



Published online: 11-20-2018

Problem-Based Learning in Professional Studies from the Physiotherapy Students' Perspective

Hilkka Korpi

University of Jyväskylä, Finland, hilkka.korpi@vamia.fi

Liisa Peltokallio

University of Jyväskylä, Finland, liisa.peltokallio@gmail.com

Arja Piirainen

University of Jyväskylä, Finland, arja.piirainen@jyu.fi

IJPBL is Published in Open Access Format through the Generous Support of the [Teaching Academy at Purdue University](#), the [School of Education at Indiana University](#), and the Jeannine Rainbolt College of Education at the University of Oklahoma.

Recommended Citation

Korpi, H. , Peltokallio, L. , & Piirainen, A. (2018). Problem-Based Learning in Professional Studies from the Physiotherapy Students' Perspective. *Interdisciplinary Journal of Problem-Based Learning*, 13(1).

Available at: <https://doi.org/10.7771/1541-5015.1732>

This document has been made available through Purdue e-Pubs, a service of the Purdue University Libraries. Please contact epubs@purdue.edu for additional information.

This is an Open Access journal. This means that it uses a funding model that does not charge readers or their institutions for access. Readers may freely read, download, copy, distribute, print, search, or link to the full texts of articles. This journal is covered under the [CC BY-NC-ND license](#).

THE INTERDISCIPLINARY JOURNAL OF PROBLEM-BASED LEARNING

ARTICLE

Problem-Based Learning in Professional Studies from the Physiotherapy Students' Perspective

Hilkka Korpi, Liisa Peltokallio, and Arja Piirainen (University of Jyväskylä, Finland)

Abstract

The aim of the study was to investigate how physiotherapy students using a problem-based learning approach develop into experts during higher education, and answers the question: How do physiotherapy students at bachelor's level understand the problem-based learning approach while learning to become professionals? PBL is examined using interpretative phenomenological analysis (IPA) of longitudinal data written by 15 voluntary students from two different higher education institutions and collected during 3.5 years. The main results on the new way of learning strengthen earlier conceptions of the importance of reflection in the learning process. The PBL method activates a reflection process by allowing students to participate in something that differs from their previous experiences of teaching and learning methods, which creates confusion and forces them to critically reflect on their actions. There are two dimensions of reflection in this study: self-reflection (information-seeking and creative learning processes) and reflection together (peer-group working and the teacher), in which reflection together seems to be more powerful than in earlier experiential learning theories. This study brings out the directions for and the timing of the necessary scaffolding and support for learning.

Keywords: physiotherapy student, problem-based learning, professional development

Introduction

The first students who studied according to a problem-based curriculum began their studies in the medical doctor education program at MacMaster University in 1966, and since the 1980s PBL has become a significant approach in vocational education.

Problem-based learning (PBL) has a central part in students' learning in this study, which answers the question: How do physiotherapy students at bachelor's level understand the problem-based learning approach during their training to become professionals?

PBL Meets Requirements of Working Life

In working life, there is a need for experts who can solve different kinds of problems in a world that is becoming increasingly complex, which is why professional education needs to take into account the changing requirements of working life, and the different view of knowledge today. The difference can be looked at in the context of expertise. In content-based

thinking, an expert is seen as a person who knows a lot, whereas in the alternative conception, expertise is seen as the ability to adopt a broad perspective when using information and to make relevant evaluations about what is problematic in certain situations (Margetson, 1991; Savery, 2015; Strobel & van Barneveld, 2009).

PBL is grounded in experiential, collaborative, contextual, and constructivist theories of learning, and it aims to integrate different subjects and branches of knowledge (Savin-Baden & Major, 2004; Yew & Goh, 2016). PBL is an educational approach in which the focus of learning is on small group tutorials. The goals of the scenarios are to provide a context for learning, to activate prior knowledge, to motivate students, and to stimulate discussion. Learning is student-centered, and self-directed learning is emphasized (Barrett, 2006; Poikela E. & Poikela S., 2006; Saarinen-Rahiika & Binkley, 1998; Savery, 2006; Strobel & van Barneveld, 2009; Yew & Goh, 2016). Students are instructed to seek information and gain practical skills with the help of a contextual chain

of problems, and to use them in the most beneficial way in different situations (Boud & Feletti, 1991; Loyens, 2015; Margetson, 1991; Poikela E. & Poikela S., 2006; Savery, 2015; Strobel & van Barneveld, 2009; Yew & Goh, 2016).

PBL has been found to be superior when it comes to long-term retention, skill development, and satisfaction of students and teachers, while traditional approaches have been found to be more effective for short-term retention (Strobel & van Barneveld, 2009). Student engagement in PBL might sometimes be troublesome, and Savin-Baden (2016) argues that there are four threshold concepts in relation to student engagement with PBL: liminality, scaffolding, pedagogical content knowledge, and pedagogical stance. Liminality means stripping away of old identities. Scaffolding is giving a temporary structure to learning, guidance or collaboration with peers. Pedagogical content knowledge would be thinking like a physiotherapist, while pedagogical stance depicts the way in which students see themselves as learners in particular environments (Savin-Baden, 2016).

Problems Are the Cornerstone of PBL

Problems are the starting point and one of the cornerstones of the courses. Learning is triggered by a problem that needs resolution. Using a problem as a starting point can inspire and motivate the learners. Students make connections to “perplexity, confusion, or doubt” (see Dewey 1991, p. 12) by activating their individual or collective prior knowledge and finding resources to make sense of the phenomenon (Yew & Goh, 2016). The types of problems vary from one area to another, and the problem characteristics can be classified into feature and function characteristics (Jonassen & Hung, 2015; Sockalingam & Schmidt, 2011). In the health care sector, diagnosis-solution problems are quite common, and they involve identifying the cause of symptoms and prescribing treatment. The problem or the trigger may also examine troubleshooting, decision-making, situated cases, and design problems. The difficulty of the problem also plays a role in the effectiveness of students’ learning. PBL problems should be open-ended, complex, and authentic. Complexity is seen as motivating and challenging for the students and therefore engages their interest in studying. It also provides opportunities for students to examine the problem from multiple perspectives or disciplines. The problem needs to be contextualized for students’ future or real workplaces, which are seen as authentic (Jonassen & Hung, 2015).

Cyclical PBL Process

The learning process is cyclical and several models of PBL have been developed (see Barrett, 2006; Barrows, 1985; Lu & Chan, 2015; Rasi & Poikela, 2016; Schmidt, 1983). In Finnish higher education, the PBL model modified by Poikela and Poikela (Poikela E. & Poikela S., 2006) is commonly used. The model has eight stages, and it consists of collaborative

learning achieved in two tutorial sessions in which the tutor-teacher and a group of seven to nine students gather approximately once a week. During *the first stage*, students need to find a shared understanding of perspectives and conceptions of the problem. *The second stage* focuses on brainstorming. During *the third stage*, the students group similar types of ideas and name them. Actual problem areas are negotiated in *the fourth stage*. In *the fifth stage*, the students then form the learning task and the objects of study. During *the sixth stage*, it is time for information seeking and self-study. The second tutorial begins *the seventh stage*, where the new knowledge is used to tackle the learning task and is then applied in constructing the problem in a new manner. Finally, during *the eighth stage*, the complete problem-solving and learning process is clarified and reflected on in light of the original problem (Poikela, E. & Poikela, S., 2006; Rasi & Poikela, 2016). Poikela and Poikela’s PBL model is used in the educational institutes in Finland where this study took place (Lähteenmäki, 2006).

Physiotherapy Education in Finland

In Finland, the first physiotherapy education program according to PBL started in 1996 (Lähteenmäki, 2006), and nowadays the PBL approach is a commonly used teaching method in higher education. In the Finnish education system, the physiotherapy degree lasts 3.5 years (210 ECTS credits) and is equivalent to a bachelor’s degree.

The European Higher Education Network’s recommendations and descriptions direct physiotherapy education. Studies consist of general competences of health care education programs and profession-specific physiotherapy courses. Competences are defined as wide learning outcomes revealing individuals’ combinations of information, skills and attitudes, and they describe the ability to carry out professional tasks. Physiotherapy studies also include instructed practical training, optional studies, a thesis, and a maturity exam, with some universities using portfolios to activate the reflection process during the study time. The competence requirements of physiotherapy education are defined by the European Qualification Framework (EQF) and the National Qualification Framework (NQF) (European Higher Education Area, 2017; Ministry of Culture and Education, 2016).

Physiotherapy is a regulated profession and it is part of the health care system. Physiotherapists are particularly interested in their clients’ action and movement and want to find tools to improve clients’ functioning. Physiotherapy students’ goal during their education is to apply independent agency to their practical work and the related work culture. They build expertise through new theoretical knowledge and gradually accumulated practical skills. Learning is based on their previous experiences. Tacit knowledge of work culture,

the ways in which the profession operates, values, and attitudes are largely learned in real working life situations (Korpi, Peltokallio, & Piirainen, 2017). In practical working life, physiotherapists are constantly solving practical tasks regarding what kind of therapy methods would be beneficial for the clients, what kind of aid clients would benefit from, and how to cooperate in multidisciplinary teams. Using the PBL method in teaching and learning gives students a chance to prepare themselves for future physiotherapy work.

