1995), the most important incentive for learning, it is often described in curricula only superficially and with technical terms such as exam and essay. Furthermore, curricula all too seldom pay attention to how objectives, learning methods and assessment methods interact with one another. To achieve congruence, one must consider what notions the relationship between learning and assessment is based on. Biggs (1999) notes that instruction should be a balanced system, where every component supports another.

Researchers studying learning have lately directed particular attention towards the relationship between learning and context. In terms of assessment, the relationship between assessment and context has been an impor-

tant focus of discussion. Assessment that combines the processes of learning and knowing means, according to E. Poikela (2003), that current modes of assessment based on measuring qualifications will be replaced by assessment that takes into consideration the contextual nature of knowledge and the context dependency of learning. The purpose of assessment is to produce information for everyone who requires it, including learners, teachers, tutors and those planning learning processes, as well as those developing working life (see Poikela, E & Poikela, S. *'Developing context-based assessment within the framework of problem-based learning'*).

When developing the problem-based curriculum of kindergarten teachers, a series of principles were listed with regard to assessment. First, the assessment system must be compatible with the approaches to knowledge and learning that the curriculum is based on. Second, the primary objective of assessment must be to promote students' learning and the development of understanding. In addition, assessment must be performed from different perspectives using a range of methods appropriate to the goals of different study periods (self-assessment, peer assessment, written assignments, and measuring what has been learned). (Nummenmaa & Perä-Rouhu 2002.)

In evaluating knowledge and competencies, an important role was played by the practice periods, students' self-assessment and assessment by their mentors. During the practice periods, assessment was strongly context-based, which increased the ecological validity of assessment.

Method and data

At the end of the 2003 spring term, the first students to complete their studies within the problem-based learning curriculum (n=42), along with their mentors (n=21), evaluated their knowledge and competencies in the central areas of early childhood education (see Table 1). The students' self-assessments focused on the kinds of knowledge and competencies that were developed during their education. The mentors' assessments were based on the

kind of impression they had of students’ knowledge and competencies in the authentic work context, as demonstrated during the final practice period.

The assessment was carried out in the form of a questionnaire. Knowledge and competencies were rated on a scale from 1 to 5 where 1 signified very little and 5 a high level. The following chapter describes the assessments of students and mentors in the form of group averages (* $p < .05$; ** $p < .01$; *** $p < .001$).

Results

Table 2 presents the assessments of students and mentors regarding *contextual knowledge and competencies*, i.e. understanding the contexts and the basic tasks of early childhood education

TABLE 2. Contextual knowledge and competencies

Contextual knowledge and competencies	Students (n=42)		Mentors (n=21)	
	\bar{x}	s	\bar{x}	s
Awareness of the social and cultural basics of early childhood education	4.00	.58	3.70	.66
Understanding the functions of social institutions	3.31	.72	3.32	.89
Cultural literacy	3.17	.73	3.40	.68
Understanding the everyday life of a child and their family	3.69	.75	3.33	.86
Awareness of the legislation steering work	3.12	.99	3.60	.82*
Awareness and knowledge of the significance of quality work	4.24	.43	3.89	.66*

According to the students, their strengths were an awareness and knowledge of the significance of quality work in early childhood education, and

an awareness of the social and cultural basis of education. The mentors also regarded these competencies and knowledge as student strengths. On the other hand, students regarded their awareness of the legislation concerning work and cultural literacy as their weakest area. In these areas, however, the mentors' assessments of the students' knowledge and competencies were higher than those made by the students themselves.

A summary of students' self-assessment concerning knowledge and competencies in early childhood education (Table 3) highlights that students felt their education provided them with competencies useful for reflective work – an awareness of their views and beliefs about education, an awareness of the significance of the values that education is based on and also an awareness of ethical issues. The mentors also regarded these competencies as a particular strength of the students, and judged the students' competencies in these areas more highly than the students did themselves. The differences in assessments were most significant when it came to educational interaction, which the mentors rated more critically than the students did.

TABLE 3. Knowledge and competencies in early childhood education

	Students (n=42)		Mentors (n=21)	
	\bar{x}	s	\bar{x}	s
Educational knowledge and competencies				
Awareness of one's beliefs and views on education	4.02	.60	4.20	.70
Awareness of the significance of the values education is based on	3.88	.71	4.26	.56*
Orientation towards the future	3.40	.83	3.71.	.64
Educational interaction	3.93	.68	3.38	1.16*
Awareness of the quality of one's interaction	3.63	.70	3.62	1.07
Ethical awareness and responsibility as an educator	3.86	.65	3.85	1.07

Knowledge and competencies regarding the child/learner				
Knowledge of child development	3.79	.72	3.76	.70
Knowledge of the special characteristics of young children's learning	3.86	.81	3.57	.60
Identifying different learners	3.49	.86	3.52	.75
Understanding developmentally appropriate practices	3.45	.77	3.33	.80
Learning theory and content knowledge				
Awareness and assessment of one's understanding of learning and knowledge	3.90	.62	4.05	.85
Knowledge of key learning theories	3.74	.59	4.05	.78
Knowledge of key contents of early childhood pedagogy	3.90	.62	3.84	.69
Knowledge of key contents of pre-school teaching	3.98	.72	3.67	.84
Knowledge of designing learning environments for young children	3.79	.75	3.63	.83
Guiding a child's learning				
Knowledge of steering documents regarding planning	3.50	.80	3.80	.83
Knowledge and competence of curriculum planning	3.31	.87	3.70	.80
Guiding the learning processes of children	3.26	.80	3.30	.80
Guiding the learning processes of a group of children	3.76	.58	3.25	.91
Knowledge of the appropriate assessment methods for children of various ages	3.10	.76	3.53	.87
Competencies for developing appropriate learning environments for young children	3.60	.70	3.35	.88

The students' assessments of their *competencies and knowledge regarding the child/learner* were lower than their assessments of their contextual com-

petencies and knowledge and those of their educational competencies and knowledge. As their strongest area of competencies and knowledge, students cited their knowledge of the special characteristics of young children's learning, and as their weakest, they pointed to understanding the appropriate practices for each development stage. In these areas there were no significant differences between the assessments of students and mentors. Although the students' self-assessments about learning theories and content knowledge were fairly high, mentors rated their theoretical knowledge still more highly.

Teaching young children and acquiring the competencies and knowledge required to do this is one of the special areas of expertise that separates kindergarten teachers from other people working in the field of day care. To master this area, students felt that their education needed to provide them with more understanding of appropriate assessment methods for particular age groups and more knowledge of curriculum design work. Here too, however, mentors rated students' competencies and knowledge more highly than they did themselves. On the other hand, students regarded their competencies for teaching groups of children more positively than their mentors did.

To summarise, it can be said that kindergarten teachers are required to have pedagogical competencies that enable them to guide a child's development and learning in the environment of early childhood education as well as those of pre-school and primary school teaching (Karila & Nummenmaa 2002). However, this seems to be the very area in which graduating kindergarten teachers experience most uncertainty.

Education is a social phenomenon and is best realised when education is regarded as a learning partnership (Karila 2005). Working with parents, staff members and other partners requires competencies in cooperation and negotiation. In partnership situations a common language is also needed.

Students felt that their education had provided them with competencies that would help them work within a team of professionals from different fields (see table 4). However, mentors' assessments with regard to these competencies were not so high. The competencies required for working with parents, in particular, were seen as weaker. Cooperation with parents may

be particularly challenging for those kindergarten teachers who are younger than the children’s parents. Therefore, it is understandable that assessments in this area were lower than in others. This could also be seen in regard to interaction competencies, where competencies for interacting with different adults were rated more severely than in other areas of interaction. On the whole, however, the interaction competencies provided by the education process were judged positively.

TABLE 4. Knowledge and competencies in cooperation and interaction

	Students (n=42)		Mentors (n=21)	
	\bar{x}	s	\bar{x}	s
Cooperation competencies				
Competencies in cooperating with parents	3.19	.94	3.10	1.18
Competencies in teamwork	3.93	.71	3.48	1.12
Competencies in developing effective cooperation relationships	3.38	.82	3.33	.91
Verbal mastery of the work in cooperation situations	3.57	.58	3.52	.87
Interaction competencies				
Awareness of the significance of one’s interaction	4.24	.58	3.71	1.19
Competencies in interacting with different children	3.93	.71	3.90	.70
Competencies in interacting with different adults	3.69	.78	3.67	1.02
Competencies in giving and receiving feedback	3.93	.80	3.81	1.12

Competencies and knowledge regarding continuous development have become important in changing working environments. Interaction and cooperation competencies as well as information retrieval and management are so-called

transferable competencies that are required in various working environments. According to the current view, education can provide students only with a basis on which to develop vocational competencies or expertise. The changing context of work and the rapid increase in information have shifted the focus from the development of expertise, competencies and knowledge, to learning at work. Evaluating one's own work requires reflective competencies and knowledge. The rapid increase in information regarding early childhood education and the redundancy of earlier information as a result of recent research require that staff have competencies in information acquisition and processing. This also includes adopting a critical approach to information management.

A problem-based learning and information environment demands active and independent information acquisition and processing from students. According to students, their education provides them with particularly strong knowledge and competencies in this area (Table 5).

TABLE 5. Competencies and knowledge regarding continuous development

	Students (n=42)		Mentors (n=21)	
	\bar{x}	s	\bar{x}	s
Reflective competencies				
Critical reflection and assessment of one's work	4.43	.63	4.10	.94
Reflection and assessment of the work and goals of the work community	4.07	.68	3.95	.86
Developing work on the basis of assessment	4.00	.70	3.81	.87
Information management competencies				
Knowing/being able to use important information acquisition methods	4.36	.62	4.05	.74
Interest in updating one's knowledge	4.40	.59	4.24	.83
Using information to develop work	4.07	.71	4.20	.83

The students' education seems particularly to develop critical reflection and assessment of their work, interest in updating their knowledge, and competencies for using suitable methods for acquiring new information – all of which are needed in rapidly changing working environments. The mentors' assessments also showed these competencies to be among the students' strengths.

