



From Individual to Collective Knowledge: Teachers' Knowledge Creation in a School Organization

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Tiivistelmä <p><i>Tavoitteet.</i> Suomen koulujärjestelmä on tällä hetkellä suurten muutosten kohteena. Entistä tehokkaampaa opettajien välistä tiedonmuodostusta ja –jakamista tarvitaan, jotta suomalaista koulujärjestelmää voidaan kehittää ja samalla myös parantaa oppilaiden oppimistuloksia. Aiempi kirjallisuus on yhtä mieltä siitä, että tiedon hankinta ja jakaminen toimivat innovaation ja arvonluomisen edellytyksinä organisatorisissa ja verkostollisissa yhteyksissä ja täten tieto on elintärkeää nykyajan organisaatioille. Yksilön ja yhteisön tiedonmuodostuksen välistä siirtymää ei ole juurikaan tutkittu. Tämä tutkimus tarkastelee uuden Jaetun pedagogisen johtamisen kompassimallin kehitystä toiminnanteoreettisessa interventiossa Viikin normaalikoulussa tiedonmuodostuksen näkökulmasta. Tämä pro gradu –työ tutkii, miten yksilön opetustieto muuntuu kollektiiviseksi tiedoksi ja käytännöntyötä ohjaavaksi malliksi. Lisäksi tutkimus yhdistää tiedonmuodostuskirjallisuuden ekspansiiviseen oppimiseen, mitä ei ole ennen tehty yksityiskohtaisesti.</p> <p><i>Menetelmät.</i> Tutkimuksen interventionistinen ja etnografinen metodologia pohjautuivat kulttuurihistoriallisen toiminnan teorian teoreettisiin käsitteisiin, malleihin ja metodeihin sekä kirjallisuuteen yksilön ja yhteisön tiedonmuodostuksesta. Tämän tutkimuksen data pohjautui kuuteen kokoukseen, jotka toteutettiin Viikin normaalikoulussa Muutoslaboratoriomenetelmää hyödyntäen. Tutkimuksen metodologia pohjautuu temaattiseen analyysiin sekä uuteen siirtymien analyysimenetelmään, joka on kehitetty tätä tutkimusta varten. Tiedonmuodostuksen siirtymien analyysi Muutoslaboratorioprosessissa on uusi laadullinen menetelmä, joka kehitettiin tämän tutkimuksen löytöjen pohjalta.</p> <p><i>Tulokset ja johtopäätökset.</i> Tutkimus osoittaa, että opettajien tiedonmuodostus muuntui yksilöllisestä tiedosta yhteiseen tietoon ja jaettuun opetuksen käytäntöön summittaisella aikajanalla useiden pienten ekspansiivisen oppimisen syklien ja tiedonrakentamisen sosiaalisten prosessien kautta. Työyhteisön jännitteiden vähentyminen, yhteisen ymmärryksen muodostaminen ja lisääntynyt yhteistyö mahdollistivat tiedonmuodostuksen siirtymät yksilöstä yhteisöön. Yhteisesti kehitetty jaetun pedagogisen johtamisen malli lisäsi yhteistyötä.</p>	
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Abstract <p><i>Objectives.</i> The schooling system is in great turmoil in Finland at the moment. More effective knowledge creation and sharing among teachers are needed in order to develop the Finnish schooling system and to increase the study results of the students. Previous literature agrees that sharing and acquiring knowledge function as precondition for innovation and value creation in organizational and network contexts and thus makes knowledge vital for contemporary organizations. The transition between an individual's and a collective's knowledge creation, however, has not been widely studied. This study explores the development of a new "Compass Model for Shared Pedagogical Leadership in an activity-theoretical Change Laboratory intervention in the Finnish Viikki Teacher Training School from a knowledge creation perspective. The thesis examines how the transition from individually held knowledge of teaching transform into collective knowledge and a collaborative model of practicing. Further, it combines knowledge creation literature with the theory of expansive learning, which has not yet been done in detail.</p> <p><i>Methods.</i> The interventionist and ethnographic methodology of the study draws on theoretical concepts, models, and methods from Cultural Historical Activity Theory and from the studies of individual and collective knowledge creation. The data analysed in this study consisted of six meetings carried out in the Viikki Teacher Training School by using the Change Laboratory method. The methodology of the study consists of a thematic analysis and analysis of transitions in knowledge creation during the Change Laboratory process. The analysis of transitions is a new qualitative method developed for this study based on findings in the data.</p> <p><i>Results and conclusions.</i> The study shows that the knowledge creation of the teachers transitioned on a rough timeline from individually held knowledge of teaching to collaborative practice through multiple small cycles of expansive learning and social processes of knowledge building. Decrease in organizational tensions, creation of shared understanding and increased collaboration enabled the transition of knowledge creation from individual to collective. The collectively created model for shared pedagogical leadership promoted collaboration.</p>	
Keywords Knowledge creation, expansive learning, Change Laboratory, school context, transition	
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1 Introduction

1.1 Background and Motivation

The schooling system is in turmoil at the moment. The traditional view sees the teacher as an individual thinker and actor (see Engeström 1994). However, the role of the teacher has been changing for some time now and needs to change even more in the future. There have been heated discussions about the quality and quantity of children's education in the media. As digitalization and globalization are constantly changing our society in an increasing pace, the critics have said that the schooling system can no longer keep up with these changes. The transformation from an industrial society towards an information society and even an innovation society has taken only a generation. (Hakkarainen 2005) Schools no longer provide children with the necessary tools to fully function in today's society. There have been pleas towards a completely new schooling system as the current one dates back to decades ago. Some argue that the current school philosophy dates back to the industrial revolution and has thereafter forgotten to update itself. Back then, the factories required simple people doing simple things and the school's purpose was to produce such people. (Säljö 2003; Hakkarainen 2005)

Säljö (2003) criticizes that schools have become too abstract: the recent information explosion has fuelled this development by making it much more difficult to localize and delimit the generative forms of knowledge. This, he explains is caused by history, when schools were the main source of information. However, in today's world, schools no longer have control over the information flow of society. Their focus has shifted from controlling information to helping people cope in such a world and to identify what is relevant and reliable information and knowledge. Education and educational research should thus be reorganised to ensure that students enjoy being in a position of acting as learners. "The challenge is to structure the activities in such a manner that people are willing to see learning as a worthwhile and interesting end in itself, and not as a watered down version of some 'real-world', where they would rather like to be" (Säljö 2003).

Already two decades ago, Engeström (1994) pointed out that school life is becoming increasingly complex and interconnected. In the profession of teaching, theory and practice are quite divided, and problems in teaching and the requirements of development are usually solved on the basis of experience (Kuusisaari 2013). Taking into account the recent changes and their ever increasing pace, Hakkarainen (2005) argues that an early completed general education does not suffice. One cannot rely anymore on an education and once gained professional competence for the rest of their adult lives. According to Hakkarainen (2005), “we have moved on to an environment where education and working life take turns”. All age groups include more and more transitions from one job or a workplace to another, from work to studying and back again (Suikkanen et al. 2001; in Hakkarainen 2005) “Lifelong learning is no longer a cliché, it is an essential part of the survival strategy of the working population” (Hakkarainen 2005). This requires more effective knowledge creation and sharing in schools and other educational institutions. How to ensure standardized, high-quality knowledge creation in education when the pedagogy and teaching methods are dispersed becomes a core question.

Teacher training schools and the department of teacher education have an important role in overcoming this challenge. The class teacher education in Finland is research-based and all teachers graduate with a Master’s degree. The teacher training schools in Finland work in close collaboration with universities in scientific pedagogical research, practical experimentation and development work in schools. During their studies, all student teachers participate in teaching practice at a university teacher training school. Finnish teachers are professionally very autonomous and thus are considered professionals in the field of studying learning and teaching. They also have decision-power over their work in implementing the curriculum and teaching methods. The new upcoming curriculum 2016 requires more collaboration and new methods of teaching and poses a challenge for the current work practices at Finnish schools.

This study explores the development of knowledge creation of teachers in an activity-theoretical intervention, which our research group facilitated during April-June in 2015 in the Finnish “flag ship institution of teacher education”, the Viikki Teacher Training School. Activity theory includes an interventionist methodology for the development of organizations and the methodology has various applications. Developmental work research is an activity-theoretical approach used by the researchers of the Center for Activity,

Development and Learning (CRADLE) in Finland and their partners. This application of activity theory uses a Change Laboratory (CL) method for developing organizations. Many profound research and development projects have been conducted in various kinds of other institutionalized and non-institutionalized settings, which usually include Change Laboratory interventions involving both professionals and customers (see e.g. Engeström et al. 1996; Kerosuo, Kajamaa & Engeström 2010).

1.2 Objective and Research Question

The objective of this study is to examine the transition of teachers' knowledge creation to collaborative knowledge creation as well as to explore how an individual's knowledge is transformed into a collaborative model of practice. This study focuses on researching these two forms of knowledge creation and pursues to determine where and how the transitions between them take place. The transition from individual knowledge to collective knowledge has scarcely been studied. As an important attempt to bridge this research gap, Kimmerle, Cress, and Held (2010) have created a framework that "defines knowledge building of cognitive and social systems". They discuss the co-evolution of knowledge building and base their model on Nonaka's knowledge creating theory and Luhmann's systems theory. Arvaja, Salovaara, Häkkinen and Järvelä (2007) identified concepts and methods for studying collaboration in context. Their study focused on students' collaborative knowledge creation in a computer-mediated discussion.

Although Change Laboratories have been conducted and studied largely in the past 20 years, they have not been focused specifically on knowledge creation. This study adds to the current literature by providing new insights into knowledge creation from both the individual's as well as the collective's perspectives. It also combines in a novel way the theory of expansive learning (Engeström 1987; Engeström & Sannino 2010) and the Change Laboratory method (Virkkunen & Newhamn 2013) with the notion of knowledge creation. The study will analyse the dynamics of individual and collective knowledge creation by qualitative techniques. The study uses thematic analysis and presents a newly created qualitative method, analysis of transitions to examine the transition from individually held knowledge of teaching to a collaborative model of practicing. Knowledge creation and expansive learning literature will be used as the main theoretical framework.

The study will widen our understanding of the theoretical relationship between knowledge creation and expansive learning. It will provide valuable insights on how knowledge is created as well as how to individual knowledge transforms to a collaborative model of practice.

The research question of the study is:

How does the transition from individually held knowledge of teaching transform into collective knowledge and a collaborative model of practicing?

The research site, the Viikki Teacher Training School and the conducted Change Laboratory intervention called PedaLabra are presented next. Thereafter, an overview of the previous literature on individual and collective approaches to knowledge creation is illustrated, as well as activity theory and expansive learning as a theoretical framework. Further, the collected data, methods of data collection and analysis are presented. The findings of the data analysis are reported in the fifth and sixth chapters. Finally, discussion and conclusions are drawn.

2 Viikki Teacher Training School as a Research Site

This chapter introduces the research site at the Viikki Teacher Training School. It also discusses the school's historical and current challenges as well as the proceeding of the conducted Change Laboratory intervention process. However, the intervention method itself is discussed in more detail in Chapter 4.1.

2.1 Historical and Current Challenges at the Research Site

The Viikki Teacher Training School, located in the city of Helsinki, is amongst the oldest schools in Finland, dating back to 1869. The school has three main objectives: research, experiment and development. It serves as a school for local children but also as a teacher training facility and research site for the University of Helsinki, Department of Teacher Education. "Training Schools also have the task of developing good-quality teaching and curriculum planning, in addition to providing innovative training periods for university students and securing their commitment to the use of modern information technology" (Viikki Teacher Training School n.d.). The Viikki Teacher Training School includes an elementary, secondary and upper secondary school, having all together almost 1000 students. There are about 100 university students, 200 university trainees and 30 other staff working at the school. (Viikki Teacher Training School n.d.) The conducted intervention takes place in the elementary school.

During its long history, the Viikki Teacher Training School has seen many changes. One of the biggest changes was the relocation of the school premises from Haaga to Viikki in the early 2000s. The pace and amount of work have increased, whereas the resources have decreased. It has also been noted that it is no longer easy to pursue intact pedagogy in the classrooms, as there are an increasing number of people teaching them. The teachers' workload is quite tremendous and there has also been discussion about their wellbeing and coping with the increased workload. Haste has been increasing throughout the years and as the teachers have multiple work tasks to take care of simultaneously, the organisation of work seems to be of utmost importance. The teacher education has undergone multiple changes during the past two decades, which has resulted in changes in the teacher trainings and trainees. These challenges are discussed in more detail in Chapters 5.1 and 5.3.

A new curriculum is coming in 2016 and it requires new methods of collaboration from the teachers. This is a challenge, as there is a strong sense of individual pedagogy among the teachers at the Viikki school. They do not really know what is happening in the other classrooms nor do they necessarily want to know about it. They use a wide array of teaching methods and some have decided to abandon text books altogether in some subjects. A clear, common pedagogical goal is missing. However, the official school brochure states: “As active members of the university, we promote research, experimentation, in-service training and academic teamwork”, which seems contradictory to the current situation (Viikki Teacher Training School n.d.). It seems as though work in the individual classrooms is not an issue, but rather everything outside of them. It has also been noted that there is a contradiction between administration and pedagogical leadership that has caused difficulties for the teachers. The school is led from an administrative point of view rather than from a pedagogical focus.

2.2 The PedaLaboratory process in the Teacher Training School

In Finland, teachers have a lot of freedom in planning their teaching methods and curriculum. This is also the case in this school. The conducted interviews reveal, that traditionally, however, the teachers have worked very individually in the Viikki Teacher Training School. Further, there is an increasing need for collaboration among teachers and for the development of common goals in the work community because of the expanded needs of the students. For this reason our research group contacted the principal of the Viikki school and suggested a Change Laboratory process to include the principal and representatives of the school staff. Our research group decided to name the intervention process a “PedaLaboratory” project, which can be seen as an application of Change Laboratory to the study and support of development of expanded pedagogical solutions in educational contexts.

The initial aim of our research group conducting the Pedalaboratory project was to enhance child-centred pedagogy in the school. In other words, to provide the staff with new tools to increasingly involve the students into the planning of the daily teaching and teaching practices. As the intervention process evolved, its focus shifted towards the collective creation of a new model for organising work, conducting distributed pedagogical

leadership and managing the organisation as a whole. In the beginning of the intervention, individual ways of knowledge creation dominated the discussions. Towards the end of the project, however, the transition from individually held knowledge to collaborative knowledge creation was clearly visible. In this study, this transition is understood as a complex, collective process of expansive learning.

During the intervention sessions, the teachers analysed their work and created an innovative new model for organising their work and management from individually driven solutions towards collaboration. The novel “Compass Model for Shared Pedagogical Leadership” model consists of teams, which are formed on the basis of teaching functions and children’s ages along with a management team. The implementation, cultivation and sustaining of the model are currently in progress. To support this, two follow-up intervention sessions, interviews and teacher meetings will be carried out during the fall 2015 and spring 2016. The two Pedalaboratory follow-up sessions will be especially important for the sustaining of the “Compass Model for Shared Pedagogical Leadership” model. However, the analysis of the long-term consequences of the implementation of the model is beyond the scope of this study. Next, I will move to presenting a literature review on previous studies dealing with knowledge creation from individual and collective perspectives.

3 Knowledge Creation

In today's society, knowledge plays a significant role in organisations (e.g. Argote & Ingram 2000; Chou & Tsai 2004; Hakkarainen 2005; Damşa 2014). From early on, it has been noted that "knowledge is an important, if not the most important, resource in post-industrial organizations" (Bell 1976; in Schultze & Stabell 2004). Knowledge needs to be managed, which "typically implies generating, organizing, storing, transferring and using knowledge" (Schultze & Stabell 2004). This chapter discusses knowledge creation from the individual's and collective's perspectives. Finally, it discusses the relationship between knowledge creation and learning.

3.1 Individual Knowledge Creation

Multiple definitions on the notion of knowledge exist in previous literature, but "a complete and agreed-upon definition of knowledge remains elusive" (Schultze & Stabell 2004). Gourlay (2006) adds that knowledge "is notoriously difficult to define "satisfactorily". One definition of it is "justified true belief" that increases an organization's capacity for effective action (Nonaka & Takeuchi 1995). According to Nonaka, Toyama and Konno (2000), "information becomes knowledge when it is interpreted by individuals and given a context and anchored in the beliefs and commitments of individuals". Thus, knowledge is relational. It can also be said that "knowledge is often in the eye of the beholder, and one gives meaning to a concept through the way one uses it" (Popadiuk and Choo 2006).

Gourlay (2006) notes that it is widely accepted that there are roughly two distinct kinds of knowledge, knowledge-how and knowledge-that. The former covers "knowledge that is situated or context dependent in so far as it does not appear meaningful to consider it as 'knowledge' apart from someone who knows and the situation in which they act" and the latter covers "knowledge in symbolic forms existing independently of individual knowers; it could be labelled 'decontextualized knowledge' and is all explicit in form" (Gourlay 2006). However, Gourlay (2006) also claims that "knowledge-how is not simply another name for tacit knowledge since it also covers in particular that explicit knowledge where context is critical to give it meaning, and where there is contextual variability in meanings

attributed to the ‘same’ explicit knowledge”. Nonaka and Takeuchi (1995) agree and note that the division between the two is not absolute. Gourlay (2006) builds his opinions on Dewey and Schutz and proposes that corresponding to these two ‘apparent’ forms of knowledge are two modes of behaviour. In this sense, knowledge can only be managed by managing behaviour (Schultze & Stabell 2004; Gourlay 2006).