PBL in Health Science and Physiotherapy Professional Studies

PBL has been extensively researched within the health sector since the 1980s. A considerable amount of attention has been given to PBL in the medical education literature, although there has been growing interest in the PBL method in entry-level therapy educational programs as well (O'Donoghue, McMahon, Doody, Smith, & Cusack, 2011). Although O'Donoghue et al. (2011) conducted a systematic review of eight databases comparing the PBL method to other didactic approaches in seven therapy education programs (physiotherapy, occupational therapy, speech-language therapy, dietetics, podiatry, orthoptics, and therapeutic radiography), their conclusion based on 119 reviewed studies was that when compared to other didactic approaches, there was no evidence that the PBL method had a more positive effect on students' knowledge, performance, and satisfaction levels. There was limited evidence that PBL improved students' approaches to learning. The review showed that there is a need for more

research documenting the effects and effectiveness of PBL in professional entry-level education programs.

There has been limited research on using PBL as an approach throughout physiotherapy students' studies in learning to be a professional. Nevertheless, Solomon (1994) reported that the physiotherapy profession could also benefit from the efforts of medical education over recent decades. Using the keywords "physiotherapy students" AND "problem based learning," a systematic literature search made on 27.4.2018 (CINAHL and ERIC databases) found 12 studies of which 6 remained for analysis after the screening process. In the analysis of the studies, four key themes were found: PBL and interprofessional education, learning in a tutor group, lifelong learning, and a practice perspective.

PBL and Interprofessional Education

Interprofessional education (IPE) among health care professionals has been reported to have positive effects on learning; it promotes authentic working life situations and develops students' confidence in communicating in a team environment (e.g., Goelen, De Clerc, Huyghens, & Kerckhofs, 2006; Solomon & Salfi, 2011), and it narrows the gap between theory and practice (Cooper & Spencer-Dawe, 2006). Cusack and O'Donoghue (2012) examined health care students' perceptions of an IPE module delivered using the PBL method. Ninety-two students from four health science disciplines including medicine, physiotherapy, nursing, and diagnostic imaging participated in the study. At the end of the module, an evaluation was undertaken using a questionnaire with

Table 1. Key themes regarding the use of PBL in physiotherapy education.

Key Themes	The Benefit of PBL in Physiotherapy Education
PBL and interprofessional education	PBL modules create innovative interprofessional communication skills and increase interprofessional collaboration (Cusack & O'Donoghue, 2012; Goelen et al., 2006; Solomon & Salfi, 2011).
PBL and learning in a tutor group	Responsibility, time and support were the main themes in tutor group working (McAllister et al., 2014).
PBL and lifelong learning	Students had a positive attitude towards life-long learning (Kell & van Deursen, 2003). Life-long learning perspective may help make tutorial work more meaningful (McAllister et al., 2014).
PBL and a practice perspective	PBL offered positive benefits for both students and work places. Proactive students were able to apply transferable skills inherent in the PBL approach to clinical practice, including a holistic, problem-solving approach and effective team-working (Gunn et al., 2012).

quantitative and qualitative components. Over 70% of students positively endorsed the module and overall satisfaction with the module was high. Students valued the opportunity to work in small groups with students from the other health science disciplines. They highlighted module structure and content as being important elements for consideration when developing the module. Cusack and O'Donoghue (2012) suggest that further research is needed if improving communication and collaboration skills are to improve the quality of care as well. Interprofessional communication showed improvement also in Solomon and Salfi's (2011) study of using the PBL method in learning. The study conducted a program evaluation of an innovative interprofessional communication skills initiative that incorporated problem-based learning, cooperative learning, and standardized patients. The communication skills session consisted of a three-hour, faculty facilitated, and interactive format in which teams of five to eight students met to conduct an interview with a standardized patient and develop an interprofessional care plan. A total of 96 students from medical, nursing, physiotherapy, occupational therapy, midwifery, physician assistant, and pharmacy programs participated in the study. Students rated their satisfaction with the communication skills sessions highly. Students also felt that they learned about one another's scope of practice and built confidence in their communication skills development (Solomon & Salfi, 2011).

Learning in Tutor Groups

Studying in a tutor group is a central aspect in the PBL method. McAllister et al. (2014) investigated factors that promote or inhibit learning in PBL tutorial groups. Participants in the study were tutors and students from physiotherapy and speech-language pathology programs. Semistructured focus-group interviews and individual interviews were used in the study. In the results, three themes emerged from the thematic analysis: responsibility, time, and support. With regard to responsibility, the delicate balance between individual and institutional responsibility and control was shown in the interviews. Time included short and long-term perspectives in learning. Under support were mentioned supporting documents, activities, and personnel resources. Increased control by the program and tutors decreased students' motivation to assume responsibility for learning. To have a positive effect, support needs to adapt to student progress and to be well aligned to tutorial work. McAllister et al. (2014) argue that tutorial work is more meaningful for the students when a lifelong learning perspective in education is adopted.

PBL and Lifelong Learning

Lifelong learning skills and self-directed learning are needed in today's working life, and professional education promotes those skills. Kell and van Deursen (2003) compared the

learning profile development of two full-time physiotherapy cohorts (31 and 36 participants) who experienced different curricula, one of which was PBL oriented. The participants completed a questionnaire on their self-directed learning skills at four selected points during their three-year course and seven months after graduation. The results showed that both curricula influenced students' learning profile development over time. The PBL group responded positively to changes in the curricula in which dependence on the teacher was reduced and self-directed learning was adopted. These changes, however, were short-term and did not extend into early postgraduate life, which raised the question of whether physiotherapy work culture is able to reinforce and encourage newly graduated professionals in their learning development.

PBL and a Practice Perspective

Clinical practices are a major part of physiotherapy education, and students' goal during their education is to learn practical physiotherapy work skills (Korpi et al., 2017; Kurunsaari, Tynjälä, & Piirainen, 2018). Gunn, Hunter, and Haas (2012) studied how physiotherapy students applied the skills gained through PBL to practice from the perspective of placement supervisors. A qualitative semistructured interview was implemented for a sample of 10 experienced placement supervisors. The supervisors felt that PBL offered positive benefits for both students and workplaces. They felt that the experienced PBL students showed positive learning behaviors and good motivation and self-direction. The students were proactive and able to apply transferable skills inherent in the PBL approach to clinical practice, including a holistic problem-solving approach and effective team working. There was, however, variation among the students. For further research, Gunn et al. (2012) see it as useful to explore the factors that enable students to successfully apply to practice the attributes developed using the PBL approach.

As mentioned, there has been a limited number of studies on the PBL method and physiotherapy education, even though the PBL method is commonly used in physiotherapy education programs. The aim of this study was to understand how physiotherapy students at bachelor's level understand the problem-based learning approach during their learning to become professionals with the aim of developing health care education programs.

Methods

The focus of this article was on analyzing and understanding the influence of the PBL method during physiotherapy students' studies by using interpretative phenomenological analysis (IPA). The data consisted of students' written accounts of their learning to use the PBL method during their professional studies.

The cyclical PBL process used in the physiotherapy programs in this study was adapted mainly from Poikela and Poikela's model of the PBL cycle, in which there are eight stages and two tutorial sessions (Poikela E. & Poikela S., 2006; Rasi & Poikela, 2016). During the whole physiotherapy education program, there were various PBL cycles, with the length and timing varying according to subject and study module. The tutor session took place approximately 1–2 times a week. At the beginning of the PBL cycle, the problem was presented as a starting point for the learning process in the PBL cycle. There were different kinds of starting points for the PBL cycle. For example, an experienced physiotherapist told the students her professional story in a study module called "physiotherapy as part of the health care sector." Another example of a starting point was using Nordic walking poles in a study module called "physical activity." The outcome of the learning process was a written seminar paper, compiled by the tutorial group and collected by the secretary of each group at the end of the process. The seminar works were presented orally to a larger audience. The presentations also varied from one subject to another, allowing the students to also be very creative. The students received support from their tutor-teacher, who directed the learning process, especially at the beginning of the studies, and made sure the learning task formulated by the students was appropriate to the tutorial. The students were graded according to the study modules, which consisted of a variety of sessions. In addition to tutorials, students also completed single tasks, practical tests, larger exams, and separate practical instruction periods.

IPA was developed within psychology and it aims to provide detailed examinations of personal lived experience in its own terms rather than using preexisting theoretical preconceptions (e.g., Smith, 2017). IPA subscribes to a hermeneutic phenomenology where both participant and researcher are recognized as sense-making agents (Cassidy, Reynolds, Naylor, & De Souza, 2011; Smith, 2004, 2011, 2017; Smith, Flowers, & Larkin, 2009; Smith, Spiers, Simpson, & Nicholls, 2017). The key theoretical perspectives of IPA are phenomenology, interpretation (hermeneutics), and idiography. For IPA, phenomenology involves hermeneutics, which is defined as the theory and practice of the interpretation of the meaning of texts (Smith, 2011, 2017; Smith et al., 2009; Smith et al., 2017). The IPA approach has a "practical" orientation and is therefore suitable for physiotherapy researchers (Cassidy et al., 2011). Thus, IPA is suitable for our research in understanding PBL during the learning process.