In addition, students evaluated their competencies and knowledge in terms of *early childhood education research*. According to their self-assessments, students felt that their education had provided them with high level competencies for small-scale research ($\bar{x}=4.36$; $s=.66$) and for applying information gained from research in practice ($\bar{x}=3.81$; $s=.80$). According to students, their knowledge of key educational research methods was fairly good ($\bar{x}=3.83$; $s=.62$), and they felt the same was true of the research tradition in early childhood education ($\bar{x}=3.62$; $s=.66$).

Discussion

In this article we have examined the interpretation of knowledge and competencies that is required by the expert kindergarten teacher. This forms the basis of the problem-based learning curriculum that students pursue. In addition, we have compared, in the light of empirical data, the assessments of the students and their mentors, made just before the completion of studies, regarding the competencies and knowledge provided by the education programme. The aim of the present study has also been to provide the department with assessment information which will allow further development of the curriculum. The extensive data and the context-based assessment method will facilitate general consideration of questions relating problem-based learning and assessment.

The methods used for evaluating learning are based on various assessment paradigms and various approaches to learning and knowledge. Poikela (2003, 229) describes the change in assessment paradigm as a shift from sci-

entific measurement towards judging assessment. While scientific measurement focuses on the objectivity of results, judging assessment focuses on the processes that bring about results and takes into consideration the subjective factors that influence these processes. Boud (1995) notes that evaluating competencies and knowledge and authentic assessment represent a new paradigm – an approach where the learning goals are described in the curriculum more clearly than before and where the assessment is considered from an appropriate perspective.

A problem-based learning and information environment is organised so that the focus is on the student as a constructor of knowledge, and the significance of the learning context and experience of learning is emphasised. Assessment is considered to be one of the central factors that guide the learning process. The experiential, collaborative and contextual nature of learning requires assessment of these processes, a task which requires self-assessment, peer assessment and contextual assessment (Poikela, E. & Poikela, S. 2005). These differing forms of assessment have been strongly present in the problem-based learning environment of kindergarten teacher education (Nummenmaa & Perä-Rouhu 2002).

Research on the assessment of problem-based learning often focuses on measuring students' competencies and knowledge. Such research typically compares a problem-based curriculum or teaching method to some other curriculum or method. Empirical studies on the effectiveness of problem-based learning have, according to one meta-analysis (Dochy et al. 2003), focused on measuring students' knowledge and analysing the processes that possibly bring about learning. From the meta-analysis of assessments, researchers conclude that problem-based learning particularly facilitates the learning of various competencies, while conceding that the knowledge level of students who studied according to PBL principles earned lower scores. In such studies, a formal assessment paradigm based on external measurement is usually applied.

The data in the present study consisted of students' self-assessments that described experiential knowledge about their competencies and the way in which these were interpreted in a working life context (a practice period).

These were mirrored by assessments from their mentors; the main features of the assessments were rather similar. The results of the present study show that the students felt their education had provided them with good (≥ 3) or excellent (≥ 4) competencies and knowledge in all the key areas of early childhood education. Interaction competencies, reflection competencies and knowledge management competencies were considered to be particularly strong areas. These are the competencies that are built-in to the pedagogical practices of problem-based learning – working together in small groups, solving problems in cooperation with others, seeking information independently and giving feedback. These competencies are also transferable skills that students will later be able to use in various working environments. A well-developed awareness of education and an ethical approach to work reveal a reflective work orientation, which also helps the student to adapt to changing conditions. Learning theories and content knowledge were also considered to be relatively strong areas. Mentors also regarded the above-mentioned competencies and knowledge areas as being among the students' strengths.

According to students' self-assessments, their education had not been quite so effective in developing knowledge and competencies regarding pedagogical and educational practices. Students were uncertain about such matters as designing curricula, guiding a learning process, utilising practices appropriate to a particular development stage, and cooperating with parents. These activities mostly involve competencies that develop and improve through the process of learning at work. When education has provided students with strong reflective skills and a researcher's approach to work, along with effective interaction and cooperation competencies, it can be assumed that they will continue active learning and development in the work environment. From the perspective of developing education, the assessment of students' knowledge and competencies in a working life context offers valuable information for curriculum development work.

PART V

TELLING STORIES ABOUT PROBELL

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ANOTHER WAY OF THINKING ABOUT RESEARCH

This article describes the origins, ideas, activities and research results of the research group for problem-based learning in Finnish higher education, ProBell. Although, the name ProBell has no special meaning as a word in Finnish, it does signify something in English. The first part of the name, “Pro” can refer to progress or the advantages offered by PBL. The second part, “Bell” can suggest a bell ringing out the good news that there are new ways of bridging education and work, theory and practice.

The flow between theory and practice is twofold, and this is also the aim of ProBell. On a theoretical level, the group researches how to develop knowledge and competence in a changing society. Its aim is to shed light on the epistemological basis of PBL and on its implementations in education and learning at work. This is linked to a broader discussion about the duties of universities in today’s society. On a more practical level, ProBell wants to develop PBL practice. This article outlines our theoretical framework and offers examples of our recent research findings. We also describe briefly some of the more practice-oriented development projects we have been involved

in, including the launching of long-term training programmes (PBL-PD & PBL-IT) for practitioners of PBL and curriculum development in different fields.

This article deals with following themes: the start of PBL in Finland and the birth of ProBell; the university as a community of academic experts; PBL and ideas about knowledge; some examples of ProBell's research and development projects; and finally, future perspectives on the research and development of PBL.

The start of PBL in Finland and the birth of the ProBell research group

PBL has spread worldwide across many disciplines in higher education including economics, law and engineering; it has impacted other levels of education; and it is transforming the area of learning at work. The first implementation of PBL in Finland began during the 1990s in medicine at the University of Tampere and, shortly afterwards, in physiotherapy at the Pirkanmaa Polytechnic. Some years later (1999), PBL was introduced into the education of kindergarten and primary school teachers at the University of Tampere. Interest in PBL has increased rapidly in numerous fields of vocational higher education, especially in polytechnics. (Poikela & Poikela 1997; 2001; 2005; Poikela, S. 2003; Nummenmaa & Virtanen 2001.)

The ProBell group was set up at the end of 2000 at the University of Tampere when we invited a number of researchers and teachers interested in PBL to gather around the same table. This promptly led to a decision to organise a national meeting which would bring together more practitioners of PBL. The first national meeting on PBL was convened in April 2001 in the city of Tampere. It immediately became an annual event gathering each year some 70–100 teachers, researchers and developers of higher education from different fields and disciplines. Every conference has also had an international keynote speaker, including Karin von Schilling from McMaster University, Canada, Gaynor Sadlo from the University of Brighton, UK,

Terry Barrett from Dublin University College Ireland, and also Madeleine Abrandt-Dahlgren, Charlotte Silèn and Lars-Owe Dahlgren from Linköping University, Sweden. In June 2005 ProBell organised an international PBL conference in cooperation with Lahti Polytechnic (see www.lamk.fi/pblconference) gathering more than 200 participants from all around the world. The PBL conference in June 2006 was once more a joint project returning to Tampere, where the theme was “Constructing Knowledge in an Information Society”. The task of organising the event was shared with the WebSeal research group which includes members from the fields of both information science and education. The PBL conference for 2007 is entitled “Understanding Problem-Based Learning”.

During 2001 the members of the ProBell group developed and focused their research ideas. In 2002 the group was awarded a prize by the University of Tampere for “innovative work in researching, developing and implementing problem-based learning”. During recent years, the Ministry of Education has awarded national prizes for quality to programmes influenced by members of the ProBell group: Physiotherapy Education at Pirkanmaa Polytechnic; the International Business Program at Helia Polytechnic and Early Childhood Education at the University of Tampere. We began the development of a joint research plan in 2001 and succeeded in obtaining funding from the Finnish Academy as part of a multi-scientific national research programme “Life as Learning” (LEARN) which took place from 2002–2006 (see www.aka.fi/learn). So far, two doctoral dissertations has been completed and published (Poikela, S. 2003; Alanko-Turunen 2005) and another four doctoral theses will shortly be completed. Members of the ProBell group have also written a number of textbooks about PBL in Finnish, and several articles and conference papers both in Finnish and English (see www.uta.fi/eduta/probell).

Most of the ProBell researchers have been concurrently involved in many development projects in different organisations concerned with pedagogical development at university and at work, tutor training and mentoring, and also curriculum development, evaluation and assessment. These development projects have been organised through the Eduta Institute which is a

consultation and training unit in the Faculty of Education at the University of Tampere. PBL has become the major “product” or a brand of Eduta. Two of the largest projects aimed at practitioners of PBL have been “PBL-PD”, Professional Development Studies in PBL (60 ECTS credits) during 2002–2005 and “PBL-IT”, PBL and Interactive Technology (25 ECTS credits) during 2004–2006. The projects were funded by European Social Fund and by the State Provincial Office of Southern Finland. Participants were mainly teachers from polytechnics in different parts of Finland. These projects have supported teachers in their aim to develop their both work and the institutions in which they work on the basis of ideas arising from problem-based learning.

In the following part of the article we will take a closer look at applying ideas from PBL in the contexts of research, development and teaching at the university. The starting point is nothing more or less than to change the university’s mission and function in our rapidly moving post-modern society. Universities have been assigned a new task, the so-called “third task”, which refers to the services universities provide for society. This direction is closely in line with the activities of ProBell, since we do not only carry out research and teaching, we are also committed to development.

The university as a community of practice

The university is no longer simply an institution which conducts research and provides teaching; it is expected to function as an active partner in different local, national and even global development projects. Different kinds of research orientation bring different perspectives to partnerships. These research orientations are (1) traditional academic orientation, (2) market orientation (affecting technical sciences), (3) administrative orientation (growing in the social sciences) and important but vulnerable (4) civil society orientation (Hakala, Kaukonen, Nieminen & Ylijoki 2003).

However, there is a conflict between academic and market orientation. The main difficulty is that faculties and departments cannot make “either or” choices between these orientations, but have to live in a continuing “both” situation. Conflicts and tensions need institutional decisions. The ideal situation would be to act within the traditional academic orientation where a reasonable level of state funding would free researchers from the worry of financing their projects. Such a situation would also guarantee that it is affordable to do basic research for its own sake. However, this is not the current situation, and universities are faced with societal accountability including demands for a certain profit.