Knowledge management literature uses mainly the labels explicit and tacit, respectively, but other disciplines use different names (Gourlay 2006). The labels explicit and tacit will be used in this paper. Tacit knowledge is often held as personal and thus implicitly private. Explicit knowledge on the other hand, is “simply that of our everyday language; our readily articulable commonsense beliefs that are at hand in any situation” (Gourlay 2006). Ritala and others (2015) further elaborate that explicit knowledge can often be formally protected by e.g. patents, whereas tacit knowledge is impossible or difficult to represent and bound to its possessors. Thus, it is best utilised in environments where personal experience is needed and encouraged (Ritala et al. 2015). However, “not all tacit knowledge assures a firm sustainable competitive advantage; only tacit knowledge that is also rare, valuable and with few strategically equivalent substitutes does” (Barney 1991; in Schultze & Stabell 2004).

One of the most influential theories of (organisational) knowledge creation is the SECI model created by Nonaka and Takeuchi in 1995 (Gourlay 2006; Popadiuk & Choo 2006). While the model has received praise and little systematic criticism, it is not flawless (e.g. Engeström 2001; Paavola, Lipponen, & Hakkarainen 2004; Paavola & Hakkarainen 2005; Gourlay 2006). According to Nonaka and Takeuchi (1995), an organization creates new knowledge through the intersection and interaction between its tacit and explicit knowledge. This conversion is a social process between individuals and is thus not limited to a single person. Implicitly, knowledge creation is also knowledge accumulation (Nonaka & Takeuchi 1995; Gourlay 2006). In this model, the conversion takes place in four modes:

- (1) Socialization,
- (2) Externalization,
- (3) Combination, and
- (4) Internalization.

The model is known by an acronym of these modes, SECI. The modes are depicted in Figure 1. The SECI process has later been enhanced to involve individual, group and organisation perspectives. The *i* depicts the individual, *g* the group and *o* the organisation in Figure 1.

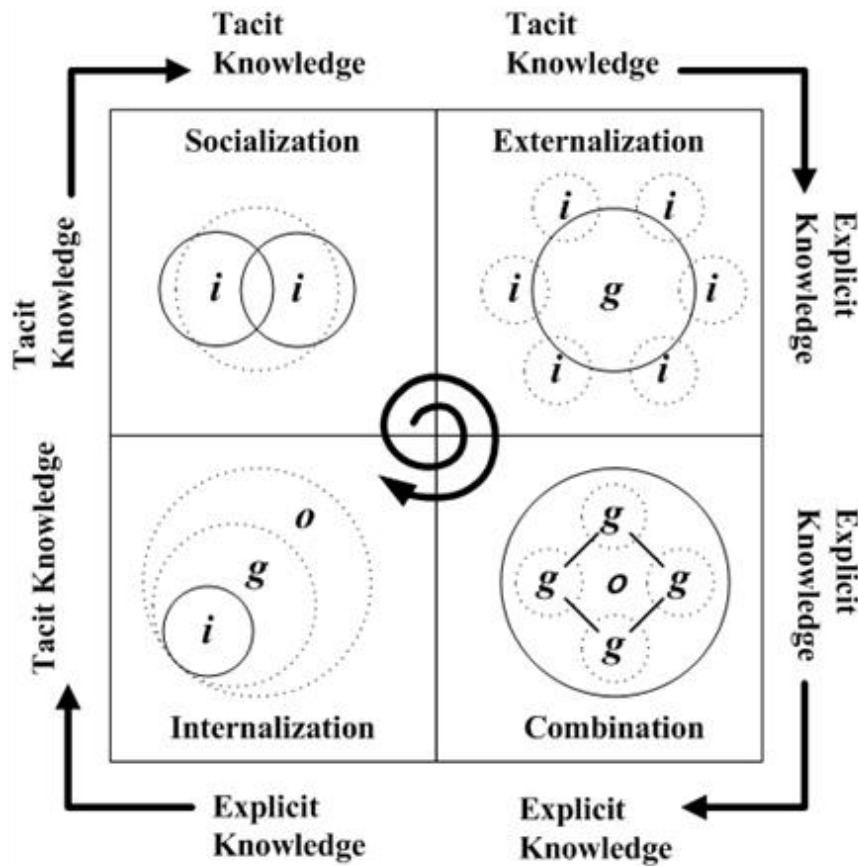


Figure 1 The enhanced SECI model (Nonaka & Konno 1998)

The SECI model contains two dimensions that describe knowledge creation processes: epistemological and ontological. The former depicts the characteristics of knowledge; the division between tacit and explicit knowledge and that the key to knowledge creation lies in the mobilization and conversion of tacit knowledge. The latter dimension consists of levels of knowledge creating entities or mechanisms that may initiate the SECI processes. The interaction and cooperation between the epistemological and ontological dimensions are important for effective knowledge creation. (Nonaka & Takeuchi 1995; Chou & Tsai 2004).

Nonaka and Takeuchi (1995) present that an organization creates new knowledge through the intersection and interaction between its tacit and explicit knowledge. Further, this conversion is a social process between individuals and is thus not limited to a single person. To them, knowledge creation is implicitly also knowledge accumulation. (Nonaka & Takeuchi 1995; Gourlay 2006). The SECI model defines knowledge creation through four dimensions: firstly through the types of knowledge (tacit & explicit) and secondly through knowledge creation processes (epistemological and ontological) (Nonaka & Takeuchi 1995; Chou & Tsai 2004).

However, Gourlay (2006) largely criticises Nonaka and Takeuchi's view of creating knowledge through interactions of explicit and tacit knowledge. According to him, knowledge is created through human activities or practices in general, and through 'a specific sub-set of practising'. An enabling context (be that either physical, virtual, mental or a combination thereof) is vital for effective knowledge creation. Further, knowledge is based on human action and is therefore dynamic and relational. It depends on the situation and the people involved more so than on an absolute truth or artifacts. (Popadiuk and Choo 2006)

This is similar to the line of thought of Schultze and Stabell (2004), who ask 'when is knowledge' and 'what is knowledge'. They explain that "the question 'when is knowledge' may seem odd and grammatically incorrect, but its value lies in denying the phenomenon of study – in this case knowledge – an objective, frozen-in-time status by opening the inquiry to the emergent nature of the phenomenon in situated practice". In addition, Wenger (1998) states that knowledge creation and learning take place in communities of practice (Robinson, Anning, & Frost 2010). This happens through "complementary processes of participation (the daily, situated interactions and shared experiences of members of the community working towards common goals) and reification (the explication of versions of knowledge into representations such as documentation or artefacts)" (Robinson et al. 2010).

"Knowledge creation is not primarily a matter of creative individuals, but instead requires fundamental reorganization of the practices of a whole community" (Paavola et al. 2004). Hakkarainen (2005) agrees and notes that creativity is not a mysterious quality of a person, but rather requires persistent work towards creating and developing a common objective.

Thus, it is a process supported by practical work and involves different individual and collective reflective processes. Yeh and others (2012) describe that “a consensus exists that among these influential factors, personal characteristics have the most direct and strongest effects on an individual’s creative performance, and such characteristics can be divided into three categories: knowledge, disposition, and abilities”. Swirski and others (2008) add that “knowledge creation involves the analysis, application, and expansion of knowledge; it encourages individual learning and confidence, lifelong learning, and learning within communities” (Yeh et al. 2012). Kimmerle, Cress, & Held (2010) note that “knowledge building aims at producing new knowledge and includes innovation and a permanent advancement of ideas”.

One of the most important factors that motivate individuals to create new knowledge is autonomy (Nonaka & Takeuchi 1995). Further, Chou and Tsai (2004) found in their study that organisational mechanisms have the most significant effect on knowledge creation. Other important parts are cognition of knowledge and user involvement, in respective order of importance. Cognition of knowledge can be defined as the willingness to search and notice new information. (King & Ko 2001) According to King and Ko (2001), individuals must be willing to devote their time and energy to identify useful information and then share their knowledge as well as adopt new knowledge. Chou and Tsai (2004) add that individuals who “know how to approach unfamiliar or new problems effectively usually achieve knowledge creation more easily”.

Individuals have an important role in the processes of knowledge creation, and they can be supported and challenged to higher achievements in knowledge creation by a community (Hakkarainen 2005). Wenger (1998) takes a collective view and argues that knowledge creation and learning occur in communities of practice through complementary processes of participation and reification (Robinson et al. 2010). Today’s working life requires increased collaboration and working in multi-disciplinary teams. This calls for collaborative knowledge creation, knowledge sharing and new forms of collective learning. In this paper, collective and collaborative knowledge will be used as synonyms to highlight the participatory and collaborative nature of knowledge and its creation in collectives.

3.2 Collective Knowledge Creation

Previous literature agrees that sharing and acquiring knowledge function as precondition for innovation and value creation in organizational and network contexts (Ritala et al. 2015) and thus makes knowledge vital for contemporary organisations. Schultze and Stabell (2004) add that “knowledge is viewed as an asset and the role of knowledge is to progress individuals, organizations and society to the ideal state of enlightenment (or competitive advantage)”. This view agrees with the traditional economical point of view that sees knowledge as an asset, an item of value for trading and monopoly (Yang & Wu 2008). Schultze and Stabell (2004) add, “knowledge is viewed as an asset, i.e., an object that can be owned, bought and sold to maintain or increase the firm’s competitive advantage”. Furthermore, the application, sharing and creation of knowledge have been suggested as the requirements for creativity (Gurteen 1998; in Yeh et al. 2012). This chapter discusses knowledge creation as a collaborative process.

Knowledge building is a synonym for knowledge creation. Raike, Sunikka, and Saarinen (2013) define knowledge building as “the production and continuous improvement of ideas of value to a community, through means that increase the likelihood that what the community accomplishes will be greater than the sum of individual contributions and part of broader cultural efforts”. They base their view on Popper (1972) and claim that a distinctive feature of knowledge building is that “knowledge can be seen as *knowledge artefacts* “existing out there,” which have a certain value or function”. Collaborative knowledge building activities can support the complex process of developing from a novice to an expert. It has also been noted that the process of knowledge building is essentially the same through people’s lives from early childhood to the ‘most advanced levels of theorizing, invention, and design and across the spectrum of knowledge-creating organizations’. Further, “learning at the collective level is the outcome of the interplay between the individual and collective forms of knowledge as they interact through the social processes of collaborative activities” (Raike et al. 2013).

People use existing ideas and align them with others’ to create new meaning and understanding (Ludvigsen 2010; in Damşa 2014). Knowledge is then taken into use and materialized into knowledge objects through interaction between participants and resources

(Paavola & Hakkarainen 2005). Hence, knowledge is jointly constructed and materialised into shared knowledge, it emerges as “an interactional accomplishment based on a combination of the individual contributions, collective processing and actions, and mediational resources involved” (Damşa 2014). Kimmerle and colleagues (2010) agree, but also remark that individual learning and collective knowledge creation will always depend on each other and thus learning and knowledge creation should always be considered “continuous exchange processes”. The following sections discuss knowledge creation in relation to learning and finally present an activity theoretical framework that combines individual and collective knowledge creation.

3.3 Knowledge Creation as Learning

The knowledge creation metaphor was created by Paavola, Hakkarainen and colleagues in 2004 based on observations of innovative work communities (Paavola et al. 2004; Hakkarainen et al. 2004; Paavola & Hakkarainen 2005). In these communities, the creation of innovations is the companies’ main business objective and they have been organized in a manner that maximizes the creation of new. This organization enables the participants to learn and increase their knowledge through communication and networks. Rather than having information and knowledge pouring down from experts to beginners, these communities seem to be working for symmetrical knowledge advancement (Scardamalia 2002 in Hakkarainen 2005; Paavola et al. 2004).

Learning should thus not be viewed as merely participation or acquisition but as a creation process of something new. Knowledge creation can take place in all aspects of the working organization functioning in dynamical environments (Hakkarainen 2005). Knowledge creation can be described as a dialogical process, as it involves working towards the creation and development of a common objective (Paavola & Hakkarainen 2005; Hakkarainen et al. 2004; Hakkarainen 2005). In a similar vein, Damşa (2014) notes that “productive interaction refers to knowledge co-construction within the context of a knowledge domain, entailing both (joint) actions directed toward shared goals, increased shared understanding of concepts, but also actions that contribute de facto to the construction and progress of the (shared) knowledge objects”. Thus, productive

interactions go beyond the level of shared accomplishment at a dialogical level (Damşa, 2014).

According to the knowledge creation perspective, learning takes place through sustained collaborative activities aiming to create new knowledge through work on shared objects (Paavola & Hakkarainen 2005; Damşa et al. 2010). According to Hakkarainen (2005), the knowledge creation metaphor is used as it emphasizes the idea that learning at its best is not merely obtaining information from books or growing into a culture, but rather a process that creates new information, innovations and social practices. Further, learning can be seen as a social process incorporating multiple distinguishable phases that constitute a cycle of personal and social knowledge building (Stahl 2000). These cycles are depicted in Figure 2.

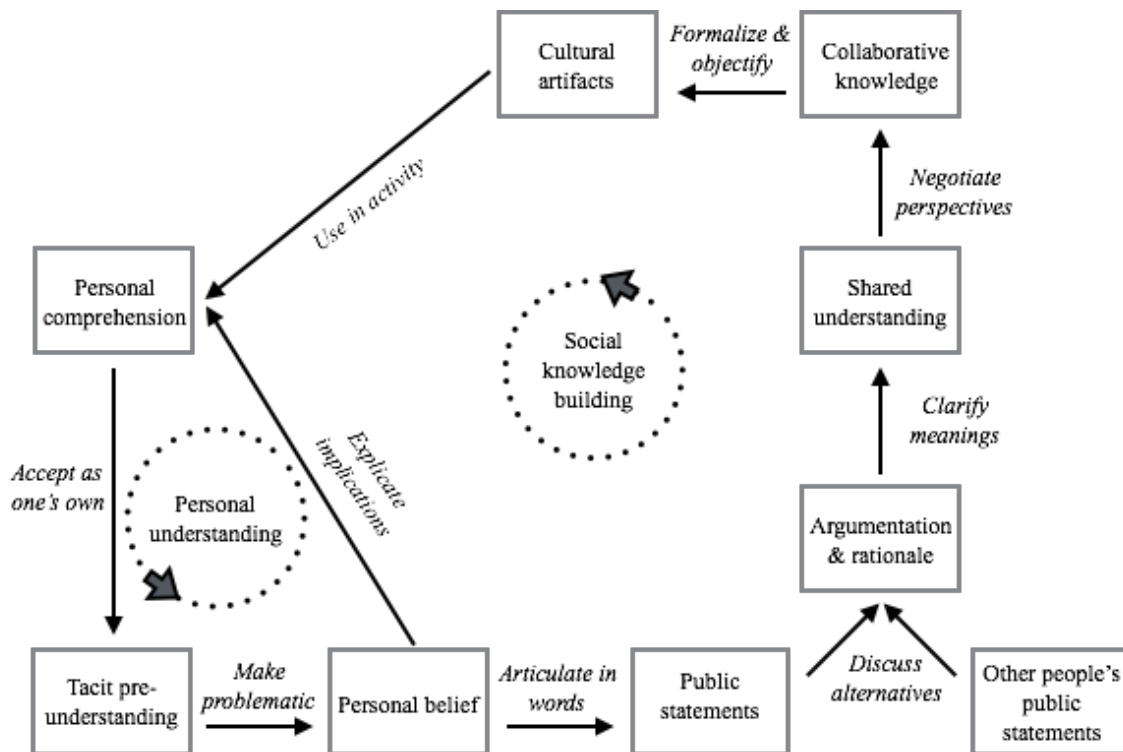


Figure 2 A diagram of knowledge-building and learning processes (Stahl 2000)

According to Stahl (2000), the interpretation of this diagram (in Figure 2) should start from the lower left corner, which presents the cycle of personal understanding. The remainder of the diagram depicts how personal beliefs that we gradually become aware of in our activities can be articulated in language and in so doing, enter the social process through interaction with other people and their shared culture. The culture, in its turn, enters the personal understanding, shaping it through thinking, motivational concerns and diverse

influences. However, Stahl (2000) notes that personal cognition and social activity are ‘mutually constituting subjects’: they go hand in hand and can only be artificially separated in a model for analysis purposes. Neither of them can exist without the other.

Barron (2000) takes a critical stance and argues that “collaborative learning has often been explained as a mere collection of individual actions” (Damşa et al. 2010). However, merely bringing people together in groups and giving them tasks or combining a group’s knowledge is not enough. These are both important preconditions according to prior research, but by themselves do not suffice for productive collaboration. Prior research indicates that the production of new knowledge and advancement of individual knowledge requires more than individual performance of collaborative tasks. (Damşa et al. 2010) Thus, it seems to hold that a group is always more than its members.

Wenger (1998) argues that “knowledge creation and learning take place in communities of practice through complementary processes of participation (the daily, situated interactions and shared experiences of members of the community working towards common goals) and reification (the explication of versions of knowledge into representations such as documentation or artefacts)” (sited in Robinson et al. 2010). Development of collaboration and sharing knowledge can prove to be difficult or even cause anxiety and conflict for professionals, especially so if their specialist expertise is questioned (Robinson et al. 2010). The just presented approaches to collective knowledge creation and learning, however, do not often focus on historically accumulated tensions and contradictions which are here viewed as important drivers for learning and change and are in the core focus of activity theory, applied in this study.