Data Collection

Data collection starts the process of uncovering and understanding the role of the PBL method in physiotherapy students' learning to be professionals (see Smith & Osborn, 2008). During the students 3.5-year-long education longitudinal data was gathered from two different higher education institutes using physiotherapy students' portfolios, which were the data source in this study (Figure 1). The data consists of 1,792 typewritten A4 pages of free narration of students' learning experiences with each student contributing on average 119 pages. Some students also used literary sources to back up their ideas.

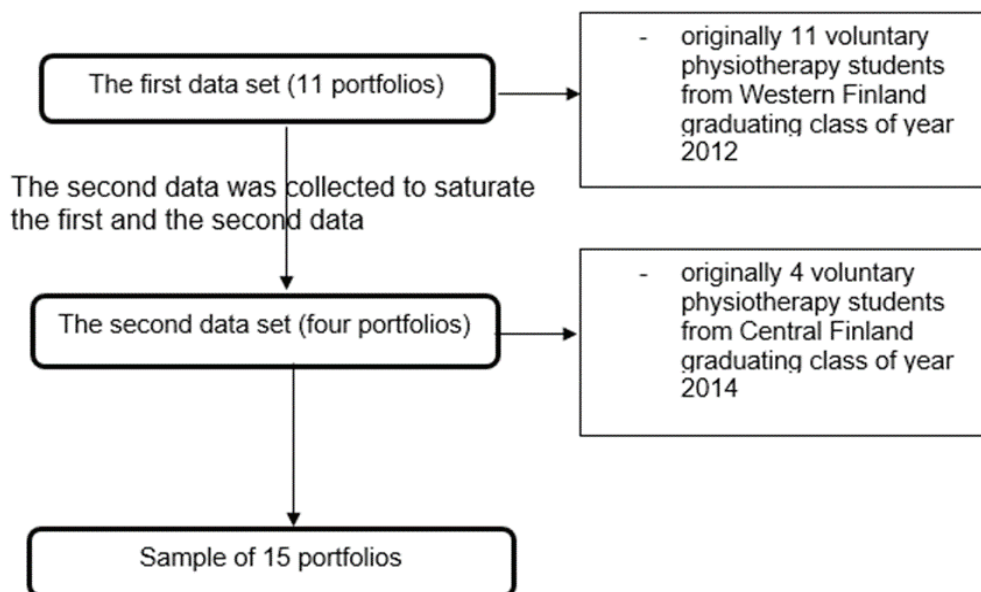


Figure 1. Research design.

Participants

The participants consisted of fifteen 22- to 37-year-old students (12 females and 3 males, mean age 24.5 years) who finished their studies in 2012 and 2014 at two different higher education institutions in different parts of Finland. Three students had earlier experience of higher education: one had studied at university, and one had graduated from vocational upper secondary education as a practical nurse. Four were professional massage therapists. Fourteen students had taken the matriculation examination. All students had gained work experience in health care and other fields both prior to and during their studies (Table 2).

Educational Purpose for Writing Portfolios

The educational purpose of writing the portfolios was to provide an opportunity for personal reflection during studies.

Writing crystalizes the thinking process (Bereiter & Scardamalia, 1987), and reflection is seen as essential in adults' learning (for example Kolb, 1984; Malinen, 2000; Merriam, Caffarella, & Baumgartner, 2007; Mezirow, 1990). The students constructed their portfolios in a study module called "Development for the Physiotherapy Profession," where the aims were to reflect on their own learning and professional development, strengthen their learning processes, and prepare themselves for the requirements of society and working life. The students also had regular meetings with the tutor-teacher in the study module, and they presented their portfolios to other students in a learning café. The study module was worth 2 ECTS credits. Portfolios were required in these programs, but students were not graded on writing their portfolios. There were no length or word number requirements, and the portfolio was checked twice a year with a tutor-teacher.

Table 2. Education and work experience of the participants.

Sex (f/m)	Age (years)	Earlier education	Working experience (years)	Graduation time (years)	UAS (A/B)
Maria, f A	22	- matriculation examination	1	2012	A
Sonja, f B	37	- matriculation examination - MPhil	12	2012	A
Anni, f C	22	- matriculation examination	1	2012	A
Emmi, f D	24	- matriculation examination	1	2012	A
Hannele, f E	22	- matriculation examination	1	2012	A
Satu, f F	23	- matriculation examination, - six months of nursing studies	1	2012	A
Antti, m G	23	- matriculation examination	1	2012	A
Päivi, f H	24	- upper secondary vocational education (practical nurse) - sports masseur	3	2012	A
Merja, f I	25	- matriculation examination - a few months of studies for community health nurse	3	2012	A
Johanna, f J	23	- matriculation examination - sports masseur	1	2012	A
Aleksi, m K	23	- matriculation examination	2	2012	A
Seija, f L	25	- matriculation examination - masseur	1	2014	B
Jaana, f M	28	- matriculation examination	5	2014	B
Anselmi, m N	23	- matriculation examination	1	2014	B
Susanna, f O	23	- matriculation examination - sports masseur	1	2014	B

Before the education program began, the students were instructed to write a preliminary assignment entitled *What kind of a learner am I?* This assignment was attached to their portfolios. Every six months during their education, they wrote about *My professional development*. Students described their learning experiences and feelings in their portfolios, and how they had experienced each study module. They also collected documents, for example, successful seminar papers, in their portfolios. They were given instructions for writing the portfolios for the first time at the beginning of their studies, before the actual tutorials started. Each student's portfolio was a unique individual narrative of his or her study time. Writing and collecting the portfolios made the students reflect once again on the study modules and see them as parts of a bigger picture.

Procedures

Participation in the study was voluntary and permission for the study was requested from both educational institutions as well as the students themselves. An enquiry was made to the head of the physiotherapy teachers about the teachers of the graduating groups who were then contacted. Face-to-face meetings with the teacher in charge and the participants were also arranged in the presence of their teacher, with e-mail used for supplementary participants. The researchers presented information about the study, both orally and in writing (see Loh, 2013; Tong, Sainsbury, & Craig, 2007). Voluntary students from the graduating group gave their paper-based portfolios to the researcher, who copied them for the study and then returned them to the students. In the other educational institution, e-portfolios were used, which the students sent to the researchers electronically. The anonymity of the participants has been maintained during the whole process, which is why the students' real names are not used in this study. Good ethical principles were adhered to in the study, which is part of a wider research project sanctioned by Jyväskylä University. None of the researchers were working in the educational institutes in which this study took place.

Analysis

In data analysis, a dual interpretation takes place. The participants make sense of the phenomenon in their own terms by explaining and interpreting their own experiences in their portfolios, after which the researchers explain and interpret, to make sense of the meaning of the participant's account during the analysis (Smith, 2011, 2017; Smith et al., 2009). Findings from the first case are then set aside to maintain sensitivity to each person's unique story (Smith et al., 2009). Using a qualitative method in the analyses allowed the students' own voices to be heard when the unique meanings of the participants' stories were figured out using IPA (Braun & Clarke, 2006; Smith, 2011). Analysis in this study had three stages:

Stage 1. Portfolios were read many times line-by-line by the first author and analyzed by searching for points of descriptive and conceptual note throughout. After this, a detailed examination of each of the 15 cases was made. The first author wrote descriptions of each case separately with regard to study time. These narratives were commented and agreed on by each researcher in this study. Narratives were used to understand the totality of the students' stories, in which the meaningful study experiences of and turning points in their learning to become professionals were recognized. The authors paid attention to students' expressions, their evaluations, and thick expressions in their portfolios. The first author collected students' experiences of the use of the PBL method from the original texts, with each researcher recognizing and agreeing upon convergences and divergences in the narratives and portfolios. The source of citations was the portfolios. Each of the 15 participants was identified by a letter of the alphabet (A–O, 15 participants). At this stage, researchers maintained an open mind and an explanatory attitude in order to produce a comprehensive and detailed account of the data (Smith, 2017; Smith et al., 2009).

Stage 2. The first author transformed the initial notes into experiential themes in one of the margins. The themes were discussed and agreed on in the research group. The themes captured the key elements of each participant's experiences of using the PBL method during their learning to become professionals. The study was data-driven (Smith, 2017; Smith et al., 2009).

Stage 3. The research group synthesized and superordinated the themes into a new abstraction level (Cassidy et al., 2011; Smith, 2017; Smith et al., 2009; Smith & Osborn, 2008). The themes that arose from the data are described and reported in more detail in the results.

Trustworthiness of the Study

The generic qualitative criteria are useful, even in assessing the quality of an IPA study. Smith (2011) highlights four principles of Yardley's approach (Yardley, 2000, 2008) when assessing the research from the perspective of sensitivity to context, commitment and rigor, transparency and coherence, and impact and importance. Smith has also described a set of guidelines to improve the quality of IPA research (Smith, 2011; Smith et al., 2009), and it is these guidelines that we have followed.

When analyzing the portfolios we used a four-stage analysis. The first author read the whole data and the other authors became involved at stage 3 when synthesizing the thematic data to form an abstract level. We gained a gradually deeper understanding of how the students understood the use of the PBL method in their professional studies.