The significance of the new task

The new situation challenges academic institutions to reconsider not only the relations between research, teaching and services but, most of all, their identity as a society of experts. Etzkowitz and Leydersdorff (2000) claim the division between academic research and teaching is fading while the importance of the third task, societal services, is rising to the level of research and teaching. This means that the entrepreneurial way of doing things also needs to be accepted by universities.

Discussions about academic revolution and the third task can be seen as a rhetorical opening for reconsidering the duties of the university. It might also seem that the change is not a very fundamental one but, even so, relations and authorities between faculties, departments and staff need to be renegotiated. The university's third task has a long historical tradition with roots in an action known as the university expansion movement. For example, the starting point of this movement was liberal education during the 1900s in Great Britain. The modern version of this is the Open University created about one hundred years later. In the United States, this movement aimed to offer professional and practical benefits from the very beginning. The Australian version of the expansion of universities appeared in various forms of distance education. In Finland, university expansion has been

developed in the form of liberal education, summer universities and further training institutes. (Poikela, E. 1983.)

What this means is that the third task is neither a new development nor a fundamental change. Nevertheless, it does touch “the most holy part” of the university, the core process which is more than just research or teaching. It is not only a question of what kind of research challenges and problems society poses, it is also a question of how the necessary expertise is produced inside the university itself. How are academic core competences, discipline specific qualifications and skills and the knowledge needed at work learnt and taught? On what kinds of pedagogical foundation do teachers build their own and shared teaching? Do they facilitate students to learn and research, or do they just teach substance and methods?

The academic division of work has meant that researchers (assistants and professors), teachers (lecturers) and trainers (educational planners and consultants) have traditionally worked separately. However, this is not the way to answer the challenges of a society which emphasises expertise. All the members in a society of academic experts should be experts in their own discipline and be able to research, teach and develop according to an academic standard. In this way, professional identification would no longer be based on the idea that some do research, some teach, some do development work, while others act as leaders. The core of academic competence could be expertise in a university pedagogy which integrates all the factors mentioned above (see Figure 1). This kind of expertise in university pedagogy is based on research, teaching and development work. It can be gained only in the long-term through professional development and career planning.

The heuristic diagram above aims to describe integration based on the university’s three tasks: 1) research, including leading research groups and supervising doctoral students; 2) teaching, which includes facilitating learning groups, lecturing and guiding exercises; and 3) development, which involves participating in the university’s societal services, various kinds of development projects and also being active in the development of one’s own department.

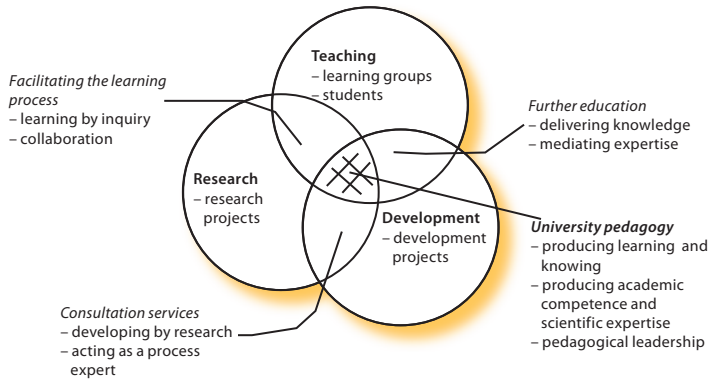


FIGURE 1. The core elements of university pedagogy

One area in which research and teaching partly overlap could be the facilitation of learning processes – a notion that is based on the idea that research is best learnt by doing. This is why both researchers and teachers should be able to facilitate both group processes and individual learning based on problem solving. Teaching connected to societal services has produced so-called traditional further training, where expert knowledge is delivered to working life and other areas of need mooted by society.

One upshot of the new situation is that work life organisations wish to contribute to research which takes the form of research-linked development. This is akin to producing consultation services for the external and internal needs of university. The key area here is university pedagogy, which can be regarded as the academic core competence and includes basic expertise and knowledge of research, teaching and development. It is evident that this kind of expertise requires time and experience in order to develop. And it is during this development that the specific nature of pedagogical leadership can be honed. Pedagogical leadership should characterise the leading style of any institution that produces learning, knowing and competence. (Poikela, E. 2005.)

The challenge of problem-based learning

Traditionally, education has been organised according to the logic of separate disciplines and subjects. However, because professional practice and individual learning processes do not follow such divisions, this has led to a widening gap between education and professional practice at work (Boud 1985; Poikela, E. & Poikela, S. 1997; Poikela, S. 2003.) PBL gathers and integrates many elements regarded as essential for effective, high quality learning, such as self-directed or autonomous learning, critical and reflective thinking skills, and the integration of disciplines. Back in 1938, John Dewey noted that strategies of learning can be characterised by inquiry and problem solving. Facing new situations, dealing with them and drawing conclusions is a directed and controlled process for forming knowledge.

Barrows (1996) describes six core characteristics of PBL which relate to learning. First, learning is student-centred (not teacher-centred as earlier). Second, learning has to occur within small student groups under the guidance of a tutor. Third, the tutor is a facilitator and a guide (and has the status of a teacher). Fourth, authentic problems are encountered in the learning sequence without any preparation or study. Fifth, problems are used as tools to achieve required knowledge and the problem-solving skills necessary to deal with a problem. Sixth, new information and knowledge is gained through self study (including lectures, information seeking, laboratory work, workshops etc.) A recent meta-analysis reports the positive effects of PBL for learning results (Dochy, Segers, van den Bossche & Gijbels 2003), reinforcing earlier well-known meta-analyses on the subject (Albanese & Mitchell 1993; Vernon & Blake 1993). In short, all these studies emphasise that PBL makes students more competent in applying skills, retrieving information and making sense of what has been learnt when compared to students who have been following a so-called traditional curriculum.

Problem-based learning (PBL) has often been understood only as a method of learning. Even Barrows' definition above emphasises PBL as a method. Consequently, many kinds of pragmatically-based pedagogical applications and development projects are called PBL. However, using PBL only as a

method or delivery model for education changes little. What distinguishes PBL as a technique, and especially as an educational strategy, or even a philosophy, are the changes needed in the whole learning environment (Chen 2000).

The focus of ProBell's research is on the epistemological, pedagogical and curricular bases of PBL. The prerequisites of developing education and professional practices are connected to general processes of change and society's educational systems. Societal changes and the idea of lifelong learning demand a redefinition of relationships between research, education and professional practices. Working life demands new kinds of competencies and this is the strength of PBL which gathers and integrates many elements regarded as essential in effective high quality learning and working, including self-directed or autonomous learning, critical and reflective thinking skills, and the integration of disciplines. (Poikela, E. & Poikela, S. 2004; 2005.)

The function of ProBell

The mission of the ProBell research group is to encourage the research, teaching and development of problem-based learning in higher education in Finland. In the following, we will describe the way ProBell functions in accordance with these tasks.

Research project

The research programme of ProBell is entitled "Problem-based learning as a strategy for developing knowledge and competence in the context of education and work". The aim is to analyse the benefits of PBL at different levels of education and to evaluate changes in learning and working cultures. Several sub-themes and aims can also be identified, each of these involving 2–4 researchers:

- Redefining the concept of learning – the aim is to analyse learning and knowledge from a contextual point of view
- The social and cultural context of learning – the aim is to describe and to evaluate the construction of learning in different kinds of social and virtual environments.
- Knowledge creation – the aim is to analyse the process of producing and constructing knowledge in PBL tutorials and to evaluate their connection to developing professional expertise.
- Working environments – the aim is to analyse the relationships between contexts of education and work from different points of view: development of the curriculum, organising and facilitating learning, PBL and organisational change
- New teachership – the aim is to describe and analyse the professional development and transformation of a teacher/tutor within the frame of a work community as an environment for creating and processing knowledge.

The main findings of these subprojects are closely reported as individual articles in this book.

The Professional Development Diploma, PBL-PD

One example of the development projects – and so far the largest – was the “Professional Development Diploma on Problem-Based Learning (PBL-PD)” designed for teachers in different fields of professional higher education in Finland. The programme consisted of 60 ECTS credits and was carried out during 2002–2005. The twin aim of the program was to provide a continuous professional development programme in PBL for teachers in higher education, and to put our theoretical and empirical research into practice (Poikela, E. & Poikela, S. 1997; Poikela, E. & Poikela, S. 2001; Poikela, S. 2003). The idea for the programme arose in autumn 2001 when we noticed ESR-funding was available for development projects offering further training for teachers.

We felt that it was not enough simply to write about PBL; instead we should use these ideas as a basis for planning and organising long-term pedagogical training. The students of PBL-PD (29 started and 24 persons completed the programme) represented Finnish professional higher education across a range of fields, including health sciences, forestry, business, engineering and domestic sciences.

PBL-PD studies focused on the understanding of PBL and the opportunities it offers for developing professional expertise and knowing. The aim was to increase and deepen the skills required for acting as a tutor who can facilitate learning and transform the curriculum and evaluation practices in accordance with the principles of PBL. One of the aims was also to increase both national and international collaboration and networking with PBL practitioners in different fields and levels of education. This latter goal proved to be very fruitful, and positive feedback was given regarding the challenging opportunity to work as a learner in group of people from varied professional backgrounds. However, this was not easy because individual ways of acting and thinking were challenged in multi-professional groups. Since these studies were organised according to the principles of PBL, knowledge and knowing was processed, produced and shared in tutorial groups guided and facilitated by a professional tutor. Gaining experience of being a learner in a tutorial group was felt to be very important – something teachers do not very often get the chance to do. All the modules included face to face tutorials, lectures or workshops and independent study supported by WebCT.

Feedback and assessment information was gathered from the participants. Our aim was also to analyse how students have developed their professional expertise as practitioners of PBL. The data consisted of a questionnaire with open questions (October 2003) and reflective group discussion (January 2005). Results show that the program successfully achieved its aim of supporting not only the individual empowerment of teachers, but also the development of organisations and the reform of curricula. The core of the feedback could be summed up in one participant's comment:

“The way the modules have been done has supported my development as a tutor and, as a whole, the programme has strengthened my previous thinking and taught me the basics and, through this, it has helped me ‘to be strong’ in my very heterogeneous work community and also in the curriculum work.”