3.4 Expansive Learning and Collective Knowledge Creation

Learning theorists Yrjö Engeström and colleagues (2002) note “among researchers and educational administrators there is widespread agreement about the need to move from transmission and acquisition of fixed knowledge to the construction of knowledge understood as a productive and collaborative process”. However, there is still much work to be done, as students are wrongly conceptualized within the key texts of this ‘historical shift in educational discourse’ (Engeström et al. 2002).

Taking an activity-theoretical stance to knowledge creation and learning, Engeström (2001) has critically challenged individually focused approaches by stating that traditionally, learning theories have concentrated on processes where a subject (individual or organisation) acquires some knowledge or skills so that it creates a corresponding and long lasting change in their behaviour. Further, in these theories, it is a presumption that this knowledge or skills are themselves stable and somewhat well defined. “There is also a ‘teacher’ who knows what is to be learnt”. (Engeström 2001) However, as Engeström (2001) notes, “the problem is that much of the most intriguing kinds of learning in work organizations violates this presupposition”. In activity theory, learning and knowledge creation are perceived as connected and are about generalization, i.e. recognizing essential differences and variation (Virkkunen & Newnham 2013). Virkkunen (2006) explains that learning activity, like any other activity, emerges from individual coordinated actions building on the results of previous actions.

Activity-theorist Tuomi-Gröhn (2003, 205) has claimed that in the working life of teachers, it is often a problem that theoretical knowledge remains detached from everyday practice, and the challenges in work settings are solved without drawing on already existing theoretical tools, which could be potentially useful. The basic metaphor for learning is participation, not knowledge transfer. “In a community of practice, learning takes place without much teaching, as an incidental by-product of productive activity and often with tremendous efficiency, due to the strong motivational basis (it is for real, not just for school) and the richly supportive environment (everybody in a community of practice functions as a teacher)” (Tuomi-Gröhn & Engeström 2003).

According to Hargreaves (1999, 126), “professional knowledge creation [be] not seen as a random, undirected activity of the minority of the individual teachers with a creative talent, but as a whole-school process that has to be managed – with the allocation of material and temporal resources, coordination of people and activities, regular monitoring and support” as well as “provision of regular opportunities for reflection, dialogue, enquiry and networking in relation to professional knowledge and practice” (Hargreaves 1999, sited in Engeström, Engeström, & Suntio 2002). Engeström’s theory of expansive learning puts the primacy on communities as learners, on transformation and creation of culture, on horizontal movement and hybridization, and on the formation of theoretical concepts

(Engeström 1987; Engeström & Sannino 2010). Virkkunen and others (2001) add that the emphasis is on the learning and development of work practices, where the employees themselves solve the issues of current activities through interpreting the meaning of work, object and result in a new manner, in broader contexts. The understanding of this broader context is not just an intellectual matter however. It requires the development of new tools, solutions for dividing work and development of rules, thus the qualitative development of activity. (Virkkunen et al. 2001)

Expansive learning depicts the logic of moving from the abstract to the concrete through specific epistemic or learning actions (Engeström 1987; Engeström & Sannino 2010). According to Engeström and Sannino (2010), “the process of expansive learning should be understood as construction and resolution of successively evolving contradictions”. The cycle of expansive learning, including seven intertwined learning actions, is presented in Figure 3. The thicker arrows in Figure 3 present expanded scope and participation in learning actions. However, it is also noted that the cycle is not ‘a universal formula of phases or stages’ and that the process of expansive learning probably never follows cleanly the ideal-typical model. (Engeström 1987, 2001; Engeström & Sannino 2010)

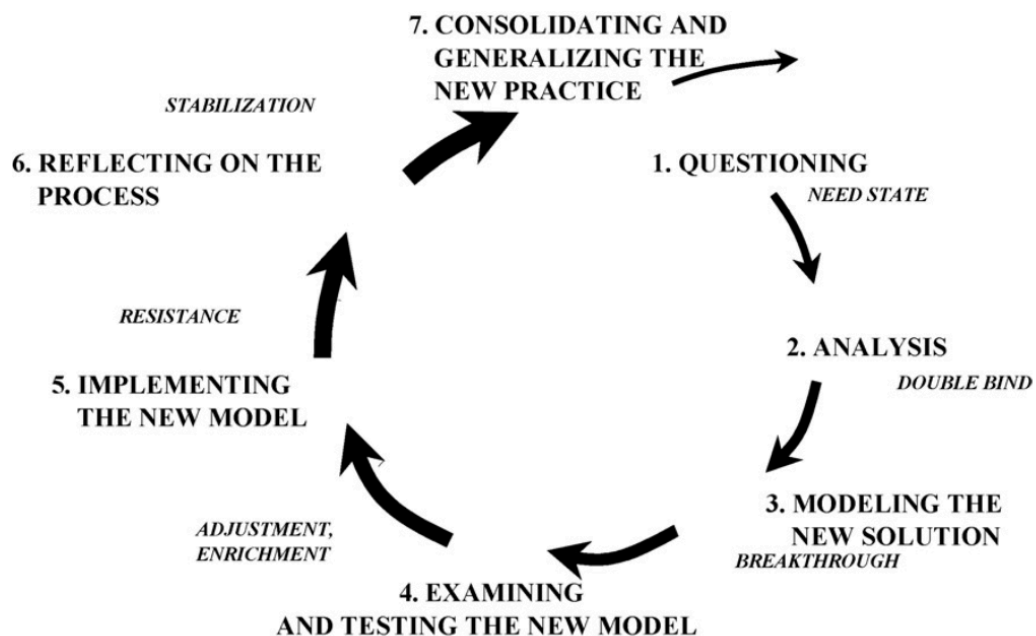


Figure 3 Sequence of learning actions in an expansive learning cycle (Engeström 1987, 322; also Engeström 1999b, 384; Engeström & Sannino 2010, 8)

The first action of the cycle of expansive learning (see Figure 3) consists of questioning, criticizing or rejecting some part of the accepted practice and existing wisdom. The second action consists of analysing the situation and can involve mental, discursive or practical transformation of the situation in search of causes or explanatory mechanisms. Historical-genetic and actual-empirical analyses are part of this action. The third action consists of modelling an explicit, simplified new model of an idea to solve a problematic situation. The fourth action consists of running, operating and experimenting the model to achieve an understanding of its potentials and limitations. The fifth action involves practical applications, enrichments and conceptual extensions. The final two actions focus on reflecting on and evaluating the process as well as merging the results into a new stable form of practice. (Engeström 1987, 1999a; Engeström & Sannino 2010)

In activity theoretical terms, collective knowledge creation can be understood as leading to expansive learning, which is learning something that is not yet there. This requires constructing a common grammar, a new object and concept for collective activity and later implementing this concept into practice (Engeström & Sannino 2010; Engeström et al. 2015). This transition is being reflected in the knowledge creation metaphor by Paavola and others (2004) and by Fenwick (2006), “who suggests participation, expansion, and translation as relevant alternative and complementary metaphors for theorizing work-based learning” (Engeström & Sannino 2010). Nevertheless, the qualitative development of activities may not always be expansive or in may only contain small, “micro-cycles” of expansive learning (Engeström, 1999a). Changes can also mean degradation or disruption of formed procedures (Virkkunen et al. 2001; Engeström, Kerosuo & Rantavuori 2014).

Thus, in its essence, learning can be perceived as transition. Expansive learning is expressed primarily as changes in the object of a collective activity. It is a “multivoiced process of debate, negotiation and orchestration” as well as “a process of material transformation of vital relations” (Engeström & Sannino 2010). The motives and motivation are in the object to be transformed and expanded. When successful, these changes can lead eventually to a qualitative transformation of all components of an activity system (Engeström & Sannino 2010). Transitions in learning and knowledge creation are in the core of the analysis conducted in this study and are to be presented in the following chapters.

4 Data & Methods

The interventionist and ethnographic methodology of the study draws on theoretical concepts, models, and methods from cultural historical activity theory (Engeström 1987, 2000; Virkkunen 2006; Sannino 2008) and from the study of individual and collective knowledge creation literature (Nonaka & Takeuchi 1995; Stahl 2000; Paavola et al. 2004). The data analysed in this study consists of six Pedalaboratory sessions carried out in the Viikki Teacher Training School. History interviews and teacher meetings will be utilised as additional data supporting the interpretations. The Change Laboratory is an activity-theoretical method that enables working with organizational problems, such as double binds and contradictions in a constructive way to learn and develop collective activity (Virkkunen 2006). The next chapter discusses the data and methods of the study.

4.1 The Change Laboratory as an Intervention Method

The Change Laboratory (CL) is a research-assisted intervention method for fostering and guiding practitioners' learning activity, and for creating new activity models and tools for the organization with the help of an interventionist who is external to the studied organization. Generating expansive learning cycles (Figure 3) and learning actions are the aim of the Change Laboratory interventions (e.g. Virkkunen et al. 2001; Engeström et al. 2002; Sannino 2008; Kerosuo et. al. 2010; Virkkunen & Newnham 2013).

The goal of a Change Laboratory is to help organizational actors understand the systemic nature of the activities at their working community, how everyday challenges are related to the established structures as well as helping them to find solutions to develop practices. Organizations can develop both through changes in procedures and culture as well as by constant development with the help of Change Laboratories. (Virkkunen et al. 2001) The changes are most often achieved through means of talk (Haapasaari, Engeström & Kerosuo 2014) and experimentation of the new models and ways of working in practice (Engeström, Kerosuo & Kajamaa 2007; Engeström, Kajamaa, Laurila & Kerosuo 2010). The method is specifically designed to prompt and support expansive organizational learning and development of shared transformative agency, i.e. breaking away from given frames of action and taking actions to transform them collaboratively. However, the

transition from a community of independently acting individuals into a collective subject of transformation effort is a long and arduous road. (Virkkunen 2006; Kerosuo 2011)

A unique feature of this intervention approach is, in comparison to that of others, the extensive use of “mirror material”, in other words ethnographic data collected by the external interventionist-researchers (facilitators of the CL) from the daily activities of the CL participants. The CL researchers are trained to apply models to depict essential relations and also testing out new solutions in practice, which then forms the “mirror material”. (Virkkunen et al. 2001) The researcher-interventionist helps the practitioners to develop a motive for learning actions by turning the focus of attention to the object and outcome of the joint activity by presenting mirror material that makes the object and current problems in mastering it visible and gives the object a voice (Virkkunen 2006). Studies have shown that the organic connection between talk and the developmental actions that follow are an important feature of these interventions (Virkkunen et al. 2001; Kerosuo 2011). “Discursive agency fulfils its agentive nature by progressively transcending the situated confines of discourse and taking the form of concrete developmental actions” (Sannino 2008). Figure 4 presents a typical CL setting, where the flipcharts and the mirror material have an important role.

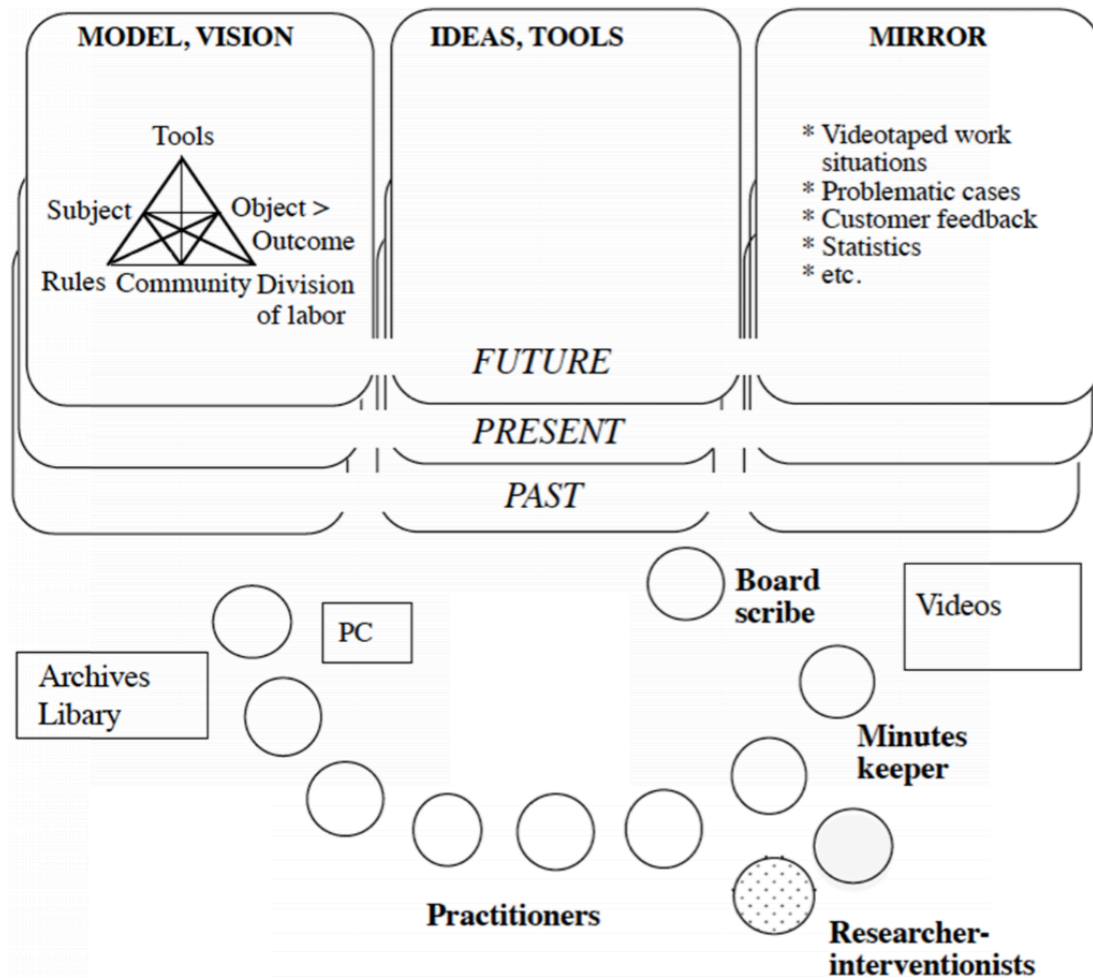


Figure 4 A prototypic layout and instruments of the Change Laboratory setting (e.g. Virkkunen et al. 2001; Virkkunen & Newnham 2013, 16)

Change Laboratories have been studied in different settings in Finland and other countries during the method's 20 years of existence. They have been conducted in various fields, such as education, health care, social welfare, media, industry, retail trade, banking and insurance (Virkkunen & Newnham 2013). Several Change Laboratories have been conducted in school contexts (e.g. Sannino 2008; Engeström et al. 2002; Engeström 2009; Virkkunen & Tenhunen 2010). However, these studies have not focused on the knowledge created in the sessions or the transition between individual and collective knowledge.

Change Laboratories can at their best function as a tool for long-term collaboration between researchers and work organisations. The purpose of the CL is to develop not only the process of work (how the work is done) but also its object and overall concept (what is done and why). (Virkkunen & Newnham 2013, 11) Haapasaari and colleagues (2014) add

that because the interventions are often conducted in the workplace during work hours and as part of the participants' work tasks, their ideas and conclusions often carry practical weight. The first step in a CL intervention is to “transform the intellectually understood motivation for developing the activity system into an effective motive, interest and involvement in the learning activity” (Virkkunen 2006). Thus, the practitioners must find the analysis and development of the activity system a personally meaningful object and an effective motive (Virkkunen 2006).

This study focuses on the collective knowledge creation process leading to a newly created “Compass Model for Shared Pedagogical Leadership” model (later on referred to as the Compass Model) created in the CL carried out in the Viikki Teacher Training School. Next, the proceedings of the data collection and data analysis are illustrated.

4.2 Data and the Proceedings of the Data Collection

The data used in this study is collected in the PedaLaboratory research project, based on the Change Laboratory method, carried out by our research team at the Viikki Teacher Training School in Helsinki, Finland. The members of the research group are Professor Lasse Lipponen (Department of Teacher Education), Docent Anu Kajamaa (CRADLE), PhD Candidates Jaakko Hilppö and Antti Rajala, thesis worker Petra Nurminen and myself. The principal of the school gave the researchers the permission to conduct research at the school and for using the name of the school in their publications such as this thesis. Participants of the study were asked permissions for videotaping and their anonymity is guaranteed. The PedaLaboratory included six research assisted intervention sessions, which form the primary data of this study.

In February and March 2015, an ethnographic field study was conducted prior to the intervention to develop an understanding of the school context and also to function as mirror material for the forthcoming PedaLaboratory sessions. The researchers organized an introductory session for the entire staff of the school in March 2015 for recruitment of participants to the PedaLaboratory sessions. A series of what we call “history interviews” was then carried out as they provide detailed information about relevant changes in the history of the school. Six two hour long CL sessions were carried out between April and

June 2015. The duration of the PedaLaboratory sessions was approximately 100 minutes each. The number of participants in each session varied between 5 and 10 people per session. Participation to the sessions was voluntary. The sessions were held usually on a weekly basis in the same meeting room at the school.

A Change Laboratory follow-up session, carried out by our research team and several teacher meetings were held during the fall 2015 and spring 2016. The additional meetings among the teachers and the principals were self-documented and videotaped by the teachers. A professional transcriber also transcribed these meetings. These sessions provide additional data, which is not analysed systematically but supports the interpretations in this study. Table 1 presents a summary of the conducted CL sessions and the additional data.