This research had a *clear focus* on the PBL method in physiotherapy students' learning to be professional. A particular aspect rather than a broad overview is more likely to be of high quality (Smith, 2011). The data in this research was wide with students' own narration over the entire period of their studies used as data. Students told about what they had experienced as important. This is *strong data*, as Smith (2011) highlighted. This study opens up *the breadth and depth* of the main theme, and levels and sectors of the new way of learning are presented. Each theme is supported with extracts from the participants, as Smith (2011) suggested, with *direct citations* from students' portfolios used to support the results. The students' voice is present in the results. This research strove to take into account students' *different perspectives* on the PBL method. *The analysis was interpretative*, not just descriptive (Smith, 2011), and the analysis went systematically deeper from stage 1 to stage 3. The analysis pointed out both *convergences and divergences* of the student's experiences of the PBL method. The limitations of our study mainly relate to any potential generalizing of the findings, namely that our research was carried out in the Finnish context, relating to Finland's specific culture, education system, and physiotherapy teacher training in Finland. The Finnish education system deviates from practices that are typical in many other Western countries (Sahlberg, 2011). Further research is needed to examine and understand learning in professional education. The researchers did their best to write a fluent, articulate, and clear presentation, even though none of the researchers has English as their mother tongue.

Results

The PBL method was a new way of learning for all the students in this study. In fact, the use of the PBL method at the beginning of their studies was the turning point in their narratives (Korpi, Peltokallio, & Piirainen, 2014). Later on in their studies, they no longer wrote about their learning method that much, and at the end of the study time, they hardly mentioned the PBL method at all. The PBL method had become familiar and a natural part of their professional studies.

The new way of learning was categorized into three levels from a depth perspective and into four sectors from a width perspective (Figure 2). Next, the three levels of depth perspective are described, followed by the width perspective sectors of learning.

The Three Thematic Levels of the New Way of Learning

The use of the PBL method in teaching jolts all students at the beginning of their studies. Students experienced the difference from their previous experiences of teaching and learning methods. It caused confusion in many students and led to critical reflection on the PBL method in learning.

First Level: Difference. A new way of learning creates enthusiasm on the part of the students, but at the same time, it brings fear about not learning everything essential. Students reflected on whether the PBL method was a suitable method of learning for them, and the use of the PBL method caused

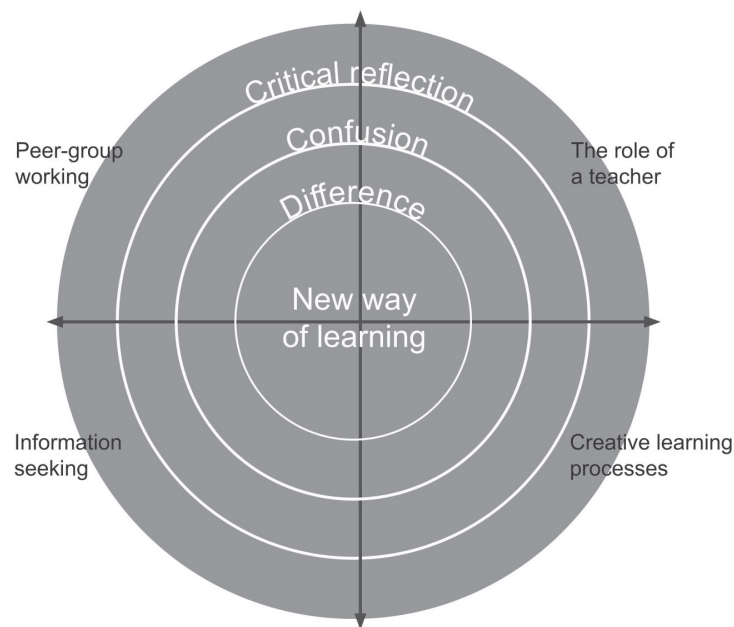


Figure 2. Levels and sectors of the new way of learning (PBL).

contradictory opinions. Because of the PBL method, many students generally experienced the first six months of studying as stressful. Sonja writes:

The pace of tutorials, “start–end,” “start–end,” felt at first rather tough, every weekend went on contributing your share of the written tasks. I felt like school work would not get easier for one moment. B 2

Also, Maria experienced the first half year of studying as stressful. She writes:

There were tutorials after tutorials, there were a lot of exercises and a little bit of stress all the time. In the autumn we already had anatomy, English, written communication, Swedish, different kinds of lectures, an e-course, tutorials and a practice period in a health care centre. A 2

Some students, on the other hand, experienced the PBL method as an appropriate new way of learning at the beginning of their studies. They felt studying was pleasant and the method was experienced as a suitable way to learn, especially when the students knew how to seek information independently. Anselmi describes his experience:

Tutorials feel like a good way to study and I feel that I myself learn better with this kind of group work than only by reading a book. Reflecting on the stuff in a tutorial helps at least my own learning a lot. N 17

Some of the students thought that the PBL method was a good, but at the same time challenging, way of learning. Merja says:

I myself have thought that PBL is a really good thing and way of learning, even though it demands a lot of activity and my/one’s own—and the group’s—eagerness. Even though I at times experience PBL studying as challenging, I believe I can be proud of the way of learning at school when I graduate. I have also started to understand the suitability of PBL studying for our field. I 3

The PBL method was experienced as working better in some subjects than others. Some students thought that the PBL method was even better in some subjects than the traditional way to learn because they also had to learn to reason independently. Seija writes:

I feel, though, that I know some parts better than others, for example I can explain how a muscle functions during a movement and in order to create movement because we went through those things so well also in the tutorials. L 1

Second Level: Confusion. Due to the experience of difference compared to their earlier ways of learning, students’

reactions reflected confusion. Some students experienced the PBL method as strange, and at the beginning of their studies, it was difficult to get a proper picture of what it was. Students were also unsure about what they should know about the subjects, how deeply they should investigate the subjects, and what they should be able to tell other students. Some students described the PBL cycle as an official and even slightly scary and arduous experience, especially if they had limited information-seeking skills. The studying rhythm was experienced as being fast, which is why some students felt that learning remained superficial. As a result students missed the traditional way of studying with the help of a set of lectures. In their portfolios students also wondered if they learned everything necessary via the PBL method, yet it was consoling to the students to know that PBL is also used in other health care education programs. Johanna comments:

I didn’t get a proper picture of what problem-based learning was in the lecture. The question of what the idea of this is, was raised in my mind. I was scared that with this kind of learning method it isn’t anyhow possible to learn as effectively as with the traditional way of lecturing. On the other hand, my fear was eased by knowing that problem-based learning is used in the education of medical doctors. J 1

Similarly, Sonja was uncertain and confused about whether she had learned everything she needed and if she had been active enough in learning independently. She writes:

At the beginning I was a bit confused. Right after the previous tutorial a new one begins, it feels like there is no time to take a breath and there is no eagerness to focus on the subject with the same intensity every time. I cannot deny I sometimes get a feeling that “during this tutorial I’m gonna be a slacker, I don’t have the resources to aim for the best now.” At the same time you sometimes notice that you keep on thinking if you’re learning enough about this subject. B 6

Jaana was also unsure about what she should know and be able to do. She wondered how deeply she should immerse herself in the topics of the tutorial tasks and what she should know and be able to do in practice. In addition, she thought about what she should share with other students about the topic.

Studying walking brought up thoughts about what was the intended level of detail for knowledge about the topic. What should I know about walking, and how much should I know about it to direct a person who has difficulties in their own walking? The group situation also forced me to think about how I should formulate my theoretical knowledge so that it suits them and about how

much they are able to comprehend of the information I share, and while I also gain some useful new knowledge in the process. M 6

Third Level: Critical Reflection. Even though the first half-year of studying was generally felt to be stressful because of the PBL method, the students' experience, however, was that they had learned group-working skills, information-seeking, and critical evaluation of sources. The PBL method had also helped them to better recognize what kind of learners they are. Susanna explains:

I could still mention separately that thanks to problem-based learning I learnt a lot about working in a group and information-seeking and also looking at the sources critically. Because of PBL I have also better recognized what kind of student I am myself—what way and how I learn best and how I act in a group—and how I could improve my group-working skills. O 9

Even though working in tutorials was a new way of learning, the students experienced that with its help it was possible to learn broadly new information. Hannele writes:

The tutorial exercises felt heavy at times because every time you had finished one tutorial a new task started. Anyway, you learn a wide range of new information in tutorial exercises. E 1

The Four Thematic Sectors of the New Way of Learning

Students reflected critically on information-seeking, creative learning processes, peer-group working, and the teacher's role when using the PBL method.