In the small group discussion participants reflected what the program had offered them. Interestingly, many felt that the formal professional teacher education (50 ECTS credits) was like a starter kit with which to begin teaching. However, it was not enough for the lifetime professional development of a teacher. As a result, participants felt it was necessary to have support for professional development. Some thought that the PBL-PD programme had given them special “empowerment” in their work. The following comment expresses these feelings in a nutshell:

“A pedagogue has arisen inside us”.

Participants of PBL-PD carried out many kinds of development projects in their own organisations, which were described in the form of project reports. Some examples of these projects are:

- Implementation of PBL in engineering education, PBL curriculum in Mechatronics
- Change agents, not victims of change – Preparing for change to PBL in Forestry
- Developing a virtual study guide for the PBL programme in Business
- What kind of assessment does problem-based learning demand? A case study of the social care programme
- Developing assessment and evaluation in the problem-based curriculum – Experiences from physiotherapy education and clinical practice
- Maintaining, over the years, the positive spirit of tutoring in physiotherapy
- Designing a new PBL curriculum in Business

- Starting PBL in Nursing
- PBL opportunities in Fashion and Textile Design

Some of these projects reports have been published (Poikela, E. & Poikela, S. 2005; Loikkanen 2005; Kärmeniemi, Lehtola & Vuoskoski 2006) and most have been presented at conferences nationally and internationally. Abstracts and full papers submitted to the June 2005 conference, “Problem-Based Learning – Bridging Work and Education” held in Lahti, Finland, are now available (www.lamk.fi/pblconference). PBL-PD also encouraged participants to network in their own professional field. So, even though the programme has now finished, several networks will continue. The PBL-PD programme was also an empowering experience for us, the writers of this article. We are convinced that the PBL approach offers an excellent starting point for the further education for adults.

PBL and Information Technology, PBL-IT

From 2004–2006 the ideas and experiences of the PBL-PD programme were developed and another long-term training programme “Information Technology and Problem-Based Learning, PBL-IT” was designed and implemented at the Eduta Institute. The PBL-IT programme consisted of 25 ECTS credits and it was partly financed by the State Provincial Office of Southern Finland and EU Structural Funds. The participants of the programme were mainly lecturers from Finnish polytechnics.

The course had three modules: (1) Problem-based learning, (2) Technology and mediated cultures of action, and (3) Groups and tutoring in online environments. These modules created a continuum without clear boundaries. All themes were interwoven and were discussed in parallel. The way in which the course was implemented matched the subject of the studies, and all subjects that were studied theoretically were first applied in practice. The main learning task for all students was to meet the challenge of combining problem-based learning and online learning with suitable technologies.

The course started with traditional face-to-face tutorials and other activities during the in-service training days. During the phase of information acquisition, the groups used online learning environments such as WebCT or Moodle as asynchronous tools for discussion and sharing information.

This blended structure, of course, could be described as computer-supported traditional PBL. Wikis and blogs rose to prominence during the course, and wiki, in particular, seems to be a totally new type of tool for shared collaboration. After the main procedures of PBL had been internalised, new technologies were presented. During in-service training days, the students simulated totally distributed tutorial settings using synchronous tools such as chat and whiteboard, which used features of tools such as WebCT and CmapTools. This enabled synchronous collaboration and could also be used for tasks like brainstorming and modelling. (Donnelly & Portimojärvi 2006.)

Different tools and software for audio conferences were tested. Skype and TeamSpeak, for instance, had potential as types of software, which could be easily combined with shared visual tools such as whiteboards or shared documents. These technological solutions made it possible to have tutorial meetings online. The next phase of this development involved improved implementation of personal conferencing. For instance, Marratech enables real group meetings with advanced tools for collaboration. This was used for personal desktop conferencing, and with it, the tutorial meetings became similar to face-to-face meetings, where everyone could hear and see one another, present materials and work collaboratively on the shared whiteboard. This same software was also used for distance lectures and the involvement of national and international guest experts. Combined with the use of the asynchronous Moodle environment, this formed the basis of the technological solutions used during the course. (Donnelly & Portimojärvi 2006.)

In the wake of technological developments and the exploration of possible software solutions, Donnelly and Portimojärvi (2006) argue that the optimal approach to online PBL is a blended solution. Face-to-face meetings, desktop conferencing tutorials, distance lectures, asynchronous discussion and digital learning materials can be used to create a single entity. It could

be described as a puzzle in which each part completes the others. PBL-IT resulted in many development projects that participants conducted in their work places. Some examples of these are:

- Problem-based learning (PBL), computer mediated communication (CMC) and leadership.
- Supervising scholarly theses in the open learning environment
- Analysing triggers from the students' perspective in health care education
- Scaffolding tutorial information seeking in virtual learning environments
- Studying medical care virtually
- Specialising in first aid within a problem-based virtual learning environment
- Interaction in synchronous on-line tutorials

These projects are reported in the forthcoming book “The Net of Problem-Based Learning” published in Finnish and edited by PBL-IT’s project leader and ProBell researcher Timo Portimojärvi.

Eduta and further training functions

The Eduta Institute, the further training and consultation unit inside the Faculty of Education at the University of Tampere, has acted as a home base for many of ProBell’s training functions. The idea of such a unit arose ten years ago from a group of teaching staff exploring “the development of teaching through research”. The new unit was established in 1998 and named the Eduta Institute in 2002. The aim of the Eduta Institute is to train, develop and research the processes of learning, facilitating and evaluating in work organisations.

The task of the Eduta Institute is two-fold. Firstly, it focuses on producing training services for society and working life. Secondly, it produces training services inside the university by, for example, developing university pedagogy and providing pedagogical training for university teachers. Eduta's activities are based on pedagogical knowing and expertise. It is essential that all development is functionally linked to research conducted inside the Faculty of Education, which is why, for example, the steering group consists of professors and researchers in education. The most important clients are universities, polytechnics, schools, vocational colleges and other public and private organisations.

ProBell researchers have actively supported the development of the Eduta Institute and have planned and implemented the training and mentoring of PBL in numerous organisations working in a variety of different fields. ProBell's research results have been applied in many practical tests over the years. One of the first PBL courses was organised in spring 1999 for the staff of the University of Tampere, and included participants from different faculties and disciplines. Some of the most active participants came from the Unit of Early Childhood Education. They started to renew their curriculum soon after having learned the basics of PBL. Their journey towards an integrated PBL curriculum has now taken seven years and has not been an easy one (Nummenmaa, Karila, Virtanen & Kaksonen 2005).

ProBell and Eduta have been active together in creating and maintaining national networking within the area of PBL. The aforementioned PBL-PD programme alone gathered participants from eight polytechnics: Häme, Kemi-Tornio, Kymenlaakso, Lahti, Mikkeli, Pirkanmaa, North Carelia and Tampere. Further organisations involved in long-term PBL training projects include Helia, Turku and South Carelia Polytechnics, the National Police School and the Vocational College of Lapland.

Conclusions – the present and the future of ProBell

PBL is no longer considered a radically new approach. The use of PBL has been expanded across curricular, pedagogical and organisational levels, and has become formally recognised in Finland. Since PBL has, in some sense, become “institutionalised” in recent years, we face new challenges both in research and development work.

For the members of ProBell, organising and participating in national and international meetings has been important for generating ideas. Both national and international networks have been expanding rapidly, and our working international connections include Linköping University in Sweden, Dublin University College in Ireland, Newcastle University in Australia and the University of Brighton in the UK.

In this article, we have described the start of the ProBell research group and its activities in which research, development and teaching all play a central role. Educational research, it has sometimes been claimed, exists in isolation from the real world of practice. ProBell has proven that educational research and practice can and must be closely connected. ProBell started on a voluntary basis as a group of educators interested in problem-based learning. We could not have developed the group without actively interacting with different fields of education and without being involved in several training projects. Up to this point ProBell has been a research group but, from now on, it will continue as the newly established ProBell Research Society.

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MENTORING TUTOR'S PROFESSIONAL GROWTH

Research on Problem-Based Learning (PBL) is usually reported from the students' point of view. There is far less research concerning teachers' development as tutors. ProBell researchers have been educating and mentoring practitioners of PBL in several organizations. Our article describes one of these cases. It is qualitative case study conducted during two semesters at Pirkanmaa Polytechnic in Finland. The data consists of observations of 20 tutorials and notes from 20 mentoring discussions with ten physiotherapy tutors. Both writers were actively involved in these activities, one as a mentor for experienced tutors and the other educating novice tutors.

We focus on a number of points: how the problem solving process and group dynamics in tutorials are best facilitated, how tutors' find their roles and how they develop themselves as tutors. Our findings indicate that developing expertise as a PBL tutor is learning and developmental process which includes acting as a tutoring teacher and co-operating with colleagues and students. It is a process that takes many years and needs continuous support.

The aim to also to offer ideas how mentoring process can support tutors work and professional growth.

The special nature of the tutors' role and work, and their perspectives on the facilitation process have not been widely investigated (Moust, DeGrave & Gijsselaers 1990; Neville 1999; Savin-Baden 2000; Barrett 2001; Mifflin 2001; Poikela & Poikela 2001; Poikela, S. 2003). The aim of our article is to shed light on how tutors' professional growth can be supported and to identify how tutorials can be successfully facilitated. We analysed the experiences of ten teachers who have acted as tutors of physiotherapy at Pirkanmaa Polytechnic, Tampere, Finland. The professional development of these tutors was systematically supported with mentoring sessions during two semesters in the academic year 2001–2002 (Poikela, S. & Lähteenmäki 2002).

In general, mentoring is open and confidential dialogue between mentor and person mentored. Mentoring needs engagement and it needs to be collaborative (see Juusela, Lillia & Rinne 2000; Zachary 2000). Mentoring can be even a powerful growth experience and has been used as method for introducing novice teachers to work (e.g. Jokinen & Sarja 2005). In our case the aim of mentoring was to help even experienced tutors to help reflect their action.