Type of Data	Length (min)	Participants	Topic of the session	Stimulus used by the team of researchers
Ethnographic Study February – March 2015		5 researchers	- Understanding the daily activities of the school	- Observations, recordings and interviews
Introductory Session March 11, 2015	20	21 teachers 1 principal	- Purpose of intervention, invitation to participate - CL method	- Powerpoint slides on expansive learning cycle and CL process
History interviews March - April 2015	209	5 teachers 1 historian	- Historical development of the school	- Analysis of the school's history
Session 1 April 1, 2015	101	8 teachers	- Introduction to the CL method & theory of expansive learning - Analysis of current challenges	- Video clip from introductory session (not shown) - CL process presented - Practical examples
Session 2 April 8, 2015	103	8 teachers 1 principal	- Introduction to the CL method & theory of expansive learning (continued) - Pedagogical leadership - Community & lack of commitment - Historical roots of working culture	- Powerpoint slides of CL method and expansive learning cycle - Powerpoint summary of previous session's discussions on current challenges - Video clip on main issues & challenges from previous session

Session 3 April 20, 2015	103	7 teachers 1 principal	<ul style="list-style-type: none"> - Researchers' historical hypothesis of the working group - Current issues (continued) - Curricula, competition, need for shared vision, structures and teams - Dedicating a weekly time slot for pedagogical issues 	<ul style="list-style-type: none"> - Powerpoint slides on expansive learning cycle - Slides on coordination and communication hypothesis - Video clip from previous session on small daily innovations - Why does the Teacher Training School exist (provocative question)
Session 4 April 29, 2015	105	7 teachers 1 teacher trainee	<ul style="list-style-type: none"> - Historical development of the school - Teams & distributed leadership, teacher meetings as a tool for teachers 	<ul style="list-style-type: none"> - History sheet constructed based on interviews & documents - Video clip from previous session on the preliminary idea of teams
Session 5 May 6, 2015	104	8 teachers 1 teacher trainee 1 principal	<ul style="list-style-type: none"> - Continued discussion of teams & their structure - Common script & clear division of labour needed 	<ul style="list-style-type: none"> - Video clip from previous session depicting the idea of class-based teams and teacher meeting as a board of directors
Session 6 May 15, 2015	101	5 teachers	<ul style="list-style-type: none"> - Modelling the new team structure into the Compass model of Shared Pedagogical Leadership in three exploratory rounds 	<ul style="list-style-type: none"> - Powerpoint summary of main aspects of the new model - Instructions for drawing model - Powerpoint slides on collaboration, coordination and reflexive communication
Presentation Session May 25, 2015	49	4 teachers 2 principals	<ul style="list-style-type: none"> - Presenting the new Compass Model to the principals 	<ul style="list-style-type: none"> - Interactive model of the Compass
Teachers' Meeting August 10, 2015	17	5 teachers 1 principal	<ul style="list-style-type: none"> - Implementation of Compass Model 	<ul style="list-style-type: none"> - Compass Model
Teachers' Team Meeting August 10, 2015	62	6 teachers	<ul style="list-style-type: none"> - Position and tasks of special needs assistants at school 	<ul style="list-style-type: none"> - Testing new team structure of the Compass Model
Teachers' Meeting August 11, 2015	59	17 teachers 2 teachers trainees 1 principal	<ul style="list-style-type: none"> - Position and tasks of special needs assistants at school 	<ul style="list-style-type: none"> - Gathering ideas on flipcharts according to CL method
Follow-up Session February 17	102	7 teachers 1 principal	<ul style="list-style-type: none"> - Assessing the implementation of the Compass Model 	<ul style="list-style-type: none"> - Reflection on the CL process & its results

Table 1 Summary of the PedaLaboratory sessions and additional data

In March 2015, a room was reserved for the forthcoming PedaLaboratory sessions, from as close as possible to the everyday work environment. According to Virkkunen and colleagues. (2001), the space should hold everything necessary for the analysis and breakdown of disturbances as well as the tools necessary for the realization of innovation-driven change. The team, unit or group of people working in the organisation utilises the space analyse its work and to develop new working methods with the help of professional work developers (Virkkunen et al. 2001).

All of the six PedaLaboratory intervention sessions of the Viikki Teacher Training School were videotaped, audiotaped and transcribed. The text files of the transcripts of these sessions are used as data in this study. A professional transcribe produced the transcripts in Finnish. The transcripts were written in Times New Roman, font size 12 and line spacing 1.5. I numbered the speaking turns in the transcripts for better transparency. The running number of each speaking turn is presented in excerpts in this paper. I have also selected and translated excerpts from Finnish to English. The duration of the analysed sessions, the length of their transcripts and the number of speaking turns are depicted in Table 2. For analysis purposes the senior and new teachers have been separated in the transcripts. Senior teachers have worked at the school for over a year and the new teachers less than a year. This separation stems from the teachers' own eagerness to pinpoint their background in the first sessions. It is discussed in more detail in Chapter 5.2.

	Duration of the Session (min)	Length of the Transcript (pages)	Number of Speaking Turns	Speaking Turns in Transcripts
Session 1	101	43	575	1 - 576
Session 2	103	40	564	577 – 1141
Session 3	103	42	590	1142 – 1732
Session 4	105	41	592	1733 – 2325
Session 5	104	49	782	2326 – 3108
Session 6	101	61	1491	3109 – 4600
Total	617	276	4594	

Table 2 Duration of the sessions, length of transcripts and number of speaking turns

The abbreviations used and respective speaking turns are presented in the Table 3. Senior teachers are referred to as ST and new teachers (having worked at the school less than a year) as NT. The principal is referred to as PR, teacher trainees as TT and researchers as RR. Some speaking turns could not be identified as the participants were occasionally speaking simultaneously or interrupting each other. They have been separated by F for female and M for male voices. Names of the speakers and previous schools have been changed for the sake of anonymity.

	Abbreviation	Speaking turns in data
New Teachers	NT	433
Senior Teachers	ST	2328
Principals	PR	328
Teacher Trainees	TT	3
Researchers	RR	1053
Unrecognised voices	F/M	449
Total		4594

Table 3 Speaking turns in data

The symbols utilised by the transcribe and used in the excerpts in this paper are presented in Table 4.

Symbol	Explanation
---	Unclear speech
#	Interrupts another speaker
##	Overlapping speech
...	Speaking turn continues and/or is left open
∅	(Creative) silence

Table 4 Symbols utilised in the transcripts

4.3 Methods of Data Analysis

The methodology of the study integrates the ethnography of organizational change and an interventionist approach (Virkkunen & Newnham 2013). The research question: how does the transition from individually held knowledge of teaching transform into collective knowledge and a collaborative model of practicing will be answered using two qualitative methods of analysis. The data driven analysis will be conducted by carrying out a thematic content analysis identifying patterns, themes and speaking turns in the six intervention (CL sessions) data. Then, the transitions from individually held knowledge towards collective knowledge and a collaborative model of practicing are depicted with the help of the method of analysis of transitions, which I create and test in this study. The methods are process-oriented as they shed light not only on the present activities but also on their past and the anticipated future. The two intertwined steps of the data analysis include and are next explained in detail:

- 1) Thematic content analysis of the speaking turns in the Change Laboratory sessions (Weingart, L. R., Olekalns, M., & Smith, P.L 2004; Brown & Clarke 2006)
- 2) Analysis of transitions in knowledge creation during the CL process (Riisla 2016)

In the first analytical phase, a thematic content analysis of the six PedaLaboratory intervention sessions was conducted following the proceeding by Braun and Clarke (2006) (see Table 5). The process of thematic analysis is a “form of pattern recognition within the data, where emerging themes become the categories for analysis” (Fereday and Muir-Cochrane 2006, 82). Themes and speaking turns discussing topics from the thematic analysis were coded and later calculated with the search function in Word. The quantitative analysis is meant to support the identification of important themes, behaviour and phenomena in the data that may otherwise be overlooked in the thematic analysis.

Phase	Description of the Process
Familiarizing yourself with your data	Reading and re-reading the data, noting down initial ideas.
Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code. Calculating codes to acquire quantitative patterns.
Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
Reviewing themes	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2). Visual inspection of quantified codes.
Defining and naming themes	On-going analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
Producing the report	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis. Drawing final visual charts and figures to support analysis.

Table 5 The phases of thematic analysis (adapted from Braun & Clarke 2006)

In line with Weingart et al. (2004), the codification of the data was conducted in two steps: 1) unitizing the data, and 2) content coding the data. Speaking turns, “units that include all actions and/or statements made by an individual while he or she holds the floor” (Weingart et al. 2004) were selected as the unit of data analysis as they allow the examination of how the participants respond to one another and thus allows for the analysis of knowledge creation between the participants. Content coding of the data was conducted in several iterative rounds as each reading turn provided new themes and patterns. Further, the frequency of these codes was calculated and produced into charts and figures for analysis.

To support the thematic analysis, the participants’ speaking turns were analysed and relevant themes and patterns were coded with letters uncommon in the Finnish language for easier analysis. By participants, I refer to the teachers, principals and teachers trainees who took part in the six actual Change Laboratory sessions. Speaking turns are calculated also for the researchers. If a topic was mentioned multiple times in a speaking turn, the further mentions were ignored and the topic would get only one mention. This was done for the sake of clarity and reliability. If a person should mention the same issue multiple

times and no one else would, it might get an unrightfully high quantity of occurrences just because of this one person. Thus, one mention of each topic per speaking turn was selected proper.

The codes were then calculated with the help of the search function in Microsoft Word and their quantity would be added together. For example, the speaking turns of the new teachers in a session were counted by searching for 'NT' in the text. Several other aspects were coded and calculated in the transcripts. These calculations are meant to enhance the qualitative analysis conducted in this study. A full list of codes used can be found in the Appendix. The codes were calculated in a similar manner as the speaking turns. As can be seen in the following excerpt, there can be several codes in one speaking turn. ST1 mentions the size of the community twice, but it is only coded once, as explained above.

154 ST1: But as I now think about myself, what I think, are like the challenges of our work community (...) commitment in a way X4, but also just the mere size of the working community, X3 I think that is our problem, we are such a big working community. Making decisions and agreeing on several things X7 and all these, which is in a way outside of our classroom work, the division of that work X9 (...).

Through thematic analysis, I found several occurring themes in the discussions. These themes are the discussion of challenges and change resistance, social pecking order and historical development of the school. The findings of the thematic analysis are discussed in Chapter 5. Thus, through the thematic analysis, it is possible to analyse the overall development of the versatile discussions in the six CL sessions. The themes were mostly identified from sessions 1-5, as the last session focused mostly on creating the new collaborative practice and did not thus focus on discussions on challenges or social pecking order. This analytical phase is important for the examination of the development of the new Compass Model, as it is a solution to many of the challenges of the organization. This analysis also supports answering the research question, as it sheds light on how the atmosphere and discussions developed throughout the sessions and enabling the transition in knowledge creation. To further support these findings, the amount of speaking turns were analysed in the six CL session to indicate that a transition from the individuals to the collective took place in the process.

The second phase of the data driven analysis contains a newly created method called the analysis of transitions. The method was created based on the findings in the data, which did not fit any existing methodological models. This method provides a qualitative analysis of the data content and contributes to the methodology of researching transitions between individuals and collectives. In this paper, the main focus is studying the interaction between the people and between the individual and collective perspectives.

The analysis draws ideas from the theoretical frameworks of the SECI model (Nonaka & Takeuchi 1995), knowledge building and learning processes (Stahl 2000), the expansive learning cycle and activity theory in the study of transitions. According to the Oxford Dictionary (2016) transition is defined as “the process or a period of changing from one state or condition to another”. In this study, the focus in transitions is between the individual and the collective. The transition between individual and collective knowledge creation is understood as a process, where the focus of the speaking turns no longer revolves around the opinions, feelings or aspirations of the individual CL participants but rather aims at building common knowledge and enhancing transformations of collective practice. Thus, the analysis of transitions includes the following steps depicted in Table 6.

Phase	Description of the Process
Familiarizing yourself with your data	Reading and re-reading the data, noting down initial ideas.
Identifying forms of knowledge creation	Understanding the differences in the focus and aspirations in the speaking turns. Identifying individual and collective knowledge in the data.
Identifying transitions in the speaking turns	Identifying chapters in the discussion, where clear transitions between the individual and collective take place.
Defining contents of transitions	Analysis of identified transitions to be able to define key characteristics. Qualitative differentiation of transitions.
Comparison of findings to theoretical frameworks	Comparing research findings to theoretical frameworks, iterating new findings.
Producing the report	Selection of vivid, compelling extract examples. Final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

Table 6 The phases of the analysis of the transitions (adapted from Braun & Clarke 2006)

As in thematic analysis, the first step of the analysis of transitions is on familiarizing with the data. The second step of the method is identifying knowledge creation in the CL participants' speaking turns. The six sessions of the CL intervention included long and fruitful discussions. Identifying knowledge creation from these discussions was not an easy task. However, especially in the first three sessions, there is a pattern of participants focusing on speaking their own mind and experiences rather than searching for collaboration and practical solutions to discussed challenges. These speaking turns I eventually identified as individual knowledge creation. They were most often focused on discussing past experiences, sharing one's own opinions and thoughts or examples of one's everyday work. These types of speaking turns would include phrases such as "in my opinion, when I came to this school, I think..."

Collective knowledge creation occurred, when the participants collaboratively created new ideas, solutions and practices. The focus of the discussions was on creating new collaborative practices and shared understanding. These speaking turns included questions, clarifications, building on others' ideas and giving further suggestions. As the two ends of the spectrum of knowledge creation were identified, I focused on identifying chapters in the speaking turns, where the focus of the discussion began to transition from the individual towards the collective and collaborative practice. As I had identified transitions in knowledge creation from the text, I created a qualitative analysis of their key characteristics. Lastly, I compared my findings of the forms of knowledge creation and their transitions to the theoretical frameworks, especially the SECI model (Nonaka & Takeuchi 1995), knowledge building and learning processes (Stahl 2000) as well expansive learning and activity theory. I utilised the theoretical frameworks to analyse my results and also was able to further enhance the findings of the forms of knowledge creation and transitions. This comparison was conducted in several iterative rounds.

The findings of the study are described in the following two chapters. The fifth chapter discusses the thematic content analysis of the data and the sixth chapter the analysis of the transitions. The analysis methods are backed up by the use of excerpts, which have been selected from different sessions to provide insight into what really happened in the discussions and to illustrate the transition in knowledge creation from individuals to a new collaborative practice.

5 From Individual to Collective Knowledge Creation in the PedaLaboratory

To answer to the research question, the results of the empirical analysis of this study are divided into two parts. This first chapter discusses the findings of the thematic analysis of the six Change Laboratory sessions. Firstly, it discusses the challenges brought up in the CL sessions. Then, it discusses the relationship of the pecking order between the CL session participants and how it altered in the process. Further, it focuses on the historical development of the school. The knowledge creation of the sessions followed a rough timeline; in the first three sessions the knowledge was mainly created individually and it gradually began to transition towards the collective in the last three sessions. The sixth session consisted of modelling the new Compass Model for Shared Pedagogical Leadership and thus portrayed the development of a new collective practice. The final part of this chapter depicts the overall development knowledge creation through a quantitative analysis of speaking turns.

5.1 Change Resistance and Other Challenges

1590 ST5: (...) And most of us at this table have received our education in the 80s, at the end of the 80s, when we have been like trained to individually working, operators and certain kinds. That it might affect somewhere in the background. That maybe we also should like show in giving this high quality basic education the fact that we more like plan it together. (...)

I will first report the challenges that were brought up in the CL sessions. As illustrated in the above excerpt, there was a strong sense of individuality prevailing at the school. Challenges were discussed especially in the first session (April 1, 2015) and yet again in the fourth session (April 29, 2015), when the historical analysis was discussed and the new model was meant to take a more concrete form. The second (April 8, 2015) and third (April 20, 2015) sessions concentrated on finding the main challenges that the new model should help with. A lot of the discussion was also dedicated to questioning the challenges brought up in the first session. The main focus of the fourth session was concretising the objective of the intervention and putting forth a new model to answer to the discussed

challenges. Session five (May 6, 2015) concentrated on clarifying the new model and it was finalised in the sixth session (May 15, 2015).

The first session of the CL intervention is rather different from the other sessions. Firstly, the beginning of the session consisted of discussions of the purpose of the intervention and possible challenges that it could help with. However, the session included change resistance and it was tension-laden as the teachers questioned the purpose of the intervention and their ability to make a difference. Secondly, all of the latter sessions began with reading the previous sessions' minutes and showing some video clips from previous discussions as mirror material.

Many of the teachers' comments were directed towards the small portion of the teachers present in the first session. How could such a small portion of teachers change anything in the school? The small number of participants and their ability to make a difference was also questioned multiple times during the first session and a few times in the latter two sessions. This was expressed in the following way in the first session:

9 ST1: There are 1, 2, 3, 4, 5, 6, 7 out of one hundred, what are we... We are already fighting, we'll get enemies, there's soon more of them than friends in the work community, so how is this... How is this... That you are some miracle workers if you can help in our problems. But this is just a joke. But out of curiosity, what it is, we don't really know what your focus is.

(...)

109 NT1: So I'm thinking (...) That there's quite a small group to be honest, that I don't really believe that this could in a way... We can chat here as much as we'd like, but how much does this really develop the work community. Could we advertise this a bit more, so that we could get a more comprehensive sample of people here?