First Sector: Information-Seeking. It had a much greater role than many had thought. Information-seeking skills were experienced as necessary when using the PBL method, and the information-seeking courses were generally experienced as truly important, with information-seeking playing a much larger role than many of the students had thought. Students said that information technology, information-seeking skills, and critical use of references were of central importance when using the PBL method. Sonja writes:

Independent information-seeking has a central role in problem-based learning; I really experienced it as very important that different information sources in our own field were introduced to us. Because I have had to think about critical use of sources in my history studies, it is easy to apply this in the current studies as well, the same principles apply also to this field. IT was partly beneficial for me, one always learns something new even though one has already worked a lot on a computer. B 8

Even though information-seeking was necessary for the students, it was also experienced as interesting. Päivi comments:

As a style PBL studying felt difficult in the beginning but getting to know it gave a new perspective on studying. Along with PBL studying you have to be able to seek the information and learn it, but on the other hand, it has been interesting. H 1

In addition to information-seeking skills, it was necessary to learn to package and edit the new information in an appropriate format, which was considered challenging. Susanna describes the problem:

Problem based learning demands a lot of independent information searching, and time and again I have faced challenges with it. The greatest challenges have been packaging the information, picking up the most important pieces of information and editing them into a form that is the easiest for oneself to understand. That is going to take a lot of time, and if I am in a hurry to find material for a tutor meeting, for example, I often need to take too broad a spectrum of information, which I end up not knowing that well, which in turn makes processing the topic more difficult. O 12

Second Sector: Creative Learning Processes. This demanded a lot of effort and many students experienced that producing written text was challenging and it was a complex process to learn to write at the beginning of their studies. Writing their portfolios at the same time was helpful for the development of their writing and reflection skills. Jaana describes this:

I felt that the production of written text was slightly challenging after a long break. Diary-like pieces were a nice way to start and get a nice writing rhythm going. Especially my skill in writing informational text was in dire need of practice and I had to learn referencing from scratch (which still isn't going very well). In this situation, I believe that I will learn and develop by doing, and only doing. M 2

Many students felt the seminar work at the beginning of studies was challenging and stressful with the first seminar works demanding considerable work. Instructions on written work were experienced as helping the process. Students also wondered about the reason for seminar-type learning. Presenting seminar work was also part of creative skills requiring concentration and preparation. Emmi elaborates:

The first tutorial was very, very exciting and maybe even a bit of a scary situation. I couldn't imagine that after that there would be a lot of them almost every week.

Next, there was a seminar work and it demanded even more work, especially when none of us understood what they were looking for by doing it. We hadn't quite understood the instructions for the written tasks so it was difficult to comply with them. Our written outcome didn't turn out very well but luckily for us the presentation went brilliantly. D 1

Third Sector: Peer-Group Working. This consisted of three subthemes: belonging to a group, format of the tutorials, and interacting with others. Many students experienced tutor group working to be the best part of the PBL process.

a. Belonging to a group. Belonging to a group was important for students. They realized the meaning of the group in learning. Emmi describes:

It is important to belong somewhere, and hardly anyone wants to be left outside. Group work is important and I understood that there is going to be a lot of it in this school. A group is always stronger than an individual. D 2

All the group members were expected to act responsibly, complete all the given subjects thoroughly, and follow commonly agreed rules. A positive attitude and motivation in studying increased team spirit in a tutor group. Anselmi writes:

I have always experienced the tutorials as really nice with this first tutor group. We have been able to handle the given subjects very thoroughly in a good atmosphere. All the group members are responsible, and all stuck to the commonly agreed rules, which helps the functioning of the group and also learning. N 16

b. Format of the tutorials. The format of the tutorials was learned in the first period of studies. At the beginning of every tutorial the students were presented with a starting point in response to which they started to form a question, the answer to which they were seeking during the tutorial. After the starting point had been set, the student roles were assigned. The students had understood the roles of the chairperson, secretary, passive observer, and other students. Antti describes:

A heart rate monitor and Nordic walking poles can be thrown in front of us. Then a question about them is made by students and solved by students. Also, the roles and all the well-defined transitional episodes before getting to make the question were new things. Afterwards thought is clear that the roles of secretary and chairperson have to exist if you want the work to form a coherent whole and for it to be divided equally. The role of the secretary is probably useful in the first tutorials but I'm not sure if it is as necessary with experienced students. The passive observer could let all the

information go in one ear and immediately out of the other and then state that everything went well and everybody produced stuff. He or she however gets the information in more detail from the secretary afterwards and that way gets into the stuff. G 1

At a slightly later stage of their studies, many students experienced particularly concrete **case tutorials** as especially useful. These helped students to face patients with the same kinds of problems in real working life. Satu explains:

The cases that were in the tutorials were interesting, and it was nice to study this way, because they had concrete examples. Back, shoulder, ankle and knee were interesting and the things you learned were beneficial in the instructed practical training. These were exactly the things I had the most of in my instructed practical training so it was nice when you already knew quite a lot about things. F 3

It was interesting to see that real people have the same problems, which they had studied at school in theory. Sonja comments:

The tutorials gave a lot of concrete benefit because in my practice I, for example, had more than one client suffering from neck and shoulder problems and that was exactly like a case we had in a tutorial. B 10

c. Interacting with others. Discussion in a tutor-group was generally experienced to be the best part of the PBL method. Students felt that their own perspectives were strengthened. Listening to others and reflecting on their own experiences in a group were useful in learning. Moreover, even though working in tutorials and interacting with others was a new way of learning and it was demanding, the students' experience was that it was possible to learn largely new information, as Susanna explains:

While listening to experiences, a brilliant discussion arose about a child's behaviour in a group—and how different things affect a child's behaviour and development. This seemed to be the best side of PBL, when I at least experience that I learn effectively particularly through discussion and reflection. O 2

The discussions and the sharing of experiences, which took place in the tutor meetings, linked theory with practice. Seija writes:

The experiences we shared with each other in the tutor sessions linked the theory with everyday life, which led to them being viewed from different viewpoints. L 3

Fourth Sector: The Role of the Teacher. The students became aware that the role of the teacher differs in the PBL method

from the traditional way of studying. Instead of traditional teaching, tutor-teachers encouraged students to seek information by themselves because independent information-seeking would be needed in the future. The teacher set goals for learning, delimited tutor tasks, gave instructions, encouraged, helped, and gave “tips” for presentations. The role of the teacher was greater at the beginning of the studies. Alekski recalls:

The first tutorial in the autumn was quite searching but, when mirrored against the goals, we made it with the help of the tutor-teacher. K 1

In the beginning of the studies, the teacher had a bigger role in directing the tutor session. The teacher had to limit the students from straying too far from the topic. Susanna recalls:

In the first session, the teacher still had a larger-than-normal role, since we didn't know the best way to proceed in each cycle. Once we got our topic, we found common ground, and were not lacking in ideas or discourse. In the brainstorming circle, we also came up with good ideas, and from time to time it felt like we were straying too far from the topic. The teacher tried to calm us down by saying that while brainstorming we were not supposed to limit or discard anything, but quite the contrary to take on all ideas with open arms. Suffice it to say that our mind map ended up being quite broad. O 17

As studies proceeded, the directive role of the teacher got smaller, and the students were learning efficiently without the directive role of the teacher. Susanna continues:

The most memorable session was a session where the teacher was not present, and our topic was muscle innervation. We taught each other e.g. by using the blackboard and explaining everything very thoroughly, so that every single one of us would know how the nerve impulse moves in the muscle-nerve junction. It was an amazing session and the learning was effective. A native English-speaking tutor was also nice for variety and especially good for language practice. O 3

The students had understood that the role of the teacher was different from the traditional, teacher-led manner of studying. The students experienced this as useful regarding the transition to working life. Anni explains:

The role of the teacher in this manner of studying is not to teach us, but to motivate us to search for information from different sources by ourselves, since we would need this skill in the future. C 1

Besides the tutorials, the students appreciated varied teaching methods and especially practical ways of learning as part of their learning process. Päivi recalls:

The health education day was completely awesome and I got enthusiastic about the upcoming studies because of it. There should be more of them. This was instantly concrete when you got to do tests for real clients. H 4

Expert lectures, for example by doctors, were experienced as important. It was interesting to listen to their examples from real working life. Sonja writes:

We gained an incredible amount of information, and the manner in which it was provided to us ensured that it stuck with us. There was a lot to learn, but the lectures proceeded at a relaxed pace, and along with every topic covered the lecturer told us about many real example cases from his long medical career. B 13

The Main Results From the New Way of Learning

The main results from the new way of learning strengthen earlier conceptions of the importance of reflection in the learning process (e.g., Dewey, 1938; Illeris, 2014; Malinen, 2000; Mezirow, 1990). There are two dimensions of reflection in this study: self-reflection (information-seeking and creative learning processes) and reflection together (peer-group working and the teacher), with reflection together seeming to be more powerful than in earlier experiential learning theories (Figure 3, see next page).

Discussion

It is interesting to see that learning to learn has such an important role in learning to become professionals. The students actually told more about the new way of learning than about the profession they were studying for. Reflection on learning and on the learning method used seemed to be a starting point for students' learning to be professionals in physiotherapy higher education. Two dimensions of reflection, self-reflection and reflection together, are central in students' stories, and these are discussed in more detail. The new way of learning forced students to reflect critically on their previous conceptions of learning, and this was a huge turning point in their stories about their learning to become physiotherapists (see Dewey, 1938; Illeris, 2014; Malinen, 2000; Mezirow, 1990). It is important to notice this and become more aware of this important step in the students' learning to become professionals (see Figure 2).