Problem based learning has been used as a pedagogical approach to physiotherapy education at Pirkanmaa Polytechnic for eight years. Most of the tutors were already working at the organization when the PBL was introduced. The process of moving towards a fully integrated PBL curriculum started in 1995, when physiotherapy teachers visited Linköping University, Sweden where the PBL had been in use since 1986. From 1995–1996 teachers from Pirkanmaa Polytechnic took part in an educational programme that introduced them to PBL, and it was during this time that the basic modularised structure for the PBL curriculum was formulated. Teachers began to deliver the new curriculum in 1996, but within a few months they found that the curriculum needed some rewriting. Further changes were introduced as the following intake of students began their studies with a curriculum which increased integration between different disciplines.

Teachers worked in close cooperation from the very beginning. This collaboration included regular meetings to discuss each module, and additional meetings aimed at furthering the development of the curriculum. Some of the teachers were also active in international cooperation, taking part in PBL conferences, teacher exchange programmes and curriculum development programmes. In the year 2000, the physiotherapy programme was awarded a grant from the Finnish Ministry of Education for outstanding quality. The extra funding this award brought to the program made possible to organise the systematic mentoring for tutors that our report describes.

In September 2001, at the beginning of the mentoring process, the mentor and the teachers gathered together for a planning meeting. Later, during the two semesters from 2001–2002, the mentor observed two tutorials from each teacher and made detailed notes on every tutorial. After each tutorial, the mentor discussed the session with the tutor and gave feedback on what they had observed. These discussions also provided the tutor with an opportunity to raise issues that concerned her. Then, in the middle of the year, the mentor and the teachers met for a plenary discussion to share their experiences. At the end of the academic year, the mentor presented their conclusions in a final paper which the teachers discussed at their staff meeting. The empirical material of this article consists of the mentor's observation notes about tutorials, notes about private discussions with tutors, and memos from meetings where the mentor met with all the teachers. The teachers have given their permission to use this data. This article will also refer to the tutor education process that was organized at the same polytechnic for nursing teachers.

The tutor as a guide

Taylor, Marienau and Fiddler (2000) describe the tutor's role in relation to the learner, as being like that of a guide. They mostly deal with tutoring in the contexts of education and work, describing the tutor's role as that of a

guide. This concept usefully describes the tutor's role in relation to students within the framework of PBL. The concept of tutor as guide usefully describes the tutor's role in relation to students within the framework of PBL.

Prepare the student for the journey: The tutor is not a travel agent who has to take care of everything for the student. It is not always easy or pleasant to tread new and challenging paths. Travelling can occasionally be difficult, and sometimes the goal may seem to recede into the distance rather than draw nearer. A good guide, like a good tutor, anticipates rather than underestimates possible difficulties. He or she is able describe the goal which is represented by the destination of the journey. The guide's role is to encourage the learner to move forwards, because a mountain always looks highest from the lower slopes. The temptation to give up is strongest right at the beginning of the journey.

Blaze the trail and offer a map: The guide helps the learner to find various routes towards the goal. He or she also helps the learner to recognize different stages of the journey so they are aware of their progress, and marks the stages as they are accomplished. Because the guide understands the stages of educational development and growth, they are in a position to help the student both cognitively and emotionally. As a result, the guide can help the student to face difficult stages of the learning process and any feelings of discouragement that may be associated with them.

Let the learners set the pace: Although the guide may wish to hurry the learner, he or she should remember that it for the learner to decide how fast to proceed. The guide may become frustrated if the learner's goal changes during the journey or if he or she stops before achieving the goal. A good guide has to respect the learner's own decisions. Perhaps the journey will proceed more smoothly on another day.

Provide a lifeline: The guide may be the only person who understands all the different challenges the journey offers. It is for this reason that the guide has to be available and listen to the learner without criticism. When the learner stumbles or is in danger of falling, the guide may rescue the situation.

Support and challenge: During some phases the learner may not need as much support as earlier. However, support is only one part of the guide's responsibility. Equally important is to challenge the learner to take more demanding routes. An effective combination of support and challenge fosters the learner's development. It is important to help the learner to identify the areas that he or she needs to develop and also to congratulate them on their achievements.

To become an effective tutor involves more than simply mastering the content of a subject area. Tutors have to share a common language with learners, possess a sense of empathy, and encourage students to be open-minded in their approach to learning. (Schmidt & Moust 1995.)

The phases of problem solving in a tutorial

Tutorials followed the same eight-step PBL cycle used at Linköping University, Sweden (Silén et al. 1993). All tutorial groups were given a general introduction to the various phases of the approach at the outset. The cycle began with reviewing the problem and creating a shared perspective with regard to it. However, students did not always want to follow all the phases. For instance, the second phase of brainstorming was considered compulsory by some groups, while others simply refused to do it. The reasons behind this difference of opinion were interesting. Some students claimed that brainstorming was unproductive in cases where a topic was new and unfamiliar, since they lacked previous knowledge about it. Such a perception, however, ignores a key goal of brainstorming in which the intention is to clarify former knowledge about a topic, even when it is unfamiliar.

The third step involved categorizing issues that arose during the brainstorming. In some groups the students wished to proceed directly to setting up the learning task. In these cases, the tutor had to recommend that the group went through a longer process which involved analysing more precisely those items that had come up during discussion. This forms an important

basis for learning something new. It is also a way of becoming familiar with the theme, forming a commitment to the learning task, and developing the motivation required for independent study.

Many tutorials and mentor-tutor meetings discussed the importance of formulating the learning task. A number of key questions arose from this issue: *How does one formulate the learning task in a way that is sufficiently concrete, avoiding an over-general approach? How should the learning tasks relate to the goals of each module? How can the tutor guide the students in formulating learning tasks that cover enough of the subject without being too broad? How does the learning task guide the gathering of information?* If the learning task was too general it was found to have a direct influence on students' independent studies, making it difficult for them to proceed. When seeking information, students became rapidly frustrated if they noticed that the learning task was insufficiently focused. (cf. Lähteenmäki 2001.)

During independent studies, students seemed mainly to use those sources that were mentioned in the module guides, or material that was otherwise easy to find. On a couple of occasions one student spoke about an article they had located themselves and this received special acknowledgement from the group. The group appreciated the fact that one of their members had discovered a new source and brought interesting information to the session. In discussions with the mentor, many tutors expressed the view that students used articles too seldom. This raised the question of how the tutors could encourage students to use them more systematically. In some modules the students could be recommended to use certain journals which could be nominated as primary sources. It might also be important to remind the students, every now and then, of the many different ways there are to obtain information.

During the second tutorial the different levels of success achieved by students and even by whole tutor groups in their independent studies became apparent. The difference were especially evident in the way students were able to use new information in their arguments. Several tutors observed that students have to be encouraged to reason their findings rather than presenting opinions as knowledge. Tutors felt that well-focused questions were important in bringing this about. During one tutorial a student who

had presented an interesting article finished by saying that this was simply one opinion. However, the article in question was written about some double-blind empirical research, and therefore the information did not constitute only one opinion. Clearly students need to learn to recognize different sources and assess their reliability and validity.

There were also differences in the ways students shared their knowledge with others. To some extent this seemed to result from poor preparation but it was also partly due to students choosing to keep information to themselves. It is especially important that the tasks set for students who are absent will result in contributions that will benefit the group as a whole. Students actively sharing information with one another form the basis for learning effectively in the group.

Assessment lies at the heart of the problem solving process, and this was carried out differently in the various tutor groups. In some groups the students started the assessment process by themselves, but, in most tutorials, the groups needed the tutor's initiative. Even if a group has no time for assessment at the end of every tutorial, it should not be routinely forgotten. Von Schilling (2001) points out the significance of assessment both in learning subject matter and in developing the learning process. Assessment also functions as an instrument for self-directed learning, and it is essential for the development of cooperation and communication skills. A key aim of assessment in professional education is to develop students' abilities to work as a professional in multi-professional teams. (von Schilling 2001, 40–43.)

Students found the personal feedback given by a tutor very important. On the subject of students' self-assessment, however, tutors raised questions about how they could lead the groups away from vague comments about tasks having progressed smoothly. One strategy is to change the way assessment is arranged, since different procedures help to avoid falling into routines. It is worth pointing out that students can also learn to give detailed feedback to one another. During this project, nearly all the assessment was undertaken by the tutors who seemed to feel it was their responsibility.

Students and the tutor in the group

In each tutorial the students selected one member of the group to work as a chairperson, one as a secretary and one as an observer in most of the tutorials. Although the chairpersons did not always act systematically, other group members were quick to comment on the way in which the chairperson led the discussion and the learning process. In a couple of groups an ineffective chairperson was passed over, and another student took over the role. These kinds of situations were not analysed further in groups, although an open discussion on this topic with the whole group would have been helpful in developing communication skills.

A key area meriting further discussion was the way in which students in different roles communicate both verbally and nonverbally. For instance, it would be useful to examine the group's reaction when the chairperson expresses negative feelings: "I am completely confused ... I can't remember any of this ... It just doesn't stay in my mind ... I don't think we'll find anything else about this ..." Since these kinds of statements have the effect of undermining the atmosphere for learning in the group, it would be profitable for the tutor to examine such comments in discussions at the end of the tutorial.

The role of secretary was not seen as very important in any of the tutorials. Indeed, in some situations this role seemed to have been entirely forgotten. The results of brainstorming were written on the board for everybody, but it would also have been useful to do the same with the learning task. The secretary could further contribute by writing, every now and then, a synthesis of new information for instance in the form of a compact mind map. During some tutorials the secretary made notes which were not a part of the group discussion at the end of the situation. To support the learning process, it is important that the secretary writes down the key points the group raises in their discussion. It should not be only the tutor's duty to ensure that the notes the secretary has made are available to the whole group.