The teachers also claimed that several change attempts and projects have been initiated, but they did not, however, tell why they had or had not succeeded. How was this developmental project going to be any different than previous ones, ones that had been begun but had not been as successful as they had hoped they would be? Despite the resistance and tension, even the most concerned participants continued to participate to the

sessions throughout the intervention. It seemed that once the participants were able to discuss and agree on the most important challenges the working community was facing, they were able to come up with new solutions to them and begin developmental discussions.

The latter part of the first session focused on discussing the current status of the working community and its challenges. Several issues and other negative aspects of the work and working community of the school were brought up and listed on a flipchart according to the CL method. For ethical reasons, their contents will not be discussed in detail. Based on these discussions, an analysis of current challenges was developed by the researchers. A challenge was understood as something that complicates the work of the teachers or other staff or is otherwise considered having a negative effect towards the functioning of the school.

Issues mentioned and interpreted as being current challenges of the teaching practice were mentioned 184 times during the first CL session. These occurrences were calculated from speaking turns, and limiting the mentions of issues only to one per speaking turn. The speaking turns were rather long in the first session and thus the same issue could be mentioned several times. The issue was however marked only once for each speaking turn for the sake of clarity and reliability, as discussed in the methodology in Chapter 4.3. Challenges were brought up in later sessions, but not to the same extent as in the first one. All in all, challenges were mentioned 350 times.

Originally, 27 types of issues were identified, but some of them were merged for analysis purposes. The full list of these issues can be found in Appendix. In the spirit of thematic analysis, these issues would be further classified into 4 main themes. These themes are related to management, atmosphere, work and structure or resources as depicted in Table 7. Most of the issues brought up were related to the managerial theme as it received 120 mentions in total during the 6 intervention sessions. The single most mentioned issue was the haste or the amount of work of the participants (62 mentions). Other often mentioned issues were the lack of common goal or disunity caused by it (30 mentions), structural issues (30 mentions) and pedagogical leadership and management related issues, 22 mentions on both. The teachers would later discover that many of these challenges have

their roots in the historical development of the school. This historical development is discussed in Chapter 5.3.

	1. Session	2. Session	3. Session	4. Session	5. Session	6. Session	Total
Atmospheric issues	60	15	8	3	8	0	94
Commitment & accountability issues	13	5	2	1	0	0	21
Lacking sense of community	12	1	0	1	0	0	14
Different interests, culture of individuality	10	4	2	0	1	0	17
Communication issues	5	0	0	1	2	0	8
Bad atmosphere, lack of support	12	4	1	0	0	0	17
Lack of collaboration & knowledge sharing	8	1	3	0	5	0	17
Management issues	68	23	8	13	7	1	120
Lack of common goal, disunity	18	5	5	2	0	0	30
Decision-making issues	12	1	2	1	2	0	18
Lack of pedagogical leadership	6	12	0	3	1	0	22
Distribution of work	6	3	0	0	1	1	11
Management / leadership issues	12	1	1	5	3	0	22
Lack of planning	5	0	0	2	0	0	7
Previous / on-going developmental discussions	9	1	0	0	0	0	10
Work-related issues	40	12	3	28	7	2	92
Possibility to influence one's work	4	0	0	2	0	0	6
Haste, amount of work	27	9	2	15	7	2	62
Trainee-related issues	6	3	0	11	0	0	20
High expectations	3	0	1	0	0	0	4
Structural & resource-related issues	16	8	2	5	10	3	44
Size & complexity of building	8	2	0	1	1	0	12
Monetary issues	2	0	0	0	0	0	2
Structural issues	6	6	2	4	9	3	30
Issues Total	184	58	21	49	32	6	350

Table 7 Issues mentioned in the CL sessions

Much of the discussion of the second session evolved around the challenges that had been brought up in the first session. Some of them were not challenges per se, but rather had different interpretations and sides to them. As many of the participants in the second session had not participated in the first one, they were questioning why some challenges had been marked on the flip board. For example, pedagogical leadership was not seen as such a big challenge as it had been in the previous session. The researchers then showed a portion of the discussion of the pedagogical leadership carried out in the first session, from a video recording as mirror material.

The following extract shows how the participants began to discuss that the situation was not as severe as it could seem to an outsider. New challenges were not brought up in the second or third sessions, as most of the discussion circled around the evaluation of the first sessions' listing of challenges. Yet, the participants concluded that some of the issues discussed should be defined and addressed collaboratively.

673 ST4: *So this doesn't... This doesn't depict the entire discussion on pedagogical leadership that we had the last time.*

674 ST3: *## And this one line gives maybe a too negative image of,*

675 ST4: *Yes!*

676 ST3: *Of what our discussion was. That at least I don't feel that we would have discussed in a precisely negative manner like this...*

5.2 Pecking Order

Curiously, the teachers constantly brought up how long (or how little time) they had worked at the school as mentioned in the introduction of this chapter. They would begin their sentences by saying e.g. "having been here for 24 years..." or "in the 1980s when I came to this school..." This could possibly be interpreted as an expression of the lack of communality at the school or as a defence method of the teachers. This, however, would change drastically after the fourth session. It will be discussed later in more detail. Time worked at the school was mentioned most in the first session. It was also brought up more again in the fourth session, when the participants discussed historical developments of the school. The time worked at the school was mentioned in 24 speaking turns. Personal

background, which includes other work-related tasks or other occupations were discussed most in the first session, but later on brought up in all other sessions. These comments would include the mentioning of previous schools or other working places where they had been or other pursued duties. The last session saw only one comment related to one's personal background. The division of these comments is depicted in Table 8.

	1. Session	2. Session	3. Session	4. Session	5. Session	6. Session
Time worked at school	24	6	1	9	0	0
Personal background otherwise	13	6	5	5	5	1
Total	37	12	6	14	5	1

Table 8 Times background mentioned

In the very beginning of the first session, a clear division was made between the new teachers (the rookies) and the more senior teachers (the veterans) based on the time they had worked at the school. They even sat on opposite sides of the table. Although made in good spirits and laden with laughter, this distinction is clearly elaborated by the discussion very early on in the first session:

17 ST1: *Yeah, having been for 24 years, that sounds like a positive idea, let's believe in that.*

18 ST2: *George is laughing over there.*

19 ST1: *Yes, George is green.*

20 ST2: *George is a fresh one.*

21 NT2: *Having been here for 6 months, so...*

(...)

24 NT1: *Thanks; back at you, this is a good layout.*

26 F: *On this side of the table are the ones, who've been here longer.*

27 NT2: *We came to this side of the table.*

28 RR1: *Oh, there's a clear...*

29 NT2: *Optimists and pessimists.*

(...)

121 ST5: *Then there are us experienced and then there are us the teachers who have come in to our building. And that for starters develops activity if we have communication.*

Apparently it was important to notify that there are teachers who have worked at the school for a long time, who are experienced and then there are the “others”, the teachers who have joined the working community later on. The communication, however, between these two groups of teachers was seen fruitful. It also seemed that the teachers were timid around each other in the beginning. All of them revealed in their first comments how long they had worked in the school and where else they had worked before. As such, it had a strong effect on the participants and their communication in the upcoming sessions. After this, the teachers do not refer to their background as a defence, but rather as an asset unlike in the first session. The timorousness between the teachers would also slowly diminish as the sessions progressed.

In the latter sessions, especially from the fourth session onwards, previous schools and their practices were discussed, but the participants did not relate it so strongly to themselves. Previous experiences were used as benchmarking, but not as a promotional method for the participants’ credibility. As seen in the following excerpt, the new teachers are discussing teams in their previous schools, but the main focus now is sharing information to others instead of highlighting their own past.

1928 RR1: *So in your case, how would it concretize? (...) How would you see is the size that could serve?*

(...)

1931 NT1: *(...) Yes, and these groups, the division was made on that the team was led by a member of the Board of directors and then it was settled. The principal had made the division, of which teacher was where. I don’t know how he made the divisions. Then there were also special groups that were specifically based on interest and purely on that basis.*

1932 NT2: *At least we had so, that there could be different weeks for different teams to meet, so this week, like the subject teams would meet, such as the security and IT teams and so forth. So the next week... So everyone belonged somewhere, or that everyone was in multiple teams. (...)*

5.3 Historical Roots of Challenges

As mentioned in Chapter 4.1, a historical analysis of the workplace is an essential part of the Change Laboratory methodology as it helps the working group to reveal and understand the historical reasons behind the experienced challenges causing problems to their current practice. This chapter discusses the historical analysis of the school and the discussions it spurred in the fourth session of the conducted PedaLaboratory. It also presents the timeline drawn from the main historical events in and outside of the school.



Figure 5 Depiction of the historical development of the Viikki Teacher Training School

Initiated by our team of researchers, the historical development of the school was discussed in the fourth session, although it was referred to now and again in the other sessions as well. I and the other thesis worker in the research group had prepared a historical sheet depicted in Figure 5 based on interviews and other documents related to the school. The historical developments were divided into two categories, inner and outer changes. In the original sheet, the former were written in blue and the latter in black. Inner changes were changes that affected the school, such as newly appointed principals or the relocation of the school. These are depicted above the timeline in Figure 6. Outer changes were changes affecting the society at large, such as the recession in the 1990s or digitalisation in the 2000s. The historical developments of the school, presented in Figure 5, are summarized and enriched with some additional information on the changes in the Finnish society and the school system, depicted below the timeline in Figure 6.

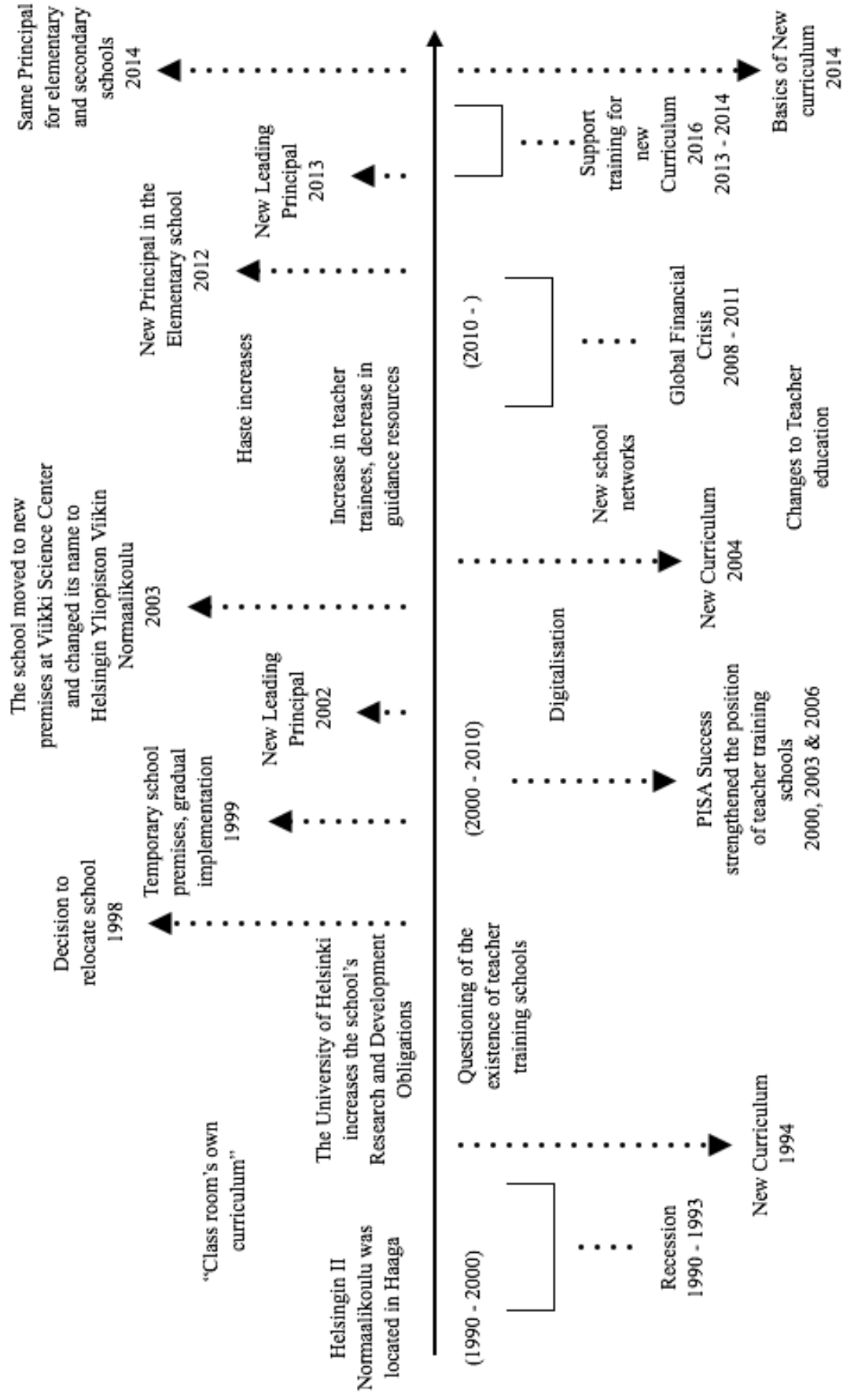


Figure 6 Key events in the Viikki Teacher Training School's history and in the development of the Finnish society and schooling system

The original history sheet was put up on the wall of the teachers' lounge after the third session in hopes of it attaining interest and further additions. This, however, resulted only in three additions to the original sheet. When the history sheet and the school's history in overall were discussed in the fourth session, there were clear focus points in the discussion. Much of the discussion focused on the changes in teacher training and the increasing working pace. As the discussions went on in the session, post-its were added to the history sheet.

In the early 1990s, the school was located in Haaga and was called Helsingin II normaalikoulu, in other words, The Second Teacher Training School of Helsinki. The area was socioeconomically very homogenous and has often been referred to as bird's nest ("Lintukoto" in Finnish) by the teachers. According to the teachers, they had plenty of autonomy considering the teaching methods as well as timetables back then. Pedagogical cafés were also held, in which pedagogical matters were discussed. During the 1990s, the University of Helsinki was increasing the school's research and development obligations.

However, the whole existence of teacher training schools was questioned in the early 1990s and the schools were under threat of shutting down. The recession was heavy at the time and costs were being cut. There was even a decree set for the closure of these schools, initiated by the management of the University of Helsinki. However, these initiatives raised a lot of resistance and pleas were signed for the preservation of the schools. It was suggested that the Viikki School should be relocated closer to the University of Helsinki's Viikki campus to further enhance collaboration with the university. The decision of this relocation was made in 1998 and by 1999 the school was working in temporary premises and gradually moved to the final location in Viikki.

The PISA success of Finnish schools further enhanced the position of teacher training schools and they became a tourist attraction for international teachers and principals. The School finally relocated to Viikki in 2003 and changed its name to Helsingin yliopiston Viikin normaalikoulu, The Viikki Teacher Training School, University of Helsinki. The relocation of the school created tremendous changes, mainly as the area had new types of students and the teachers were placed to newly built work premises and some staff changed as well. The socioeconomical status of the families living around Viikki is much more versatile and international than in Haaga. This has also increased the need for new ways of

teaching and different types of student counselling services. In the last decade, the communication with the parents has also increased with the introduction of new communication methods.

The biggest changes of the 2000s were the new curriculum, digitalisation, changes to teacher education and thus the teacher trainees and their supervision at the school, increasing haste and workload of the teachers. The teacher training and teacher trainees have increased and thus some of the teachers also discussed whether they have ‘intact’ pedagogy anymore. They have so many teacher trainees teaching in their classes that they do not know what the pedagogy is anymore. The haste of the teachers was widely discussed in the CL-sessions. The extremely tight schedule in the teachers’ daily work is depicted in the following excerpt:

1796 ST7: Yes! Just there, our trainees, when I had to leave running from the midst of a meeting, thinking that I am already late, but I’m listening to what you have to say. I haven’t here or there and had a quick bite to eat and... That I just realised, that you should have packed lunch with you to have time to eat... (...)

1797 RR1: Has it always been that you should have packed lunch with you? Can you tell on the timeline...?

*1798 ST7: I think the pace has really increased.
(...)*

1800 ST7: I came to the school in 1997 (...) Probably already when we moved here to Viikki. (...) That already makes it so that I have to physically run when my class ends and the other starts right after. And the trainees are tugging your sleeves. And a colleague wanted to have a word... So there’s like a common...

During the 1990s and 2000s, the resources and finances of the school have decreased and the workload has increased. Also the amount of teacher trainees has increased, but simultaneously their training schedule has changed and become tighter. Further, there are less guidance hours for the trainees but they should be able to teach the classes with less attended courses than before. They used to have four subjects per period in the 1990s, but now they have six. According to the teachers, this has caused a lot of uncertainty in the trainees. Teacher education has become more research-laden, which has decreased the subject didactics. Earlier, the students had to take more courses before being allowed to do

their training. Now they need less basic courses and this has also lead to an increasing need of counselling from the teachers.