Contradictory opinions about studying with the PBL method have been reported in Finland as the results in this study also showed. For each student in this study, the PBL method was a new method for learning. As a result, the initial phase of studies was experienced as quite stressful and students felt the learning rhythm to be fast with tutorials following each

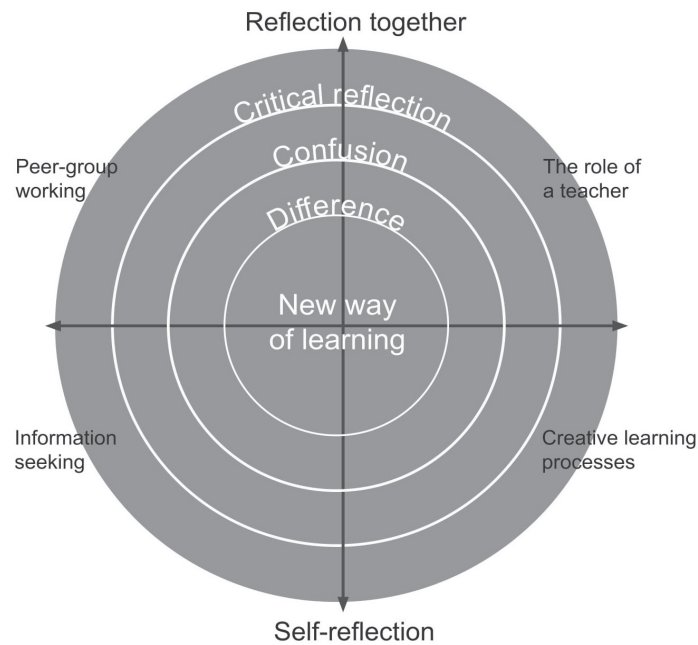


Figure 3. The two dimensions of reflection in the new way of learning in PBL.

other in close succession. Also, Tuomi and Äimölä (2014) reported that the PBL method produced more satisfied and enthusiastic students, but at the same time caused insecurity among other students. The positive sides, however, are the flexibility in timetabling and variety in learning. Furthermore, learning in tutorial groups trains multiple skills and knowledge for studying and working life. In this study, engagement in PBL at the beginning of studies was challenging for some of the students since a new way of learning means a stripping away of the old, and students need to see themselves as learners in this new environment. In addition, Savin-Baden (2016) reports that learning to use PBL requires scaffolding in learning, guidance, and collaboration, which can be seen especially at the beginning of studies in this research.

Self-reflection concentrated on information-seeking and creative learning processes in this study. **Information-seeking**, searching for sources, critical reflection on sources, and processing of information were experienced as playing an important part in using the PBL method. IT skills, information-seeking courses, and critical use of references are experienced as important in programs. Also, Tuomi and Äimölä (2014) report that some students experienced independent information-seeking as beneficial to learning, with other students regarding it as absolutely essential. Even though information-seeking was felt to be demanding at the beginning of the studies in this study, Kamwendo and Törnquist (2001) reported that PBL students

have better attitudes toward research later in their studies than traditional students. A lifelong learning perspective and a positive attitude to learning also contribute to tutor work (Kell & van Deursen, 2003; McAllister et al., 2014).

In this study, **creative learning processes** were experienced as demanding a lot of effort at the beginning of the studies. Students needed writing skills when tackling seminar topics in the PBL circles; similarly, presenting their own work required concentration. Writing essays, in particular, was experienced as a challenging but also educational process. Often the lack of time was felt to be a problem. On the other hand, Tuomi and Äimölä (2014) report that if there was time to do one assignment properly, it was experienced as rewarding. According to this study, physiotherapy education needs to consider development of writing skills. Also, Kurunsaari, Tynjälä, and Piirainen (2016) report that physiotherapy students may experience reflective writing as a useless task, as a tool for deepening understanding, as a tool for self-reflection, and as a tool for professional development. This is important in education because in health care reflective processes are increasingly related to writing activities: professionals need to document, register, and synthesize information (Karjalainen, 2012).

Creative learning processes and information-seeking skills improved as studies proceeded, which helped students to study using the PBL method. Lähtenmäki (2006, pp. 48–49)

also reported in her dissertation that physiotherapy students studying with the PBL method gradually and progressively improved their independent studying. In the first academic year information-processing transformed from mainly repeating collected information to a more analytical and reflective use of information and building of common information. Seeking information, independent study, and analyses of the information learned in the tutor group, synthesis, and seminar situations could be seen to correspond to abstract conceptualization in Kolb's (1984) cycle of experiential learning.

Reflection together concentrated on peer-group working and what the role of the teacher was. In this study, **the teacher's role** was understood to be different from that in traditional learning, with the teacher, especially at the beginning of studies, playing a big role in encouraging and instructing students to seek information independently and learn by using the PBL method. McAllister et al. (2014) also state support to be an important factor in learning in tutor groups. Furthermore Poikela (2003, pp. 301–304) states in her dissertation that tutor-teachers need to involve adequate expertise regarding the content studied and also have the ability to adopt the roles of facilitator, expert, and learning designer. The tutor-teacher is also a learner in the process of PBL, continuously having to check and adjust his/her pedagogical ideas.

Many students experienced tutor-group working to be the best part of the PBL process in this study. **Working in peer-groups** consisted of the format of tutorials, belonging to a group, and interaction between students. Students felt that they had already learned how tutorials proceed at the beginning of their studies. They had learned to act in various roles in the tutor groups. It is important for students to focus on understanding how the PBL cycle proceeds in order to adopt the learning process (see also Lähtenmäki, 2006, pp. 48–49; Pekkinen, 2014; Rasi & Poikela, 2016; Saarinen-Rahiika & Binkley, 1998). The roles that are used in PBL tutorials, however, cause contradictory thoughts. On the one hand, they are considered good and it is seen as educational that one can act under their shelter and that they change every time. On the other hand, people would like to be able to reject a role (Tuomi & Äimölä, 2014). The new situation is exciting or even scary, and it might feel difficult to concentrate on a given task. To avoid that, specific role cards have been developed for students to use during the tutorials (Pekkinen, 2014).

In this study, the starting points at the beginning of tutorials were experienced as a new tool of learning. The principal idea behind PBL is that the starting point for learning should be a problem, a query, or a puzzle that the learner wishes to solve (Bound, Keogh, & Walker, 1985; Jonassen & Hung, 2015; Saarinen-Rahiika & Binkley, 1998; Yew & Goh, 2016). The problem can be also a scenario, a trigger, a case, or a structured contextualized problem, depending on the aim of

learning (Barrett, 2006; Jonassen & Hung, 2015; Sockalingam & Schmidt, 2011). Tuomi and Äimölä (2014) reported that the starting points of learning assignments had produced rich comments with regard to both improving learning and weakening it. The basic starting point is to see the learning assignment as interesting and in this study, case learning assignments especially were mostly experienced as interesting starting points. The starting point given to the students can be seen as a concrete experience of Kolb's (1984) cycle of experiential learning, with the beginning of the PBL cycle corresponding to the stage of reflective observation.

According to the results in this study, a tutor group needs to have commonly agreed rules to function well. A good attitude toward group working and responsibility helps the learning process in the PBL method, a finding also confirmed by McAllister et al. (2014), who identified responsibility as central to work in tutor groups. There is an opportunity and a duty to be accountable for the work process in the tutor group. This study supports the idea that a small group contributes to learning more than a large group. According to the students, the stability of the group supports learning and its functioning can be disturbed, even by new members joining the group. Similarly, Piirainen and Skaniakos (2014) see that learning is promoted if all the group members commit to the group and to an atmosphere that is positive for learning.

Interaction in a tutor group was seen to be the best part of the PBL method. Discussion, listening to others' experiences, sharing experiences, confirming one's own opinions, and learning completely new information in a tutor group were experienced as positive for learning. Also, Tuomi and Äimölä (2014) stated that discussion and listening as a form of learning receives positive feedback from the perspective of learning. Students also learned memory-enhancing new information and new viewpoints from others' examples, experiences, stories, and information they had discovered.

Tutor group working overall was an effective factor in learning with PBL in this study. Working in a group helped in developing social and group working skills, as Lähtenmäki (2006) has also stated, and also in improving teamwork and interprofessional communication, which are needed in real working life situations (Cusack & O'Donoghue, 2012; Goelen et al., 2006; Holland et al., 2013; Piirainen, 2014; Solomon & Salfi, 2011). These kinds of real-life learning contexts, where there are students from different professional areas, narrow the gap between theory and practice (Cooper & Spencer-Dawe, 2006). In addition, Gunn et al. (2012) reported that proactive students were able to apply transferable skills inherent in the PBL method of learning to clinical practice, and that this had positive benefits for both students and workplaces.

In higher education and learning to become professionals, **experiential learning** is essential. Students wrote about their

experiences in their portfolios. Adult experiential learning evokes reflection and it is always a process, not just an outcome, resulting in a widening of personal experiential knowing (Dewey, 1938; Illeris, 2014; Knowles, 1980; Kolb, 1984; Malinen, 2000; Mezirow, 1990). The PBL method seemed to activate a reflection process. The results in this study support Dewey's (1938) idea of the reflection process after experience and Schön's (1987) view on reflection also taking place in the midst of the experience as well as afterward. The nature of the reflection process varied, underlining the premises and assumptions of earlier experiences (see Mezirow, 1990). In this study, the PBL method forced students to reflect on their earlier ways of learning and their assumptions about their earlier experiences in studying. They had to learn to be more self-directed and to take more responsibility for their learning than earlier in their studies. They had to learn to learn and their personal knowledge about learning was transformed (Cranton, 2006; Mezirow, 1990). In addition, Kell and van Deursen (2003) reported that students that had used the PBL method in learning had even better lifelong learning skills than students following traditional curricula, which was not taken into consideration in this study.

Practical Implications for Education

This study showed there is a need for scaffolding, especially at the beginning of studies, when using PBL as an approach. This study brings out the directions for and the timing of the necessary scaffolding. It needs to be directed toward information seeking, creative learning processes, group working, and clarifying the teacher's role. There is a need for support during the first six months of studies because the initial period of studying is generally experienced as quite hard.