The observer did not play an active role in all tutorials. Some groups felt that the role of observer was unnecessary, while others made use of the ob-

server when processing feedback about working in the group. Some tutors maintained that the observer should not take part in the discussion, since they felt that this would prevent them from making detailed and varied observations. Other tutors felt that the observer could play a partial role in the discussion. Despite tutors' requests, the observers adopted a very low-key approach when giving feedback to the group. One strategy for making the observation more varied would be to vary the target of observation in different tutorials. Such targets might include, for example, the PBL-cycle, working in different roles, the amount of time different speakers spend talking, or the content of the discussion itself. This develops the students' self-reflection skills, and also offers them practice in both giving and receiving feedback, which will benefit them in their professional lives.

The groups' responsibility for sharing what they had learned varied considerably. In some groups the students ended up with a common outcome that either the chairperson or the secretary had put together at the end of the cycle. Then, there were other groups in which students looked at their watches, stood up and stated, "this is enough". In a couple of tutorials groups seemed to direct responsibility for the outcome at the tutor with comments such as, "Now the tutor is satisfied." or "How are we going to learn the right things?"

Supporting learning as a tutor

There is no fixed role for a PBL tutor, and, during this project, every tutor began from their own personal starting points. The PBL cycle offered a certain structure and a procedure to follow for the tutorials. While it is important to follow the model, it is possible to vary it a little when appropriate. The rules that had been agreed together proved to be important factors both for the work carried out in tutorials, and for developing cooperation among the teachers. The role of the tutor is essential to the success of the whole process and he or she should never be simply a silent observer outside the group's

discussion. The tutor can and should make interventions when necessary. However, a certain amount of patience is needed because the tutor should resist the temptation to hurry the group in “the right direction“. Usually, after a while, the learners themselves noticed difficulties the tutor had been aware of a little earlier. During this project we did not encounter situations where tutors had been so active that his or her actions had disturbed the tutorial.

If the tutor is very silent during the tutorial it may encourage the group to work “too independently“. In situations like this the group may begin to think that the tutor is not needed at all, and students may develop a tendency disregard the tutor’s comments. This easily leads to confrontations with the next tutor as occurred in one of the tutorials observed. One group, having become accustomed to a more silent tutor, were offended when the tutor tried to guide them or comment on their discussion. Sometimes students turned to the tutor with a direct question but did not even listen to the whole answer before continuing with their own discussion. The students’ action was a straightforward signal to the tutor to be quiet and not to intervene. Naturally, the tutor felt unhappy with the situation since she felt that the group was trying to dismiss her contributions.

This situation parallels the findings of Charlotte Silén’s study (1996). She points out that the assumption that a tutor need not interfere in a group’s work if it appears to be progressing well, shows a misunderstanding of the tutor’s role. The tutor’s task is always to lead the group towards deeper reflection. Without reflection and discussion the self-directed approach may lead students into becoming “cue-seekers rather than learning to trust themselves in solving problems and developing a clear awareness of situations in which they do need help and guidance. Independent and critical thinking skills need to be practised, reflected on and evaluated by other group members as well. The problem solving process itself needs a great deal of practice. To be able to handle a problem one needs to develop critical thinking skills, the ability to assess what is essential and the ability to draw conclusions. It also required the development of abstract, convergent and divergent thinking skills. If tutors guide the students into routine and superficially self-directed

work, then it is likely that this pattern will be repeated in their professional lives. (Silén 1996, 120.)

A key topic the mentor discussed with tutors was the ability to frame questions. The tutors noted the importance of clear questions, and felt that a short single question was more useful than a long explanatory one or a number of questions one after another. Sometimes tutors noticed that they started to offer too much explanation to students and ended up repeating the question. On many situations the tutor formulated a very exciting question, but the group were initially uninspired by it, although this did sometimes change over time. Successful questions started with 'how' or 'why', and they challenged students to argue and clarify issues.

Tutors made a variety of interventions during group work which included clarifying, empowering and encouraging students. Tutors did not criticise students' work, although in some groups this would have been useful when the discussion was at a very superficial level. For example, students might be talking about the subject but they were failing to adopt a critical standpoint or focus on problems.

Tutors often acted spontaneously as a resource person. The equipment in some classrooms made this a fruitful option. One tutor, for example, used a model of a skeleton to activate the group in a discussion about its structure. The tutor's work as a resource person did not seem to disturb the group during these situations. On the contrary, it served to benefit the learning process. In some situations the group asked the tutor to work as a resource person. In these cases the tutor might announce that they were going to be an expert teacher for a short while to enable the group to work further. These moments did not last long and the teachers did not actually start lecturing.

The tutors turned out to be active and attentive listeners who seemed to have a clear awareness of the group's progress. Tutors consciously tried to avoid giving hints to the students by avoiding nonverbal communication, for instance nodding the head. On the other hand, nonverbal communication can be used as a strengthening factor. An example of this was seen in one tutorial organised in English where the tutor used a great deal more non-verbal communication than they had when facilitating a tutorial in Finnish.

The foreign language guided not only the students' work but also that of the tutor. Offering detailed explanations in Finnish was easy for the tutor to do, but answers given in a foreign language tended to be short and to the point.

The journey continues – conclusions

PBL can be seen not only as a strategy for changing education but also as a way of thinking; it is a philosophy which changes the definition of knowledge, learning and knowing. This presents enormous challenges for research in this area. (Poikela, S. & Poikela, E. 1997; Poikela, E. & Nummenmaa 2002.) Silén (2001) investigated the work of medical tutor groups during the second term of their studies. She noted that students showed clear motivation for their studies as well as the ability to reflect, make choices, and think critically. These are the skills that are required of professionals in the future, and it is therefore essential that the tutor has the ability to support students' growth into critical, active, responsible professionals who are able to develop themselves as well as their chosen professions.

Back in the 1940's Charles J. Gragg wrote that the duty of subject teachers, besides being experts in their field, was to activate students to reflect on issues that arise from education. He emphasized the joint responsibility of teachers and students and especially the creativity and ingenuity required of teachers in supporting learning. (Gragg 1940.) This comes close to Norman and Schmidt's observations (1992, 559) about the psychological basis of PBL, and the importance of small group discussions in activating new knowledge which can then be drawn on at a later time.

The move to PBL prompted different, often conflicting, feelings in teachers. Karin von Schilling (2001, 46) points out that feelings of uncertainty easily lead both teachers and students into tutorial work which is heavily tutor-led. Students may gain a sense of security from being given learning tasks that they feel are "real and important", while teachers may feel safe in continuing in their old role as teachers. By sticking to teacher-oriented edu-

cation and to pre-established contents, groups fall back into old routines. In such cases students do not learn to trust their own thinking, relying instead on the teacher's opinion about what they need to learn. Teachers unable to abandon their former role as an authority will have difficulties supporting and activating learning.

The continuous development of teachers' and tutors' work is a prerequisite for successful learning outcomes and also for giving meaning and challenge to the teachers' own work. It is important that tutors have opportunities to observe one another's tutorials and regularly share feedback with one another. Tutors should also gather feedback on their own way of working, for instance by video-recording tutorials and analysing the tapes later. Teachers starting with PBL have to prepare themselves for a new kind of teachership, a process that should be carefully supported. They need to learn the basics of PBL and they also need some understanding of group dynamics. The education of PBL tutors offers an important forum for meeting and overcoming teachers' fears and prejudices.

While the mentoring project was being undertaken, PBL tutor education was organised for about 30 health care teachers (at the same polytechnic). This education included three orientation and discussion sessions and two organised opportunities to observe tutorials in physiotherapy education. Observing the tutorials prompted teachers to think about the need for changes in their own approach to teaching. Many tutors noticed that they needed to learn to trust the students and to allow them more space, while they themselves needed to learn when to be quiet. A primary ability for tutors seemed to know when to make appropriate interventions during the tutorial in order to assist the students' learning.

The results of our study show that it is not possible to become an effective tutor through formal training alone. It is important to be able to share the knowledge, understanding and competence of more experienced PBL-tutors and teachers. By working together in this way, both experienced teachers and novices can develop their expertise as PBL tutors. It also seems to be extremely important to reflect on experiences that arise from the process of tutoring and facilitating. This creates an opportunity to conceptualise the

essential elements of tutorial process and the tutor's role within it. Tutors work in a complex environment where they need to utilise and construct different types of knowledge. It is for this reason that development as a PBL tutor must be understood and analysed in the context of learning at work.

PROCESS-ORIENTED SUPERVISION IN DOCTORAL EDUCATION

In the context of a general evaluation of the doctoral student education in Finnish universities, an extensive survey research was made for doctoral students. One of its main results was that there is a specific need to develop a functional supervision system for doctoral education and, in general, pay attention to the supervision of doctoral students (Dill et al. 2006). In this article I will discuss especially the supervision of doctoral education and general work processes of a dissertation. This development work has been one of the subprojects of our research project and its development ideas have been published in a book (Nummenmaa & Lautamatti 2004) and several articles (Nummenmaa 2004; Lautamatti & Nummenmaa 2004; Nummenmaa 2005a; 2005b; Nummenmaa & Lautamatti 2005). The wider theoretical context of process-oriented supervision is education as an activity directed to the future and the factors influencing that process. Socio-dynamic counselling theory is the background of supervision. I will first describe process-oriented supervision on a general level. Then I will reflect on the supervision processes of the doctoral students of our research group.

Doctoral education in general and preparing the doctoral thesis as one of its sub-processes are activities directed to the future. Activities that are directed to the future and the thinking related to that are described as a three-phase process which consists of *motivation*, *planning* and *evaluation*. These interact with the students' images of *their future and themselves*. Education always takes place here and now – in some *social context*, which is formed by the doctoral student's phase of life, general situation in life and the scopes for action related to that. (Nurmi 1991.) Students set themselves different goals while planning their future post-graduate education. These goals are formed through comparing information about one's own motives, interests and values as well as anticipated future events with each others. The various anticipations include, among others, assumptions of oneself as a student and as a writer of a dissertation, assumptions of one's own know-how, own strengths etc. The anticipation also includes assumptions of the surrounding environment, such as future working life and visions and plans for life in general.