Further, the previous leading principal has had a strong effect on the processes and organisation of the school. Many of the effects are visible still today and have made the work of the teachers more difficult. The leadership has since been more focused on administration than on the actual pedagogical matters of the school. The teachers referred to this as “paragraph management”. This has created strong traditions in the organisation and management of the school and has caused difficulties throughout the years. The historical structures have caused a lot of frustration and lack of collaboration as depicted in the previous chapter. The existing ways of working and the organizational structures provide no room for collaboration and during the Change Laboratory, the teachers realized that this needed to be changed. The teachers noted in the fifth session that they are currently in a limbo as the current leading principal is “the other leg already in retirement and thus doesn’t think about the school’s future so strongly”. They also said that the load of history is very heavy and thus clauses overpower the contents. One of these old structures was the organisation of the classes into “cells”, which are separated units forming silos within the organization. This, along with the difficulty to see things through, is elaborated by a discussion in the fourth session:

1962 RR4: (...) Could you tell, for example in relation to history, why are you in the cells that you are in?

1963 ST7: That’s a good question.

1967 ST5: We have had, when we came to this new building... (...) When we came to this building we had the idea that it would be easy for the students and visitors. That you could always say that the first grades are over there or the thirds are over here. (...)

1969 ST5: And we have always done so that if somebody transfers to another grade, that they have to move in the spring. And during the past few years we have had moving fatigue.

(...)

1971 ST5: It’s rough to have to pack an entire class. (...) But I understand that the staff has now asked that they should not have to move so often anymore.

(...)

1973 NT1: *We just talked about it in the last teachers' meeting.*

(...)

1977 NT1: *It was kinda left hanging. I guess it was mostly concretized into whether the early teaching is in the same (cell) or not.*

Digitalisation has also had a profound effect on the school, affecting all aspects ranging from research to teaching methods and equipment. There have also been various discussions e.g. whether children should be allowed to use mobile phones in the classrooms. The changing society and its increasing pressure for collaboration has also forced the teachers to reconsider their teaching methods. There have also been concerns about the scarcity of pedagogical discussion at the school. The workload and schedule of the teachers are such that they simply do not have the time or energy to conduct pedagogical discussions efficiently.

A new curriculum is to be implemented in Finland nationwide in 2016. It increasingly emphasises student-centeredness, such as focuses on children's agency and competences. The basics of the curriculum were issued in 2014 and support training for the teachers in Viikki for it was held between 2013 and 2014. The new curriculum calls for joint planning of teaching and collaboration from the teachers. This change seemed to concern and excite the participants of the Change Laboratory at the same time. A teacher expresses this in the fourth CL session:

1849 ST5: *But look (pointing at the history sheet), here is what emancipates us from all the pain and worry. (laughter) It's this Curriculum 2016. Because the objectives and contents are no longer so important, the main focus is on the student being an active agent. And if we think that whatever he/she studies, or objectives and contents, the bliss is found through the fact that less is sufficient.*

5.4 Participation to the Knowledge Creation During the Sessions

The end result of the CL intervention was the creation of a new, collectively created Compass Model for Shared Pedagogical Leadership. This chapter focuses on the creation of knowledge in the making of the new model and discusses the analysis of speaking turns in all the six sessions using a quantitative method.

The average speaking turns by session provides an interesting view of the sessions (see Figure 7 and Table 9). They have been calculated as an average of a participant group's members and their respective speaking turns. It has been calculated from the participants who were present and spoke. Some did not say anything in the sessions and have thus been excluded from the calculations. The Others line includes the speaking turns of a teacher trainee and unrecognised speaking turns. The teacher trainee participated in two sessions, but spoke only in one and even then used only three speaking turns.

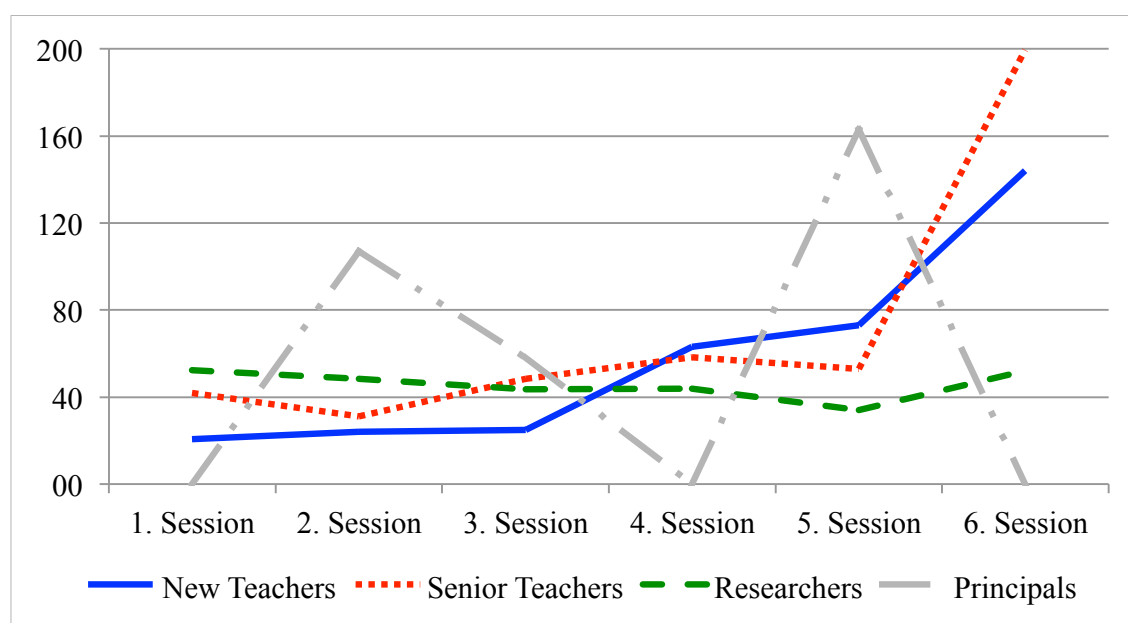


Figure 7 Average speaking turns per session

One can see a clear increase in the speaking turns beginning in the fifth session. This was caused by the decrease of the length of the speaking turns as well as an increase in the collaboration between the participants. The presence of the principal is rather visible in Figure 7. A surprising feature of the figure is the increase of the new teachers' average speaking turns from the fourth session onwards indicating the diminishing of the pecking order. Further, the sixth session presents the highest number of average speaking turns. The senior teachers provide the biggest portion of it. The average speaking turns of the researchers peak in the first, fourth and sixth sessions. These were the sessions, when the researchers instructed the participants the most by asking questions and making conclusions.

	1. Session	2. Session	3. Session	4. Session	5. Session	6. Session
New Teachers	20,5	24,0	25,0	63,0	73,0	144,0
Senior Teachers	41,8	31,0	48,3	58,3	53,0	199,4
Researchers	52,3	48,3	43,5	43,8	34,0	52,0
Principals	0,0	107,0	58,0	0,0	163,0	0,0
Others	0,0	0,0	0,0	0,0	0,0	0,0
TOTAL	52,3	47,0	49,2	49,3	65,2	149,1

Table 9 Average speaking turns per session

In the fourth session, the average speaking turns of the new teachers surpassed that of the senior teachers. Simultaneously, the researchers' average speaking turns reaches its highest value of the sessions. This meant that, on average, new teachers and researchers used more speaking turns in comparison to the number of participants in that participant group. The researchers used the most speaking turns in this. The fourth session consisted of discussion about the historical development of the school and began the modelling and concretizing of the new solution. One of the most profound turning points of the CL process took place in the fourth session. As described in Chapter 5.2, the teachers were very eager to stress the time they had or had not worked at the school. However, after Christine had once more apologetically mentioned her short working time at the school, Jack decided to dismiss the division between the senior and new teachers. This seemed to have a positive effect on the atmosphere and resulted in increasing speaking turns in the next two sessions. This turning point is depicted in the following:

2286 ST6: *I just want to say Christine, I don't think it makes a difference how long you have worked here, don't think about it.*

2287 NT1: *Well, I don't, it's then again...*

2288 ST6: *(...) I think you just said that. (laughter)*

2289 NT1: *I said that based on this year.*

2290 ST6: *(...) I wanted to... Yeah, but I just wanted to say it straightforward.*

Instead of discussing current challenges and what had been done, the teachers began to model the new solution and started to truly collaborate. This had a tremendous effect on the final outcome as the new teachers had a crucial role in its creation. The speaking turns also reflect this, as for example in the fifth session, the participants were eager to present

their ideas and solutions to the principal, who in turn used many speaking turns to question them and presenting counterproposals of his own. The new teachers increase their speaking turns throughout the sessions, but there is a tremendous increase in the participation of the older teachers in the last session. There were two teachers in this group who produced almost half of the speaking turns between them.

The average speaking turns of the participants presents a more democratic manner of displaying the division of speaking turns. There were three times more of the so-called senior teachers present in the sessions and thus the absolute number of their speaking turns is higher. For analysis purposes, the absolute distribution of speaking turns can be seen in Figure 8 and Table 10. These absolute figures also present the significant increase in speaking turns in the final session. Figure 8 was scaled, so that it would be easier to analyse. This however, led to the fact that the large amount of senior teachers' speaking turns is not visible in the figure. If the figure had not been scaled, it would show the senior teachers' speaking turns in a visible manner, but on the expense of others.

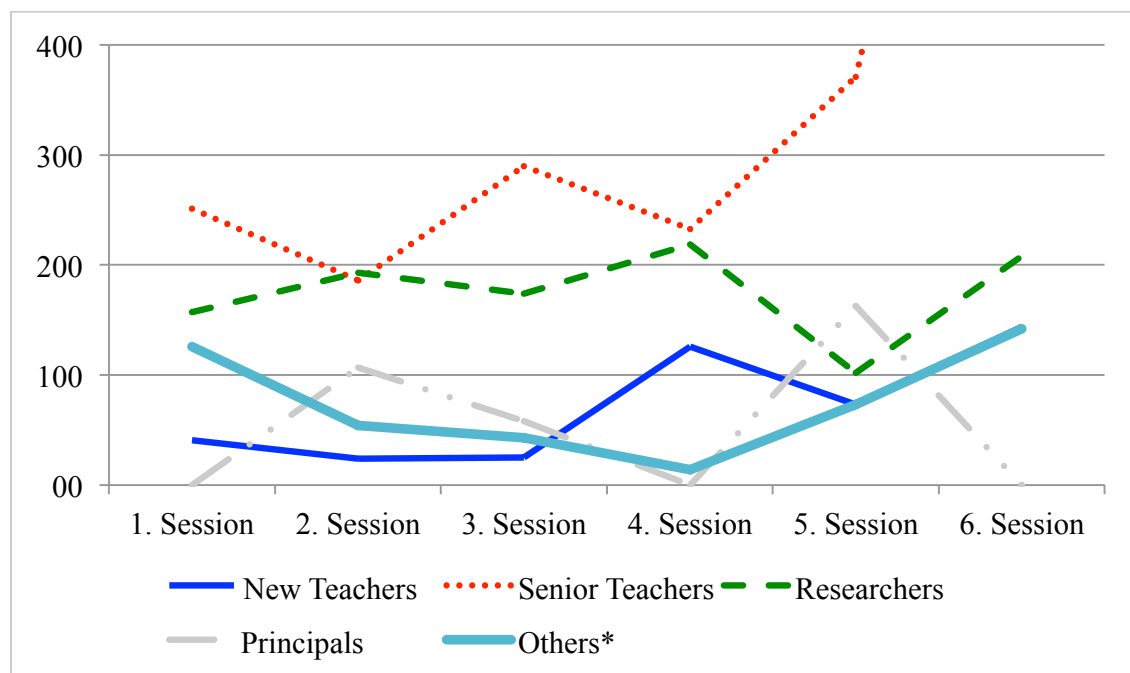


Figure 8 Absolute speaking turns per session

	1. Session	2. Session	3. Session	4. Session	5. Session	6. Session
New Teachers	41	24	25	126	73	144
Senior Teachers	251	186	290	233	371	997
Researchers	157	193	174	219	102	208
Principals	0	107	58	0	163	0
Others*	126	54	43	14	73	142
TOTAL	575	564	590	592	782	1 491

Table 10 Absolute speaking turns per session

There was only one new teacher present in the fifth and sixth session, but they still used a lot of speaking turns and were clearly encouraged by the others' curiosity towards their background and experience from working in teams. In the beginning of the CL process, the researchers led the discussions. Towards the end of the CL process, the teachers themselves started to lead the discussion. Important to note, when the principal was attending, he led the discussion very often. It seems that the participation of the principal in the second, third and fifth sessions decreased the speaking turns of all other participant groups. However, the total frequency of speaking turns increased from the previous session with more than the principal's portion. Interestingly, the principal was absent in the first session. The participants were not sure, why the principal was missing as depicted in the following discussion:

90 RR3: *Doesn't this sort of have Jim's support?*

91 F: *Yes.*

92 RR3: *At least we have understood that...*

93 F: *Yes, yes.*

94 RR3: *That he was at least so far... (...) constantly highlighted it.*

99 F: *He said yesterday that he would come here today.*

100 RR1: *Yes.*

101 F: *Yeah, something must've come up. (...) But he is participating.*

(...)

106 RR1: *Let's assume that he'll be here next week. At least we should disturb him so much. Let's hope his coming. It would be important.*

Considering that the length of the six sessions was approximately the same, as seen in Table 1, one can see a change in the amount of the absolute speaking turns. In the first sessions, the speaking turns were long, as there were less than 600 speaking turns in the 100 minutes of the sessions. This changes drastically towards the end, as the last session consisted of almost three times as many speaking turns as the first one in the same amount of time. The number of speaking turns increased significantly in the last two sessions and thus their duration also shortened as the duration of the sessions remained the same. The speaking turns were shorter but also more collaborative, which implies a transition from individual to collective knowledge creation. The organizational tensions started to diminish and the teachers began to build on each other's ideas, instead of having long monologues of their own. These transitions and their knowledge creation content are discussed in detail in the following chapter.

This chapter has discussed the results of the thematic analysis and has mostly focused on how the sessions and their discussions developed on a general level. It has discussed the challenges and the historical development of the school. It has also looked into the development of the pecking order as well as the overall participation of the teachers and other participants in the six CL sessions. The diminishing of the tension and change resistance seems to increase the overall amount of speaking turns and thus change the discussions towards dialogue. It seems that the lengthy discussions concerning the working community's current and historical challenges enabled the teachers to start looking for common solutions to overcome them. The Compass Model was created to answer to the challenges and to better organise the work and collaboration.

This chapter has not, however, discussed the nature and contents of the sessions' knowledge creation. Based on this chapter, it is clear that the participants' collective knowledge creation increased during the PedaLaboratory intervention and they were able to come up with new solutions that they could agree upon. What remains unclear is how they created new knowledge and how it transitioned towards a more collective direction. The next chapter looks into the development of the collective knowledge creation in the creation of the new Compass Model in the Change Laboratory process.

6 Development of the Collective Knowledge Creation in the PedaLaboratory

To provide answers to the research question, this chapter discusses the development of the new “Compass Model for Shared Pedagogical Leadership” from a knowledge creation perspective. The foundations of the new model were laid in the fourth session, as the session’s purpose was to concretize the vision of the CL intervention. This chapter discusses the findings of the analysis of transitions in the six CL sessions. The chapter firstly goes through the creation of the Compass Model in the sixth CL session on May 15, 2015. Then, it discusses the contents of individual and collective knowledge creation across all of the CL sessions. Lastly, it focuses on the transitions between individual and collective knowledge creation as well as the transformation towards collective practice. The final part of this chapter discusses the implications of this study and combines the findings presented in the fifth and sixth chapters.

6.1 Creation of the Compass Model for Shared Pedagogical Leadership

The Compass Model for Shared Pedagogical Leadership was drawn in three iterative rounds in the sixth CL session. The teachers wanted to form one big group in planning and drawing the new model. However, they took turns in drawing the model.

3191 NT1: Bob just said, draw a picture and show your stupidity (joking).

(...)

3194 RR1: This is no easy task, but I believe you will manage.

3195 ST5: Hey may I draw something there and then we’ll start developing from there?

(...)

3197 ST5: Or does somebody else want to draw?

3198 RR1: Whichever method suits you best.

3199 ST5: Do you others have...

(...)

3201 RR1: We can bring the paper in the middle.

(...)

3204 RR1: *It's also possible, if you want to go somewhere in two groups to think even about two options and then bring them together.*

(...)

3207 ST5: *Can you come here, there's free space here.*

(...)

3210 RR3: *Do you want to be together, the whole lot of you, or should we have two groups?*

3211 F: *Yes.*

3212 F: *Let's stay together.*

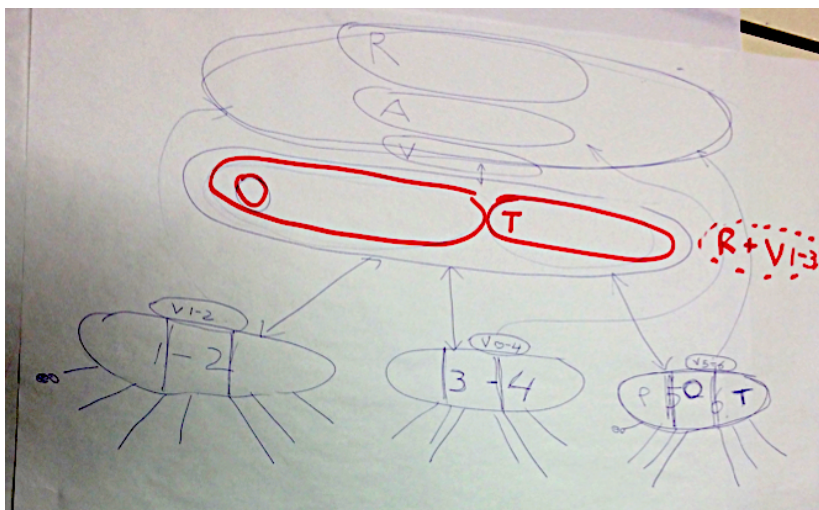


Figure 9 Photograph of the first version of the new model drawn by the teachers

The first version consisted of a top-down module, where the principal, as the leader, was at the top of the model (depicted in red) in Figure 9. The three new class-based teams were then depicted below the principal. It was criticised and referred to as “the army model” by Jack (ST6); as to him it did not present collaboration or functionality. Jack’s resistance toward this hierarchical model led to radical changing of the model.