Scaffolding and guidance at the beginning of studies should be directed largely toward information seeking. It is essential to make sure the students' IT skills are good enough for this purpose and for independent writing as well. Stable tutorial groups promote learning, and commonly agreed rules in the groups create a pleasant atmosphere and a sense of belonging to the group. Tutorial rhythms should not be too exhausting at the beginning of the studies before the students get used to their frequency and duration.

It is important in learning to support reflection skills, which is why reflective writing courses are also beneficial for students in learning to be reflective. Writing portfolios and diaries during studying forces reflection. In addition, regular discussions in a tutor group and with a teacher promote reflection.

Students need guidance from the tutor-teacher, especially at the beginning of their studies. The role of teachers needs to be clarified for the students. Besides the tutorials, the students benefit from varied teaching methods as part of their learning process. Promoting and encouraging a good

attitude and open atmosphere for learning provides a positive beginning for completely professional studies.

Further research on the use of PBL in physiotherapy professional studies is needed. For example, what would be a suitable tutorial rhythm for the students at the beginning of studies? How do we support the students' creative learning processes and reflective writing as part of PBL seminar tasks? Moreover, how do we encourage students to use their problem-solving skills in instructed practical training periods and in working life? Cooperation with clinical placements and educational institutes is needed for transforming the PBL ideology into a physiotherapy work culture that supports students and professionals' lifelong learning.

Conclusion

The main outcomes of the study were as follows: (1) The PBL method activated physiotherapy students for reflection at the beginning of their studies and they experienced the difference from their earlier learning method, which created confusion and forced critical reflection. (2) The new way of learning includes self-reflection and reflection together, with self-reflection focused on information-seeking and creative learning processes, and reflection together focused on peer-group working and the role of the teacher.

The study brings new information for developing health care education and its curricula. Learning to learn—a new way of learning—is an essential step in students' learning to become professionals, something that is important to notice in their curricula and which provides the support needed for learning skills.

Acknowledgments

The authors sincerely thank all the physiotherapy students in Finland who participated in this study. We also wish to thank physiotherapy teachers for helping to obtain the material from higher education organizations.

References

- Barrett, T. (2006). A problem as a provoker of a space betwixt and between old and new ways of knowing. In E. Poikela & R. Nummenmaa (Eds.), *Understanding problem-based learning* (pp. 37–39). Tampere: Tampere University Press.
- Barrows, H. (1985). *How to design a problem-based curriculum for the preclinical years*. New York: Springer.
- Bereiter, C., & Scardamalia, M. (1987). *The psychology of written composition*. London: Lawrence Erlbaum Associates.
- Boud, D., & Feletti, G. J. (1991). Introduction. In D. Boud & G. J. Feletti (Eds.), *The challenge of problem-based learning* (pp. 13–18). London: Kogan Page.

- Boud, D., Keogh, R., & Walker, D. (1985). *Reflection: Turning reflection into learning*. New York: Kogan Page.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Cassidy, E., Reynolds, F., Naylor, S., & De Souza, L. (2011). Using interpretative phenomenological analysis to inform physiotherapy practice: An introduction with reference to the lived experience of cerebellar ataxia. *Physiotherapy Theory and Practice*, 27(4), 263–277. <https://doi.org/10.3109/09593985.2010.488278>
- Cooper, H., & Spencer-Dawe, E. (2006). Involving service users in inter-professional education narrowing the gap between theory and practice. *Journal of Interprofessional Care*, 20(6), 603–617. <https://doi.org/10.1080/13561820601029767>
- Cranton, P. (2006). *Understanding and promoting transformative learning: A guide for educators of adults*. San Francisco, CA: Jossey-Bass.
- Cusack, T., & O'Donoghue, G. (2012). The introduction of an interprofessional education module: Students' perceptions. *Quality in Primary Care*, 20(3): 231–238. Retrieved from <https://pdfs.semanticscholar.org/8162/e198d6aa7f48f8653ef4bbf8f413a68e8e27.pdf>
- Dewey, J. (1910/1991). *How we think*. New York: Prometheus.
- Dewey, J. (1938). *Experience and education*. New York: Collier Books.
- European Higher Education Area, The Romanian Bologna Secretariat. (2017). *European higher education 2010–2020*. Retrieved from <http://www.ehea.info>
- Goelen, G., De Clercq, G., Huyghens, L., & Kerckhofs, E. (2006). Measuring the effect of interprofessional problem-based learning on the attitudes of undergraduate health care students. *Medical Education*, 40(6), 555–561. <https://doi.org/10.1111/j.1365-2929.2006.02478.x>
- Gunn, H., Hunter, H., & Haas, B. (2012). Problem based learning in physiotherapy education: A practice perspective. *Physiotherapy*, 98(4), 335–340. <https://doi.org/10.1016/j.physio.2011.05.005>
- Holland, C., Bench, S., Brown K., Bradley, C., Johnson L., & Frisby, J. (2013). Interprofessional working in acute care. *Clinical Teacher*, 10(2), 107–112. <https://doi.org/10.1111/tct.12002>
- Illeris, K. (2014). *Transformative learning and identity*. London, England: Routledge.
- Jonassen, D. H., & Hung, W. (2015). All problems are not equal: Implications for problem-based learning. In A. Walker, H. Leary, C. Hmelo-Silver, & P. Ertmer (Eds.), *Readings in problem-based learning: Exploring and extending the legacy of Howard S. Barrows* (pp. 17–42). West Lafayette, IN: Purdue University Press.
- Kamwendo, K., & Törnquist, K. (2001). Do occupational therapy and physiotherapy students care about research? A survey of perceptions and attitudes to research. *Scandinavian Journal Caring Sciences*, 15(4), 295–302. <https://doi.org/10.1046/j.1471-6712.2001.00041.x>
- Karjalainen, A. L. (2012). *Elettyä ymmärtämässä: Omaelämäkerrallinen kirjoittaminen ja teksti reflektiona sosiaalialan ammattikorkeakouluopinnoissa*. [Understanding the past: Autobiographical writing and text as reflection in social studies conducted at the Diaconia University of Applied Sciences]. (A Studies 35). Helsinki, Finland: Diaconia University of Applied Sciences.
- Kell, C., & van Deursen, R. (2003). Does a problem-solving based curriculum develop life-long learning skills in undergraduate students? *Physiotherapy*, 89(9), 523–530. [https://doi.org/10.1016/S0031-9406\(05\)60178-2](https://doi.org/10.1016/S0031-9406(05)60178-2)
- Knowles, M. S. (1980). *The modern practice of adult education: From pedagogy to andragogy* (2nd ed.). New York: Cambridge Books.
- Kolb, D. A. (1984). *Experiential learning: Experience as a source of learning and development*. Englewood Cliffs, NJ: Prentice Hall.
- Korpi, H., Peltokallio, L., & Piirainen, A. (2014). The story models of physiotherapy students' professional development. Narrative research. *European Journal of Physiotherapy*, 16(4), 219–229. <https://doi.org/10.3109/21679169.2014.934279>
- Korpi, H., Peltokallio, L. & Piirainen, A. (2017). Practical work in physiotherapy students' professional development. *Reflective Practice*, 18(6), 821–836. <https://doi.org/10.1080/14623943.2017.1361920>
- Kurunsaari, M., Tynjälä, P., & Piirainen, A. (2016). Students' experiences of reflective writing as a tool for learning in physiotherapy education. In G. Ortoleva, M. Betrancourt, & S. Billett (Eds.), *Writing for professional development* (pp. 129–151). Leiden, Netherlands: Koninklijke Brill.
- Kurunsaari, M., Tynjälä, P., & Piirainen, A. (2018). Graduating physiotherapy students' conceptions of their own competence. *Vocation and learning*, 11(1), 1–18. <https://doi.org/10.1007/s12186-017-9177-8>
- Lähteenmäki, M-L. (2006). *Asiantuntijuuden kehittyminen ongelmaperustaisessa fysioterapeuttikoulutuksessa*. [Development for expertise in PBL-based physiotherapy education] (Doctoral thesis). Available from TamPub Database (Record No. 1197, <https://tampub.uta.fi/bitstream/handle/10024/67665/951-44-6795-7.pdf?sequence=1&isAllowed=y>).
- Loh, J. (2013). Inquiry into issues of trustworthiness and quality in narrative studies: A perspective. *Qualitative Report*, 18(65), 1–15. Retrieved from <http://www.nova.edu/ssss/QR/QR18/loh65.pdf>