Doctoral education and dissertation are a part of the wider context of life. Its basic structures are the student's phase of life, personal situation in life, position of studies and the training process and meaningfulness of studies realised in them. The students' general situation of life consists of their human relationships, free time and hobbies, family life, residential situation, financial situation and more and more participation in working life alongside studying. The position of studies in the university consists of department and education cultures which change according to the subject (Ylijoki 1998). It also includes the general organisation of post-graduate studies as well as the teaching and supervision received by the students etc. The students' life situation and position of studies construct a structure of possibilities, which can make studying a meaningful process. (Aittola & Aittola 1985; Aittola 1995.) Hands-on experiences have shown that there is plenty of variation in students' target-oriented activities and motivation, planning and self-evaluation related to that. According to our experiences, these are essential prerequisites for studying and intertwine in many ways also with the concept of adult learning. We suggest that the clarification of these focal phenomena and concepts helps the supervisor understand what the work processes of a

student are about and how directed supervision can help the progress of a student's work (Nummenmaa & Lautamatti 2004).

The supervision of doctoral students has traditionally focused on guiding the product, dissertation. Thus the main issues of supervision have been the scientific problem solving process related to the contents and methods of one's own field and scientific writing. Doctoral education as an overall process has received less attention. In doctoral education and research also work processes that are general in nature and field independent are needed alongside the work related to the field. These kinds of work processes include various *planning, motivation, information gathering, reflecting and assessment processes as well as study and learning processes*. The field independent work processes that I call *general work processes* often cause problems and can therefore be the reason of the interruption of dissertation or doctoral education. In the work of a doctoral student these scientific and general work processes are closely connected in the preparation of the thesis. The starting point of process-oriented supervision is the basic assumption that the supervision of post-graduate education should, alongside scientific problem solving process, be directed also to so-called general work processes (motivation, planning, information gathering, evaluation and study processes) The primary target of supervision in general work processes is not "dissertation as an object" but dissertation and study processes and a student as a living, feeling and acting subject.

Whereas a dissertation and research process are often described as logical and linear, temporal work processes overlap, recur and relate to each other in unexpected ways. The goal of the supervision of general work processes is the mobilisation of the learner's own resources. Peer groups form an essential resource for supervision for this purpose. The aim is also to construct a new socio-cultural space for studying and learning in the supervision of work processes. The Japanese would call it *ba* and the Swedish the *third space*: an open social space that supports being together, free brainstorming and thus comprehensive learning. (Nummenmaa & Lautamatti 2004.)

Beginning and agreement

The beginning of doctoral education and dissertation as lengthy, future-oriented activities activate the motivation, planning and self-evaluation processes from the start. The students contemplate whether their interest lasts, can they and are they able, how they plan their education to be a part of their lives, time management etc. The instructor's attitude to this is crucial. When the instructor understands how intricate and important the beginning is for the future work of the students she can consciously utilize it by contemplating with a student or/and student group the general and personal goals of studying, such as: *What kinds of goals I set for my doctoral education? How am I going to reach these goals? What kinds of expertise and know-how I try to achieve and develop during the doctoral education? How will I develop this know-how and expertise? What kinds of career plans I have at the moment?*

It is useful in the beginning for students to also think about their dissertations as a part of the post-graduate education process. Possible thought patterns are: *What kinds of thoughts and plans I have about the forthcoming dissertation process? What kind of a timetable plan do I have? How do I plan my time and other resources in practice? How will my dissertation support the development of my know-how and expertise?* Discussion about these issues helps students to discern their own doctoral education as a target- and future-oriented process. It also creates a basis for the tentative post-graduate education plan prepared by the student and the instructor. It is good to discuss the expectations and commitments in the start. The supervisor might expect, among others, the following of the student: she is prepared when arriving in the supervision situation, she continuously produces written material and distributes draft material, she is regularly in contact with the instructor and completes the tasks reconciled and scheduled together. The student, on the other hand, might expect from the instructor regular supervision, oral and written feedback and getting feedback within a reasonable time. Also discussion about the so-called general work conventions is needed in the beginning. First, it is important that the supervisor explains her work methods to the students and clarifies how the students' needs fit

into them. Possible practical questions related to supervision include: how often the meetings are held, what is the best time for a meeting, some agenda agreed beforehand, contact practices, yearly supervision cycle etc. It is important to make the principles related to the publishing practices visible in the beginning especially in research projects that prepare joint publications to avoid unnecessary disappointments. (Delamont 1997.) As the supervision of especially dissertations generally include a lot of personal supervision, it is advisable that the instructor and student make an *supervision agreement*. The agreement is psychological in nature and the instructor and student briefly write into it the jointly set goals, responsibilities of supervisor and student, the time the student uses to make the dissertation, the time supervisor reserves for supervision, agreements on contacting and meeting practices etc. (see e.g. Lindholm-Ylänne & Nevgi 2003).

Motivational processes

An interest to one's own study and maintaining it are the prerequisites for the eventual completion of the dissertation. Students often mention that personal interest in the research subject is an important motivator but they find it hard to know how long this kind of initial interest will last. Students also differ from each other according to what kinds of factors motivate them in their current situation of life – what amount of the motivation is directed by interior factors, such as personal interests, and what amount is directed by exterior factors and, for example, is dependent on career development or the possibility to focus on the research. Students are usually aware of the strength of their motivation while working, but not necessarily, for instance, why it sometimes weakens. The more the motivating factors – external and internal, belonging to a group, professional needs – are related to the work situation the more probable it is that the study progresses. On one hand, the work process in itself can strengthen motivation if the student feels that doing research empowers her personally and provides her with general and

academic working life skills. On the other hand, even a motivated student has to be prepared for the fact that the working rhythm changes. However, a well constructed motivation helps to get through the slower periods. Various theories of motivation provide various explanations of what motivation is, but the origin of motivation is harder to explain. The issue of motivating students in supervision seems to be more complicated. Since motivation is about the whole person and her whole life, the fact that supervision gives the chance to study oneself and one's own relationship to the study from different viewpoints both in time and various perspectives of work can prevent the birth of motivational problems or help to find possibilities to overcome obstacles. Supervision can support motivation in at least two ways. First, it can help the student to recognise her own motivational state and the factors that affect it. Second, supervision in its different forms can increase the elements that maintain motivation. A well functioning group or support that the group members offer each other in various ways can have this kind of an effect. Various methods can be utilized in this kind of work, such as metaphor work, visualization, recognition of work rhythm and learning styles etc. These often help students to recognise the obstacles of work or own strengths and possibilities (Nummenmaa & Lautamatti 2004; Lautamatti & Nummenmaa 2004).

Planning processes

It is said that all work is done at least twice: first in thoughts and then in the final form. This applies especially well to dissertations. While writing their dissertations, students learn new things, work with complex concepts and the result is realised structurally in a clearly regulated form. The use of thinking that involves planning and guided imagination is very important. Also, in this context it is useful to make the same kind of separation between process and output as in research usually. *Both the planning process and the plans themselves have their own rules.* A student preparing her dissertation

should know the ways she usually plans things and the measures that promote planning. She should also know what form of plans it is necessary to prepare to promote the study. She needs at least plans related to the structure and contents of the study and plans regarding its progress. It is advisable that the students think what kind of a form of the plans is the most helpful to them. Plans can be very different, related to, for example, the study or dissertation process or more widely to personal life situation. In the following, I introduce two such plans that are usually needed: research plan of the topic and structure of the dissertation and a plan of time management which includes progressing stages. Supervisors are familiar with the research plan and plans related to its various phases but it is good also to instruct the students to plan their time management with different timetables. They can be prepared for different purposes, for both long-term and short-term periods, but it is advisable to regard them as tools. A change or modification of timetables helps students revise their assumptions of the time needed for the various operations and thus better predict forthcoming stages. Timetables are a source of planning, self-knowledge and brainstorming. Time management plans vary in scope – the overall timetable of the study with its phases, year plan, month plan, week plan etc. Prepared models are available to discern the overall schedule, but there are also more creative and perhaps for some students more motivating alternatives. What kinds of tasks the timetable includes is a personal matter. It is advisable that the week plan of a student includes a peaceful moment of thinking every morning when things can be put into an order of importance. In harder phases it is good to have space for matters to work out by themselves. The subconscious seems to work best when it has time to be alone. This method also has its own name: the Chinese concept of *Wu Wei* refers to restraining oneself of action until the right moment comes. In addition, the editors of the book ‘Matkaopas joutilaisuuteen’ (Guide to Inactivity) state in its foreword: “[---] *we are satisfied to give the one and same advise that is found in all inactive thinking: Do nothing. At least do nothing that you do not like. Let things work out by themselves [---]*” (Hodgkinson & De Abaitua 1996, 21).

Assessment and feedback

Students often feel that they get too little supervision and feedback to support their dissertation work. However, the supervisors describe the situation as an eternal question – sometimes there is enough supervision and sometimes there is not and, on the other hand, students do not always use the supervision available. It is also a well-known fact that learning is dependent on the feedback students get and quick and developing feedback is very useful for them. In addition, students benefit from feedback and assessment if they are actively committed to the evaluation process of their own and others' studies (Boud 1995). On the other hand, it is also true that instant feedback is harder to be given when the supervisor has several different groups. Doctoral students get feedback from their study either in a personal discussion or in a group situation. The factors of interaction in these affect the significance of feedback. The atmosphere of supervision discussion and given feedback is important. In feedback situation the student faces a person who has the power of an institution, has personal expertise and in certain framework can influence her progress. Therefore, being the target of evaluation might arouse fear. Fear can then prevent the reception of the supervisor's messages or otherwise harm the reception of feedback. It is advisable to create as favourable exterior setting for the feedback discussion as possible. Also word choices can have a bigger meaning for the student than the supervisor might think. As in every situation that involves interaction there should be enough time and peaceful space – the supervision gets disturbed if the instructor, for example, receives telephone calls at the same time. References to the supervisor's own hurries, as well as non-verbal signs of a lack of interest, might tell the student that her case is in the end less important in the instructor's work. Since we supervisors are all people with hurries and tiredness, it is inhuman to demand that we could always act as if we were unhurried or strong. Thus we can look for a solution by developing more varied evaluation and constructing it to be a part of learning situations. We can get help from continuous evaluation and forms of feedback that individualize students. Then, everything does not depend on one or two feedback discussions. Group and

peer feedback alongside the instructor's feedback also clarifies the several perspectives of evaluating a student's progress and restores a healthy sense of proportion. It is easier to give feedback when it is consciously constructed to consecutive elements that serve different purposes. The awareness of the construction of the feedback discussion – the chain of reflecting, guiding and assessing feedback – might make the task easier and more natural. In addition, the instructor's work is easier if the students tell her the things that they especially want to get feedback on. In giving feedback, it is advisable to check how the student has understood it. There are often misunderstandings in this and the study begins to go into a wrong direction.