3299 ST5: *Well I was thinking, that it would be like good to do different models here, so that...*

3300 ST6: *## Could it be like an option to this? Because this clashes instantly, this kind of hierarchical army-like box organisation, it clashes instantly it,*

3301 ST5: *## This is not army-like!*

3302 ST6: *that some teachers do not follow this box model, even though we class teachers do. And then its also related to those, I'm quite frankly scared of the children, guardians, teacher trainees, cleaners, kitchen personnel ---*

3303 F: ## ---

3304 F: *And the janitor.*

The second version of the model had a different approach to the teams as depicted in Figure 10. A couple of teachers (NT1 and ST3) tested drawing some different shapes until the group agreed on a round shape, where the principal was depicted in the middle. This model had three class-based teams and also three functional teams. The following extract depicts the enthusiasm of the teachers as they are constantly speaking on top of each others (marked by ##) as they decided to test the new circular shape instead. A lot of hilarity ensued from the new round shape of the model.

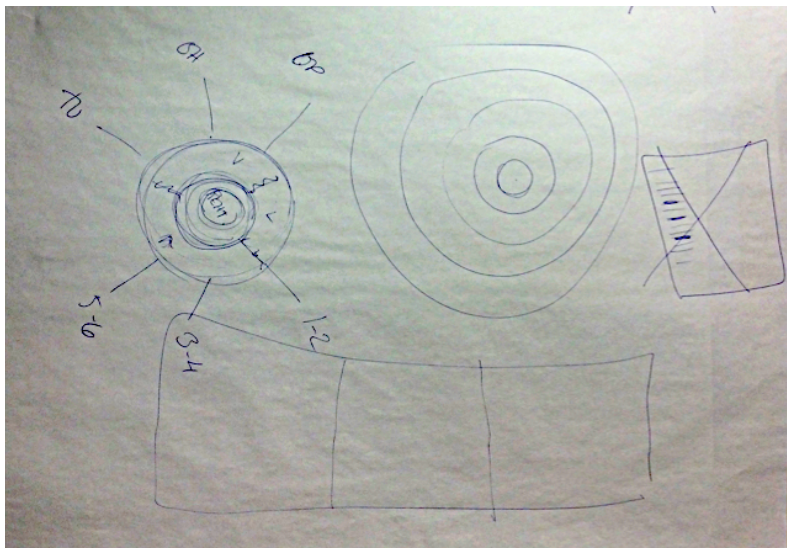


Figure 10 Photograph of the second version of the model drawn by the teachers

3541 NT1: ## *But could it be like a ring shape?*

3542 ST3: *I think we've spoken of a...*

3543 ST5: ## *Yes, because I kind of think that it would be good for us to spe...*

3544 ST3: # *This was stuck to my head the last time.*

3545 ST5: *Yes.*

3546 ST3: *But now we could have something completely...*

(...)

3548 ST6: *Why don't you draw a circle, let's do that!*

3549 NT1: *But could it be a circle. But what's in the middle?*

3550 ST6: *In the middle is the leading principal. (laughter)*

3551 RR1: *Like a bullseye, to shoot at*

3552 ST5: *## Hey, hey, and the trade...*

3553 ST6: *## Around which everything circles (laughter)*

3554 F: *The sun!*

3555 ST5: *And the trade union?*

3556 M: *The principal.*

3557 ST6: *And the trade union.*

(...)

3564 ST6: *Yes, if there are those in the rings, that some of them are those class-based but then there would also be the functional teams. So the donut would be like this.*

Due to Jack's questioning of the other participants' ideas half the drawing time, a new circular model was formed. Jack received credit for the name compass, even though it was first initiated by one of the researchers. The round shape of the model inspired the participants to dig deeper into its development. The participants concluded that the model is more dynamic and versatile in a round form. The shape inspired also the name of the model to become "Compass Model for Shared Pedagogical Leadership", and the participants decided to draw one more version of it. The final version of the model is depicted in the photograph in Figure 11.

3851 RR1: *Is that a little like a pedagogical compass, it's like dynamic. That it's not a model like this, but it rather moves like this.*

3852 ST5: *Yes, and then we...*

3853 RR1: *Isn't it like what you Jack were implying there.*

(...)

3855 ST6: *A compass model, it's a compass model.*

(...)

3858 RR2: *There's some paper, let's draw a big compass! --- Make the compass bigger then.*

(...)

3861 RR2: *There are two good versions already.*

3862: ST5: *Lily is clear and well... But do you want to sketch somewhere first?*

3863 ST3: *No, let's just start making the compass model. Who do we have here?*

3864 ST6: *The leading principal of course! (laughter)*

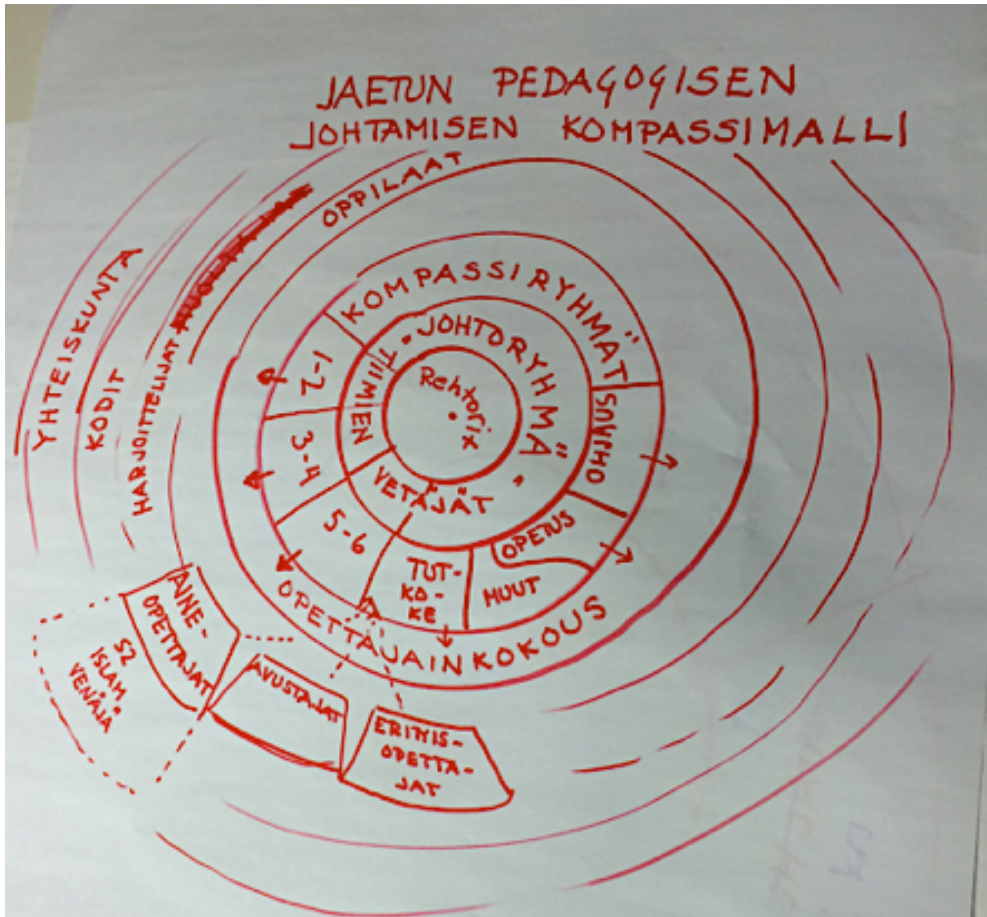


Figure 11 Photograph of the third and final version of the model drawn by the teachers

During and after the drawing process, the participants constantly tested the organisation of the model by asking who is located on each layer.

(...)

3871 ST3: *This is a heliocentric model. Who do we have here? What's here?*

3872: NT1: *Well there's the leading principal and the principal probably.*

3873 ST6: *Then the board of directors is next.*

(...)

3875 RR5: *But where are the children?*

3876 *F: Yes.*

3877 *ST6: Come on, not the children, let's not speak of them!*

(...)

3880 *ST6: They're the last ones over there.*

3881 *F: In day care*

3882 *ST3: That was the anxiety hey!*

3883 *ST5: We need to reorganise ourselves first.*

This last comment is interesting as it clearly underlines the challenges in the organisation itself. Before trying to even think about further development, the teachers felt that they need to reorganise themselves as agentic actors first and foremost. As discussed in the previous chapter, some of the working community's challenges have sustained quite some time. Many of the structures prevailing had their roots in previous principals' decisions and had not been altered since. As the new curriculum is requiring new types of working methods, the participants seemed to feel that they first needed some order in their own organisation and answers to some challenges, before they could set forth on tackling new ones.

An important innovation in the new model (Figure 11) is the creation of the management group consisting of principals and team leaders. Other innovative developments compared to prior versions of the model are the formation of class-based and functional teams depicted in the third circle from the centre. According to the teachers, this will allow more collaboration and transparency in the decision-making as well as more efficient organisation of their work. Teams and their leaders will also have an important role in the teachers' meetings. The arrows are drawn between multiple layers to depict the communication and collaboration flow. An important feature of the model is that, although they are depicted as one-way arrows (see Figures 11, 12 and 13), the communication is meant to function both ways in the model. Many of the new innovations were ideated based on teachers' experiences from previous schools, which also implies an important transition from individually held knowledge of teaching to collective knowledge creation to enhance collaborative practicing. As the participants explained practices at their previous schools, they were able to use this information and combine these practices into a new collaborative structure they were all committed to.

The teachers edited the Compass Model to be able to present it in an additional meeting (May 25, 2015) to the principal and vice principal of the school, whom were not present in the sixth CL session. In this meeting, the teachers explained the model layer by layer with the help of transparent slides as depicted in Figure 12. The principals were very positive towards the new solution and the principal later presented the Compass Model to all elementary school teachers.

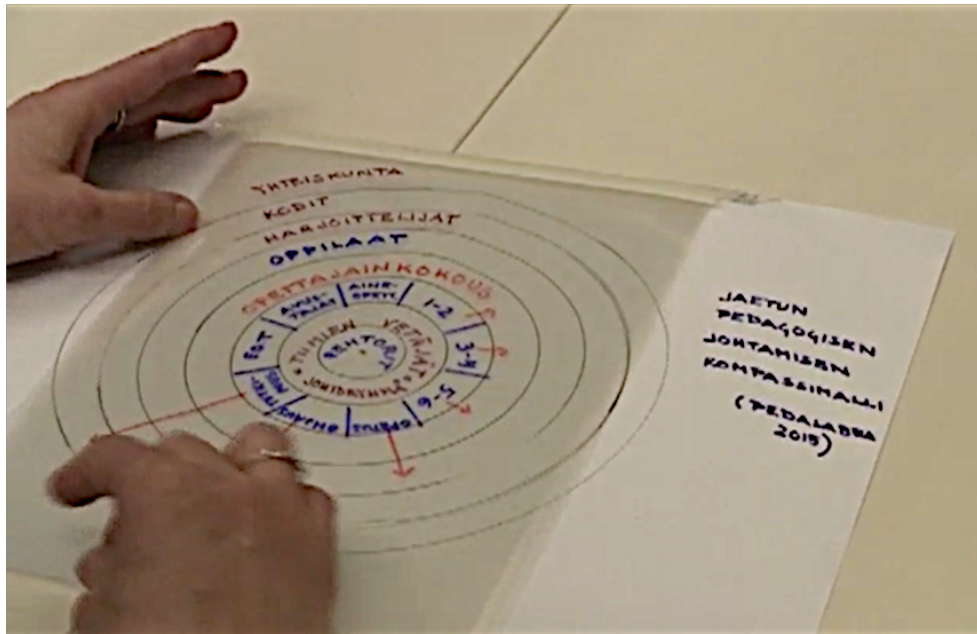


Figure 12 A screenshot from the teachers' presentation session in May 25, 2015

Figure 13 is an edited version of the model presented in Figures 11 and 12. The contents of the model are translated into English by the researcher. The teachers did the editing of the model to a PowerPoint for the principal to be able to present it in the beginning of the school year in a forthcoming meeting to the rest of the staff in August 2015. The principal presented the model saying that this is a new pedagogical model for the whole elementary school staff, created in the PedaLaboratory intervention and praised the model's potential. The teaching staff participating in this meeting received the model very positively.

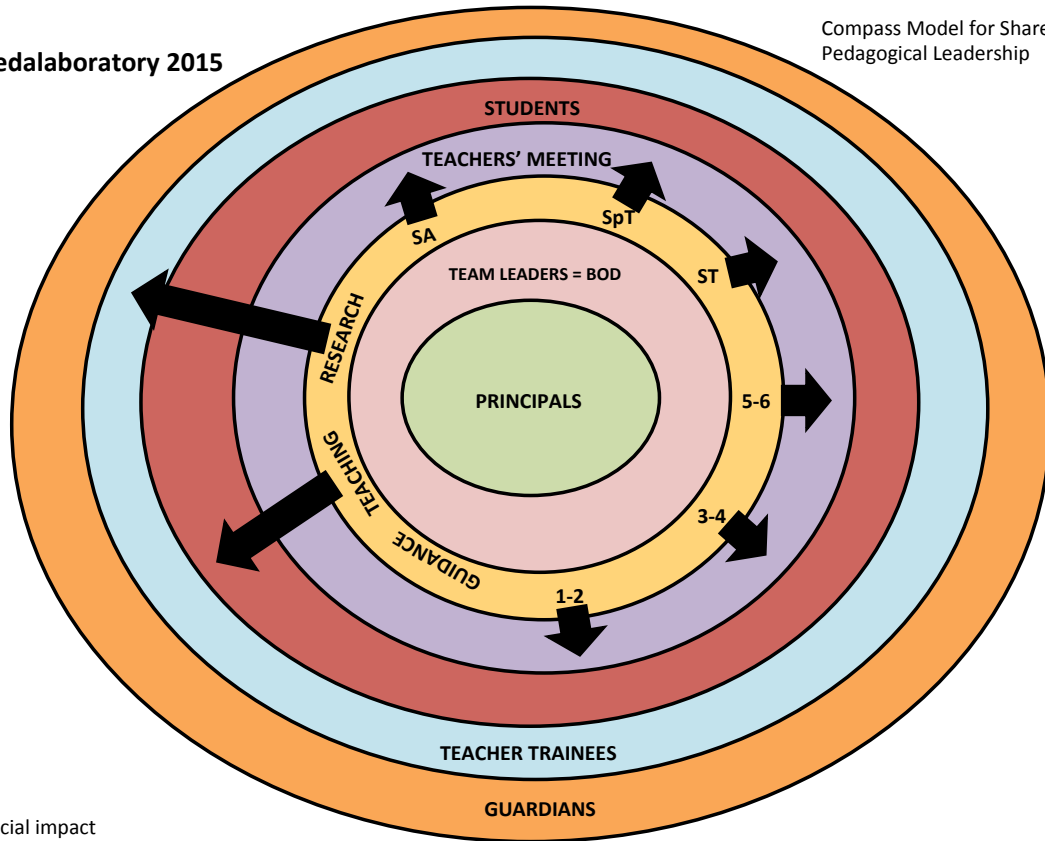


Figure 13 The Compass Model for Shared Pedagogical Leadership created and edited by the teachers

6.2 Analysis of Individual and Collective Knowledge Creation

This chapter discusses firstly the contents of individual knowledge creation and presents examples from the discussions and then moves on to presenting collective knowledge creation in the sessions. This resulted from the analysis of transitions method and enabled later the identification of transitions between individual and collective knowledge creation.

As mentioned, the teachers at the Viikki teacher training school are very autonomous and used to working on their own or with their teacher trainees. This autonomy is also reflected in the knowledge creation in the beginning of the intervention. The participants use long speaking turns and bring forward their views. Speaking turns beginning with “I would like to say, in my view, I think...” are all very common in the firsts sessions. They would also begin by stating how long they have worked at the school as discussed in Chapter 5.2. As the speaking turns were rather long, the teachers explained their background, working

history and daily practices quite elaborately. Even the length of the speaking turns implies that the discussion was more a monologue than a dialogue. These types of speaking turns are not focused on creating new, shared knowledge but depict the views and knowledge of the individual speakers.

In the first session, the teachers discussed the nature of knowledge and pedagogical solutions among other topics. Some of the speaking turns revealed very personal information and reflections of the participants. Due to their delicate nature and for the sake of anonymity, extracts presenting individual knowledge creation have been selected with special care. If school names or years worked at the school are mentioned, they have been altered to protect the identity of the speakers. A typical manifestation of individual knowledge creation is the depiction of one's own thoughts and opinions, such as in the following example:

185 ST5: (...) You constantly search for something to give you more energy. And actually at least I notice, and which somehow also frightens me, is that the longer you've done this, the more things you begin to question. That knowledge somehow increases the pain, and experience increases the pain. That I'm thinking that luckily the retirement years are coming at some point, because otherwise you don't know how to do anything anymore. I'm just kidding right here, but one actually starts to question many things that they knew perfectly well how to do in one's twenties.