- Loyens, S. M. (2015). Foreword. In A. Walker, H. Leary, C. Hmelo-Silver, & P. Ertmer (Eds.), *Readings in problem-based learning: Exploring and extending the legacy of Howard S. Barrows* (pp. V–VIII). West Lafayette, IN: Purdue University Press.
- Lu, J., & Chan, L. K. (2015). Differ in socio-cognitive processes? Some comparisons between paper and video triggered PBL. *Interdisciplinary Journal of Problem-Based Learning*, 9(2). <https://doi.org/10.7771/1541-5015.1495>
- Malinen, A. (2000). *Towards the essence of adult experimental learning*. Laukaa, Finland: ER-paino.
- Margetson, D. (1991). Why is problem-based learning a challenge? In D. Bound & G. Feletti (Eds.), *The challenge of problem-based learning* (pp. 42–50). London: Kogan Page.
- McAllister, A., Aanstoat, J., Hammarström, I. L., Samuelsson, C., Johannesson, E., Sandström, K., & Berglind, U. (2014). Learning in the tutorial group: A balance between individual freedom and institutional control. *Clinical Linguistics & Phonetics*, 28(1–2), 28–40. <https://doi.org/10.3109/02699206.2013.809148>
- Merriam, S. B., Caffarella, R. S., & Baumgartner, L. M. (2007). *Learning in adulthood*. San Francisco, CA: Jossey-Bass.
- Mezirow, J. (1990). How critical reflection triggers transformative learning. In J. Mezirow & Associates (Eds.), *Fostering critical reflection in adulthood. A guide to transformative and emancipatory learning* (pp. 4–5). San Francisco, CA: Jossey-Bass.
- Ministry of Culture and Education, Finland. (2016). Eurooppalainen tutkintojen viitekehys [European Qualification Framework]. Retrieved from http://www.minedu.fi/OPM/Koulutus/artikkelit/ammattillisen_koulutuksen_koeopenhamina-prosessi/Eurooppalainen_tutkintojen_osaamisen_viitekehys_xEQFx.html
- O'Donoghue, G., McMahan, S., Doody, C., Smith, K., & Cusack, T. (2011). Problem-based learning in professional entry-level therapy education: A review of controlled evaluation studies. *Interdisciplinary Journal of Problem-Based Learning*, 5(1), 54–73. <https://doi.org/10.7771/1541-5015.1218>
- Pekkinen, T. (2014). PBL-kortit—tutortyöskentelyn oppimisen tukena [PBL cards—as supports for learning in tutor work]. In J. Tuomi (Ed.), *Sitkeästi reilut 10 vuotta ongelmaperustaista oppimista hoitotyön koulutusohjelmassa [Roughly over 10 years of problem-based learning in a nursery education program]* (Tampereen ammattikorkeakoulun julkaisusarja. Sarja B. Raportteja 76) (pp. 19–24). Tampere, Finland: Tampere University Press.
- Piirainen, A. (2014). The peer groups bridging the disciplines and social contexts in higher education. In B. Käßlinger, N. Lichte, E. Haberzeth, & C. Kulmus (Eds.), *Changing configurations of adult education in transitional times* (pp. 473–484). Berlin, Germany: ESREA Publications.
- Piirainen, A., & Skaniakos, T. (2014). Pienryhmäohjaajien vertaisryhmä andragogisessa koulutuksessa. [Small group instructors' peer group in andragogical education] *Aikuiskasvatus*, 34, 107–120. Retrieved from <http://elektra.helsinki.fi/se/a/0358-6197/34/2/pienryhm.pdf>
- Poikela, E., & Poikela, S. (2006). Problem-based curricula—theory, development and design. In E. Poikela & R. Nummenmaa (Eds.), *Understanding problem-based learning* (pp. 71–81). Tampere, Finland: Tampere University Press.
- Poikela, S. (2003). Ongelmaperustainen pedagogiikka ja tutorin osaaminen. [Problem-based pedagogy and the tutor's knowing and competence] (Doctoral thesis). Available from TamPub Database, Record No. 250, <http://tampub.uta.fi/bitstream/handle/10024/66398/951-44-5661-0.pdf?sequence=1&isAllowed=y>
- Rasi, P. M., & Poikela, S. (2016). A review of video triggers and video production in higher education and continuing education PBL settings. *Interdisciplinary Journal of Problem-Based Learning*, 10(1). <https://doi.org/10.7771/1541-5015.1609>
- Saarinen-Rahiika, H., & Binkley, J. M. (1998). Problem-based learning in physical therapy: A review of the literature and overview of the McMaster University experience. *Physical Therapy*, 2(78), 195–211. Retrieved from MEDLINE, <http://pubmed.gov/9474111>
- Sahlberg, P. (2011). *Finnish lessons: What can the world learn from educational change in Finland?* New York: Teachers College Press.
- Savery, J. R. (2006). Overview of problem-based learning: Definitions and distinctions. *Interdisciplinary Journal of Problem-Based Learning*, 1(1). <https://doi.org/10.7771/1541-5015.1002>
- Savery, J. R. (2015). Overview of problem-based learning: Definitions and distinctions. In A. Walker, H. Leary, C. Hmelo-Silver, & P. Ertmer (Eds.), *Readings in problem-based learning: Exploring and extending the legacy of Howard S. Barrows* (pp. 5–15). West Lafayette, IN: Purdue University Press.
- Savin-Baden, M. (2016). The impact of transdisciplinary threshold concepts on student engagement in problem-based learning: A conceptual synthesis. *Interdisciplinary Journal of Problem-Based Learning*, 10(2). <https://doi.org/10.7771/1541-5015.1588>
- Savin-Baden, M., & Major, C. H. (2004). *Foundations of problem-based learning*. Bodmin, England: MPG Book Ltd.
- Schmidt, H. G. (1983). Problem-based learning: Rationale and description. *Medical Education*, 17(1), 11–16.
- Schön, D. A. (1987). *Education: The reflective practitioner*. San Francisco, CA: Jossey Bass.
- Smith, J. A. (2004). Reflecting on the development of interpretative phenomenological analysis and its contribution

- to qualitative research in psychology. *Qualitative Research in Psychology*, 1(1), 39–54. Retrieved from <http://www.tandfonline.com/doi/abs/10.1191/1478088704qp0040a>
- Smith, J. A. (2011). Evaluating the contribution of interpretative phenomenological analysis. *Health Psychology Review*, 5(1), 9–27. <https://doi.org/10.1080/17437199.2010.510659>
- Smith, J. A. (2017). Interpretative phenomenological analysis: Getting at lived experience. *Journal of Positive Psychology*, 12(3), 303–304. <https://doi.org/10.1080/17439760.2016.1262622>
- Smith, J. A., Flowers, P., & Larkin, M. (2009). *Interpretative phenomenological analysis: Theory, method and research*. London: Sage.
- Smith, J. A., & Osborn, M. (2008). Interpretative phenomenological analysis. In J. A. Smith (Ed.), *Qualitative psychology: A practical guide to research methods* (pp. 53–80). London: Sage.
- Smith, J. A., Spiers, J., Simpson, P., & Nicholls, A. R. (2017). The psychological challenges of living with an ileostomy: An interpretative phenomenological analysis. *Health Psychology*, 36(2), 143–151. <https://doi.org/10.1037/hea0000427>
- Sockalingam, N., & Schmidt, H. G. (2011). Characteristics of problems for problem-based learning: The students' perspective. *Interdisciplinary Journal of Problem-Based Learning*, 5(1). <https://doi.org/10.7771/1541-5015.1135>
- Solomon, P., & Salfi, J. (2011). Evaluation of an interprofessional education communication skills initiative. *Education for Health: Change in Learning & Practice*, 24(2). PMID:22081661
- Strobel, J., & van Barneveld, A. (2009). When is PBL more effective? A meta-synthesis of meta-analyses comparing PBL to conventional classrooms. *Interdisciplinary Journal of Problem-Based Learning*, 3(1). <https://doi.org/10.7771/1541-5015.1046>
- Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*, 19(6), 349–357. <https://doi.org/10.1093/intqhc/mzm042>
- Tuomi, J., & Äimölä, A-M. (2014). PBL pistää enemmänkin ajattelemaan asioita kuin opettaa. Hoitotyön opiskelijoiden kokemuksia ongelmaperustaisesta oppimisesta. [PBL makes you think more than teaches. Nurse students' experiences of problem-based learning]. In J. Tuomi (Ed.), *Sitkeästi reilut 10 vuotta ongelmaperustaista oppimista hoitotyön koulutusohjelmassa [Roughly over 10 years of problem-based learning in a nursery education program]* (Tampereen ammattikorkeakoulun julkaisusarja. Sarja B. Raportteja 76) (pp. 59–79). Tampere, Finland: Tampere University Press.
- Yardley, L. (2000). Dilemmas in qualitative health research. *Psychology & Health*, 1(2), 215–228. <https://doi.org/10.1080/08870440008400302>
- Yardley, L. (2008). Demonstrating validity in qualitative psychology. In J. A. Smith (Ed.), *Qualitative psychology. A practical guide to research methods* (2nd ed., pp. 235–251). London: Sage.
- Yew, E. H. J., & Goh, K. (2016). Problem-based learning: An overview of its process and impact on learning. *Health Professions Education*, 2(2), 75–79. <https://doi.org/10.1016/j.hpe.2016.01.004>

Hilkka Korpi is a PhD student in Physiotherapy in the Faculty of Sport and Health Sciences at the University of Jyväskylä. She also works as an adult educator in Vamia in Vaasa. She is doing her doctoral thesis about physiotherapy professional studies.

Arja Piirainen has been a postdoctoral researcher and lecturer in the Faculty of Sport and Health Sciences at the University of Jyväskylä since 2007. She is the responsible researcher in andragogic learning and teaching in higher education. She conducts research to patient education in counselling and health sciences and competencies in health care.

Liisa Peltokallio is a lecturer emerita in the Faculty of Sport and Health Sciences at the University of Jyväskylä. She has been the responsible lecturer in health care teachers' education and conducted research to developing teacher education.