When supervision is implemented in a group setting it is easy to connect it with peer assessment. Students might find it difficult to evaluate each others' writings in the beginning but learning to do it is a valuable skill. The typical stiff opposing and examination situations can be prevented when students have learned from the beginning to give constructive feedback with respect to the others' studies but talking openly. In the phase when research plans or completed dissertations are discussed in the seminar the students should be instructed to the correct evaluation or opposing practice. Then the supervisor transfers her own expertise for the use of the students: she tells about the evaluation criteria of the field applied to the seminar work, presentation principles of evaluation, scales and use of grades etc. Thus students also get information about the way their theses will be evaluated and are able to utilize it when preparing them.

ProBell – in group and together

In the expertise discussion of recent years attention has been paid to the collaborative nature of expertise. It is becoming more and more unusual that experts would act alone in the analysis of work situations, solving of work-related problems and development of their work. The working life requires nowadays more often multidisciplinary, shared expertise that breaks the

boundaries of the various fields. Expertise is seen as a collaborative phenomenon alongside its individual dimension. Thus it has been considered important to construct elements that help people to learn collaborate and share creation of information in also the doctoral education processes. This is possible in multidisciplinary research projects the kind of which also our ProBell research group has been. Collaborative activities and intelligent action that develops from them is described, among others, with the *collaborative partnership* concept: construction of a ladder that helps the tightly interacting participants to solve more difficult problems than they could solve individually (Hakkarainen 2003; John-Steiner 2000). Our ProBell research group as a multidisciplinary group has formed a creative forum for the development of shared expertise. This partnership has also been a strength supporting our research group. The cooperation and supervision relations have been diverse. Our research group includes senior researchers, who have done their own research projects related to our project, as well as doctoral students. The diversity and diverse relationships of the project group have been a strength but also somewhat brought in learning challenges for both us supervisors and doctoral students. The supervision of our doctoral students has taken place mainly as group supervision in the regular meetings of the project group and in seminars. Our research group has formed a genuine group in the sense the researchers of group operation define it: our group has had shared goals and interests; participants have felt to be a part of the group and the group has been experienced to be rewarding; the operation of the group is described by strong interaction and the group has had mutual, although loose, working rules (Johnson & Johnson 1982; 1987). All this has also enabled the use of group as a supervision resource. The core of doctoral education is the dissertation process. Thus also the target-oriented work with scientific questions has been in the centre of the supervision process. However, this work has been supported simultaneously by paying attention the above-described general work processes. By participating in various activities that make work processes visible and support them, as well as thinking about one's own and others' solutions our doctoral students have become more aware of, for example, their own timetable planning, evaluate their

own know-how or study their ways of receiving feedback. Common reflection and collegial feedback have in many ways been the core of supervision.

In conclusion, but not the least important, “space” and its meaning should be mentioned. We have consciously created different “spaces”, which the Japanese call *ba* and the Swedish *third space*. These different “spaces” of being have been open to the formation of the social interaction of the group, they have supported togetherness and creative brainstorming.

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PROBELL AND ME

Timo Portimojärvi

My ProBell is not just a group,
it is an idea in my head or it is a pile of papers in my bag.
Sometimes it doesn't let me sleep in the evening,
asking me to come and play.
My ProBell is always present,
even if it is totally silent and feels forgotten.
Suddenly it creeps onto my table
and tells me to write at least one paragraph.
My ProBell is extraordinary,
I don't even remember how I met it.
And then it grabbed my hand and my head
and led me into the land of research.

Anna Raija Nummenmaa

My ProBell has been a continuing adventure
 in a colourful autumn forest.
 It has been an opportunity to learn
 about the manifold characteristics of changing nature.
 It has given me a lot of energy.
 When I have been tired, a short walk in this wonderland
 with the group has given me the power I need to continue.
 Right at the beginning, it was impossible to understand
 where we actually were and where we were going.
 There were many possible routes and there still are.
 Now I think that everybody has found their own way.
 As I did mine.

Merja Alanko-Turunen

I joined the ProBell research group in winter 2001. During the stimulating and rewarding time I have spent in this community of practice. I have learned not only how to carry out a PhD study, but how to organise national and international conferences, write and present articles and papers, consult educational institutions, work as a fellow researcher when assisting others in their research projects and, last but not least, how to spot a stone bramble in a forest. Furthermore, PBL as an educational approach has served as a remarkable threshold concept for me – there is no going back. My current interests include critical pedagogy and critical business studies.

Jyri Lindén

During the years of being a member of the ProBell group, my interests have been twofold. Firstly, I have been curious about the discursive position of teachers, their roles with regard to the power relations in different educational institutions. Secondly, I have been trying to examine what curriculum as a theoretical concept means, and, in particular, what kinds of narratives support the PBL curriculum as a construction.

When I joined the group, we had just started a curriculum development project in the department of teacher education where I worked.

PBL was one of the key concepts in this process, only we did not know what the concept would mean to us in the future. As our own project proceeded, I was able to follow other institutions' curriculum development work both as a mentor and trainer. From the beginning, the ProBell group accepted these training-mentoring projects as part of its approach. Research and development were closely intertwined and we were able to share practical and theoretical findings arising from our work. Theory-based development work at different levels of educational institution has given contextual understanding to our research. One important discovery is that curriculum development and implementation cannot be copied from one institution to another; they are unique, culture-based reconstruction processes.

Satu Öystilä

I have been working with PBL since 1995, when in the faculty of Medicine at the University of Tampere they trained their teachers to become PBL tutors. I joined the ProBell group in winter 2001. I have used the PBL strategy in many university educational projects. I have also trained PBL tutors as group leaders, especially in higher education. My special interest has been and still is group dynamics and the significance of group processes and peer groups in promoting the learning process.

Marja-Leena Lähteenmäki

I encountered PBL for the first time when I visited London as an exchange teacher in 1995. My interest deepened when I got the chance to visit Linköping University that very same year. The students' active and responsible way of studying impressed me. The PBL-education that my work place organised initiated a curriculum change in my professional field – physiotherapy education. At Pirkanmaa Polytechnic we started the first PBL group in autumn 1996 and by 2007 eight groups of students had graduated.

I have been a member of ProBell since 2001, and have enjoyed meeting colleagues from different polytechnics and universities. My own research interests are focused on planning problem-based learning environments,

implementing problem-based learning, and comparing the learning outcomes of problem-based learning and subject-based learning.

Helvi Kaksonen

I became acquainted with PBL in 1999, when Esa Poikela PhD began to teach the basics of PBL to our work community. In autumn 2000 the Unit of Early Childhood Education at the University of Tampere began to implement PBL as an educational strategy in the programme for kindergarten teachers. This meant that the curriculum had to be transformed in accordance with the principles of PBL. I have worked within different study modules as the students' tutor, and have also used PBL in providing in-service education to the mentors of day care centres.

I joined the ProBell group in 2003. Being a member of this research group has facilitated interaction between teaching, research and in-service education. As a member of the ProBell group, I have had the opportunity to pursue my doctoral studies at the Academy of Finland as part of the 'Life as Learning' project. Participating in PBL conferences organised by the ProBell group has deepened my knowledge of PBL pedagogy. The exchange and sharing of different thoughts and ideas within the ProBell group has enhanced not only my personal research, but also the teaching and in-service education in which I am involved.

Kirsti Karila

I became familiar with PBL in 1999 thanks to Esa and Sari Poikela's PBL-related course. Soon afterwards my work place, the Unit of Early Childhood Education at University of Tampere, started to implement PBL as a strategy for educating kindergarten teachers. I joined the ProBell group in 2001 and, since then, the group has played a significant part in my development both as a teacher and as a researcher. I have learnt a great deal, not only about teaching and conducting research, but also about collaboration. My own research interest is focused on the processes of learning at work and the development of expertise especially in the context of PBL.

Jorma Virtanen

Some years ago we started to construct a new kind of curriculum in the Unit of Early Childhood Education at the University of Tampere. The process comprised many phases of development, and the final implementation of problem-based learning by the curriculum workgroup was very exciting. – What do I think nowadays about those years and those pedagogical innovations? – It's just PBL, and I like it.

Terry Barrett

I am a lecturer in education development at the Centre for Teaching and Learning, School of Education and Lifelong Learning, University College Dublin. I am working with lecturers from a variety of disciplines on problem-based learning initiatives. I am joint co-ordinator of the HEA funded inter-university project on Enquiry and Problem-based Learning lead by University College Dublin. My research interests are in PBL students' talk in PBL tutorials, PBL staff development and the potential of PBL to develop students' critical and creative thinking. I have given keynote papers at PBL conferences in Ireland, England and Finland. I met members of Probell in 2001 and really appreciate the opportunities Probell has afforded in encouraging and developing one another as PBL practitioners and researchers.

Esa & Sari Poikela

Our journey into the world of PBL began with training and research into the work of PBL tutors in medical and physiotherapy education in Tampere during the 1990s. This exploration continued as we examined the roots of PBL in Sweden in 1995 and in Australia from 1996 to 1997. At the beginning we were surprised how little Finnish researchers in the field of education knew about the PBL that had been successfully implemented for over 20 years in many parts of the world. Hopefully, educators now know more about PBL thanks to ProBell's books, dissertations, articles, conferences and training programmes.

For us, founding ProBell meant creating a community in which ideas and practices regarding interesting or special areas of pedagogical research into PBL could be shared. We have combined research, develop-

ment, teaching and training in many educational institutions during recent years. Our articles in this book eloquently express our joint research interests so far. Now we have settled at the University of Lapland in the Arctic Circle, and it is time to concentrate more deeply on issues of PBL. We need to look more closely, for example, at assessment and evaluation, information literacy and knowledge acquisition, curriculum development, leading learning and workplace learning.