Another feature of individual knowledge creation was the presentation of one's previous experiences in another school. This individual knowledge creation seemed to be meant for either boosting one's own professional identity or making up for the lack of time spent at the school. It is unclear whether these presentations were meant for the researchers or if the teachers were not so familiar with each other's work history. They can also be interpreted as being defensive, justifying the teachers' methods and existence and reflecting the individual culture prevailing at the school. In the next excerpt, the teacher seems to be discussing her other background to make up for the shorter period worked at this particular school. It was also usual to mention the size or other details of the previous school.

324 ST2: May I say something from here? So, I was just left thinking that when before I came here, before I went to the university, I was at a school in Vantaa. It

was an elementary school, with 500 students, but it didn't have this teacher-training task. (...) When I came here, then I sort of by myself... It wasn't that many years ago, this is my third year here now... (...)

Different kinds of examples from current practices were widely used throughout the sessions. In individual knowledge creation, the examples were utilised to highlight the position and experience of the speakers. The use of the first person, such as “in my work, I have noticed, let me give an example”, in the speaking turns is very common, when presenting these types of examples. In the following are a few examples of current practicalities and current traditions used in individual knowledge creation.

1433 ST2: (...) I have a small example. Yes, I have been here for six years, and I'm still in trouble with the multidisciplinary report. And I know that Susan has a template, and you have a template, I don't have any kind of template.

(...)

1435 ST2: So I do it a bit differently every time. (...)

1463 ST6: But I would like to concretise for example what I myself... (...) the development of metatheoretical thinking. It's clearly that, and it has a certain teaching level of thinking, to which I... Where I take the idea from. I consider it, not exactly after every lecture, but probably on a weekly basis with the students and that's where I'm pushing them. (...)

Thus, individual knowledge creation consists of speaking turns focusing on presenting the ideas, opinions and experiences of the speaker. As opposed to individual form, collective knowledge creation focused on searching for common solutions, answers or practicalities. Collective knowledge creation, shared goals and creating new collaborative practice were clearly visible in the sixth session, especially so during the drawing phase of the model.

One of the manifestations of searching for common solutions was the principal's eagerness towards concrete changes. He would often ask “So how do I do this? How can this be put to action? How do we advertise this?” Even though these speaking turns are presented in the first person, their focus is clearly on creating collaborative future practice. Before the fifth session, the principal had sent the researchers a list of all the current teams and

working groups at the school and asked that it should be used as mirror material. The list was very long and he made a point that there are a lot of teams that are not functioning or meeting at all. The list was then discussed as a benchmark for the future teams discussed in the session. How could the new teams be different and ensured to have motivated members? The teachers also discussed whether the old teams would remain side by side with the new teams. The issues with the team structures and people's participation in them was elaborated by the following discussion in the fifth session:

2493 PR1: (...) *There are many groups of which I know that they have not met during the entire school year (...)*

2494 NT1: *If you've really known how to pick, you haven't had to go into any meetings.*

2495 PR1: *Exactly! (...)*

2496 ST8: *Yes, people do know how to play tactics.*

(...)

2499 NT1: *She signs up to a group related to teacher training guidance but there hasn't been a word from there.*

2500 PR1: *## How do we get all the people excited and working in those teams?*

2501 NT1: *But do we really need them anymore? We don't need such a list, if we have a model like this.*

(...)

2503 PR1: *Yes, yes. But I'm currently thinking about the new teams.*

(...)

2505 PR1: *How do we make them so that people don't think that luckily I don't have to go, or... As you know, our working community consists of a lot of people.*

2506 ST5: *But that could also be caused by the fact that the tasks become personified, I think that it's in its way one of our problems. (...)*

A peculiar feature of the teachers' discussions was their use of concrete and colourful examples. Whenever somebody mentioned something that was too abstract or otherwise unclear, the participants would ask for or give clarifying examples. They also used these examples when trying to imaginatively test a new solution in their everyday work. The participants spoke of e.g. pedagogical butterflies, singing-drawing lessons, swimming teams, political parties or some other form of unconventional combination to get their point

through. This can be interpreted as sense making and thus collective knowledge creation. The teachers' discussions of sharing best pedagogical practices with each other in the final session whilst drawing the model provides an example of the use of colourful expressions:

3737 ST6: *See, if you have there a wonderful early educational singing-drawing --
- course*

(...)

3754 ST6: *(...) So things that are good here (points at a team in the paper) could
work here too (points at another team)*

3755 ST3: *## Yes, yes! Share there, yes!*

3756 ST6: *Or here.*

(...)

3758 NT1: *Isn't the teachers' meeting the place?*

3759 ST3: *Yes, then on the other hand we could bring from there (points at the
paper) those...*

3760 ST5: *## Right, that's what I kind of meant.*

3761 ST3: *The fourth Wednesday could be, that we bring all these wonderful
singing drawing courses then to the teachers' meeting.*

By using very concrete examples, the participants were able to share knowledge on even the most complicated ideas and practices. By testing the new ideas, they were clarifying meanings and looking for an agreeable solution. However, sometimes these colourful examples caused confusion and questions among the participants. The following excerpt shows this confusion as the teachers are assessing the functioning of the new teams:

3370 ST6: *Yes, yes, that's way the division is not necessarily based on age, but
rather on what people are interested in. That if you don't want to be in a swimming
team, you are allowed to be in the avoidance team.*

(...)

3375 ST6: *Then you hand out the swimming teaching to those who are interested
in it. And you trust that they can take care of it.*

(...)

3378 ST3: *Are we talking about different... Are we talking about different
matters?*

3379: *F: ## ---*

3380 *NT1: No, we're not really talking about swimming.*

3381 *ST3: No! Yeah, we are..yes...*

3382 *NT1: You really can't juxtapose swimming with curricular work.*

3383 *ST6: No these were... these were...*

3384 *ST3: ## They were play groups.*

3385 *ST6: These are like, I was just trying to demonstrate that it's a completely different matter ---*

An important difference between individual and collective knowledge creation is the focus of the speaking turns. In individual knowledge creation, the focus of speaking turns is on presenting personal statements and thus on the individual themselves. In collective knowledge creation, the focus of the speaking turns is on a shared focus and creating new collective understanding. It is important to note, however, that individual and collective forms of knowledge creation cannot be completely separated, as they intertwine and feed to each other. Even the same speaking turn of a participant could include both forms of knowledge creation. Chapter 5 discussed findings, which enabled the shift from individual knowledge creation towards a more collective form. The most important findings were the decrease in organisational tensions, creation of shared understanding and increased collaboration. The drawing of the Compass Model itself promoted collaboration.

6.3 Transition between Individual and Collective Knowledge

As defined in the methodology of this study (Chapter 4.3), a transition is understood as a process, where the focus of the participants' speaking turns no longer revolves around the opinions, feelings or aspirations of the individual but rather aims at building common knowledge and enhancing the transformation of collective practice. This chapter presents situations, where transition from individual towards collective knowledge creation occurs. It aims to identify the qualitative characteristics of these transitions.

Especially in the first sessions the speaking turns were rather long. Already in the first session, the participants build on the knowledge shared by another participant, but the focus of the speaking turns was not on finding common solutions. In the next example, a

teacher agrees with a previous speaker and adds his or her own experiences of the subject. However, this line of thought is disturbed, as one of the participants changes the subject. This was common in the beginning of the intervention. The participants were more eager on presenting their views than on building collaborative knowledge and searching for common meanings.

164 ST3: (...) But that still I underline the same that this is such a big ship that such an exhaustion might hit. That there are things that one would like to affect, which are talked about a lot, but just that the ship turns so slowly.

165 ST4: It's good for me to contribute after these people; we've probably been here as long. But I really do agree, you do have to have some sort of a positive mind-set in this building, you wouldn't be able to manage this job, if you don't think like that. (...)

166 ST6: If I say something, because I have to leave soon, as I have a meeting. (...) That I think it would be important to understand that the shared culture that was prevailing in the 80s when I arrived, has come and gone ages ago and it's not coming back.

In the third session, the researchers presented three hypotheses of the current state of collaboration at the school. This presentation influenced the participants to begin discussing what the common object is in their activity. When asked by the researchers, they started listing these ideas on a flipchart. This began the transition of knowledge creation, as the participants began to think of common goals and methods to achieve them instead of just discussing their own perspectives. It seemed that this discussion clarified the purpose of the intervention to the participants and began the change in the overall focus of the discussions from individuals to collective knowledge creation.

1220 ST6: From the top of my head, for example social justice or the recognition of society in schoolwork. (...)

*1221 ST3: They are surely larger concepts.
(...)*

1224 ST6: Common goals.

1228 RR2: (...) if I understood Jack correctly, you are still looking for maybe...

1229 ST3: Bigger.

(...)

1235 RR1: *## Vision and goal, just what ---*

1236 ST3: *## Yes!*

1237 ST6: *That could be reached through these methods.*

(...)

1450 ST9: *(...) But how I think about it myself, as Carol said or how you think, but in my mind we should have some sort of common object. (...)*

(...)

1469 ST6: *I don't think that quality basic teaching and quality guidance mean anything. I think they're just rhetoric.*

(...)

1476 ST3: *So they're words that should be opened, what we collaboratively mean with them.*

All in all, researchers and the principal played an important role in the transition between individual and collective knowledge creation. They proposed questions and made conclusions and suggestions to the participants whom in their turn started to develop on them. However, these questions were not always successful in creating discussions, as they created several creative silences in the third session. The teachers themselves also began to ask questions from the other teachers who had worked elsewhere. They had noticed that maybe working in this one Viikki school the whole time was not as important and fruitful as they had first thought. Instead of dismissing the newer teachers, they started to receive special attention and their knowledge and experiences were used as a reference point. The following excerpt is from the fourth session, when the participants began to vision a more concretized outcome for the CL intervention:

1934 RR2: *Did you find this, that you belong to multiple teams, was it in your opinion difficult, disruptive or was it reasonable or... How would you describe it?*

1935 NT2: *Well I don't know, it wasn't a prerequisite in one way or another. (...)*
There are a lot of decisions at school that it is completely irrelevant how they are made, as long as they are made. (...) That somehow you should get to a kind of pretty concrete level, which probably in my experience was created when, you are with the cell, with them, whom you do the work with. Somehow that you are in grips with the everyday matters, with its solutions and sharing...

1936 RR2: (...) So a cell founded around the everyday work, how you said George, somehow. That's how you said.

1937 NT2: Yes, so that it would serve, comes there straight. As I was hearing Jack over there saying, that it would really transfer to your own class, and that you would feel that it's useful.

When in the first sessions teachers referred to their backgrounds and time at the school as a means to prove their worth, in the latter sessions it was used as benchmark, whereupon teachers could introduce good or bad examples to be used in the creation of the new collaborative practice. The Viikki teachers working in early education (classes 1 and 2) have had a functioning team for some time. The teachers utilised their experiences as a positive benchmark, yet, the ideas needed further developing as the teachers had, despite their team structure, worked very individually. These past and current experiences turned out to be crucial in the creation of the new Compass model. Many of its innovative ideas, such as the new board of directors and the grade-based teams were based on the teachers' experiences of practices at previous schools.

In the next example of a transition, the participants are discussing team structure and planning. Jack (ST6) is resisting and is determined to maintain his pedagogical individuality and freedom and shared his 'worst case scenario' of what shared planning could be. Christine (NT1) refers to other teachers and their previous experiences to discuss the benefits of teacher collaboration. Here one can see the transition as Jack first states his own perspective but later begins to ask for concrete examples as he tries to understand Christine's point of view. Christine on the other hand, draws on the experiences and speaking turns of other participants. She uses the previously created knowledge, adds her own to it and then combines individual and collective knowledge creation to prove her point and advance collective innovation.

1900 ST6: So that kind of shared planning I definitely don't want, it's just going to be another shackle.

1901 NT1: I'd go back to what George just said, and would refer to what Mary, what Mary said, that what happened at Järvenpää, and what I had a few years at the Kuopio elementary, where teams functioned very well in my opinion, and that kind of view that George had, I definitely didn't have. (...)

1902 ST6: *Hey, may I ask a question? The same question I wanted to ask Tracy the last time, just give me a concrete example. (...)*

1903 NT1: *Well, we had these kind of pedagogical teams, where we did kind of curricular activities, that type of thing. (...) That in overall we could find... We like tried to find the big picture by subjects.*

In the following example, the participants are searching for common ground and the object of collaboration as they discuss their activities. A typical form of transition is for a person to refer to something that somebody had already said or asked about and then adding their own knowledge to this. The others would then begin to contribute to this line of thought and the discussion evolves into searching for shared understanding:

1313 ST3: *I was thinking about that, when Jack mentioned the acknowledgment of the surrounding society, then shouldn't all the goals of the all-around learning relate to how the child copes, will survive, what kind of preparedness he/she gets to function in the society of the future?*

1314 ST6: *Yes, because they are the divisions of the all-around learning.*

1315 ST3: *## Yes, yes.*

1316 ST6: *The subjects are leaning on their development.*

1317 ST3: *## Yes, yes, yes. So could it be developed into something shared?*

1318 RR2: *How the child copes.*

1319 ST3: *Yes.*

1320 RR1: *What level of preparedness does to child obtain to function in the society.*

During the later sessions, the teachers returned to ideas presented by individual speakers. One of these was the idea of forming a board of directors with teacher representation, which has been so far lacking in the school.

2169 NT1: *So yes, I was still thinking about the need for the Board of directors, that in a way, that the teachers' meeting in a away functions maybe as a Board of directors. That if something comes up in the teachers' meeting that we don't have time to discuss then, then it can be taken to the team and be considered there, and then come back a little wiser on the next time to it.*

2170 NT2: *Yes, which would be great if it really worked, that you had time to think. And then you could make decisions about them or there could come a proposition that we could decide on.*

2171 RR1: *And that, if something, is concrete.*

Later on, the model of the board of directors would be referred to as Christine's (NT1) model. The participants were very eager to ask especially Christine for confirmation and more information later on. There was also another model, Carol's (ST7) model, which consisted of breaking the teachers' meeting into two parts to make it efficient. Thus, transition was clear, when participants suggested or explained something innovative or novel to the school's current practices and it was approved and built on by the others. The utilisation of Christine and Carol's experiences depict the transition from an individual's knowledge of teaching towards collaborative practice. Both suggestions were vital for the ideation of the new model and were incorporated to it.

This sixth chapter has identified several transitions between individual and collective knowledge creation and explained their contents. Firstly, an overall transition between individual and collective knowledge creation was visible in the third session, when the participants started discussing the common object, and in the fourth session as the participants began to concretize the plan for the new model. Transition evolved, when the participants began to pay more attention to what the others were saying instead of what they wanted to say themselves. Secondly, researchers and the principal had a significant role in the transitions as they proposed questions and made conclusions to the speakers so that the knowledge could be more understandable and easily built upon. Thirdly, clarifying questions and examples made by the participants had an important effect as well, as they opened up knowledge of the individuals and paved steps towards shared understanding. The colourful examples had an important role in this. Fourthly, new creative ideas and practices from previous schools and the early education team were also starting points for transitions. Thus, the forms of knowledge creation and characteristics of transitions are depicted in Table 11.

Individual knowledge creation	Characteristics of Transition	Collective knowledge creation
- Personal experiences, opinions and ideas	- Understanding purpose of intervention	- Building on others' public statements
- Expressing personal understanding and one's perspective	- Suggestions, conclusions & clarifying questions	- Shared objective
- Examples from current and former practices	- Searching for shared understanding and common meanings	- Shared understanding
- Lengthy speaking turns	- Innovative ideas and practices	- Clarified meanings
- Focus on current and past situation	- Examples from current and former practices	- Examples from current and former practices
- Focus on monologue	- Shift in focus of discussions	- Focus on creating new collaborative practice
		- Modelling together
		- Focus on dialogue

Table 11 Development of knowledge creation from individual to collective

6.4 Reflecting on the PedaLaboratory Process

The creation of the new Compass Model for Shared Pedagogical Leadership was a multifaceted process. It took time and a variety of questions, suggestions and coffee, but the participants were finally happy and proud of what they had achieved at the end of the intervention process. They even referred to the Compass model as their baby and posted photos of it to social media. At the end of the sixth session, the teachers agreed on implementing the new Compass Model into practice in August 2015 and could not wait to present it to the principals for their approval.

Comparing the final session and its atmosphere to that of the first session, there is a tremendous difference. It seems that the participants were more casual with each other and laughter and jokes were very common in the final session. It seems that the participants finally understood the importance of collaboration, as illustrated in the following discussion:

4469 ST5: I've actually enjoyed this new working method.

4470 ST3: *Yes, this was fun.*

4471 ST5: *Well yes, we should have more of this in all matters.*

4472 ST3: *This is just it, that none of us couldn't have been able to do this by ourselves.*

4473 ST5: *Or it's just insane to do it by one's own, if we really are, then it just doesn't make any sense.*

4474 ST3: *No.*

In comparison to the tensions and negativity in the first sessions, the atmosphere and mood of the last session was drastically different. Even the attitude towards the CL method is drastically changed from the beginning of the intervention. The teachers themselves asked for additional sessions, as they said that they provided a neutral ground for discussions.

4263 ST5: *I think that we have too much (...) that we always discuss and ponder. I've noticed that after these PedaLabs I'm not tired like that.*

4264 N: *Yeah.*

(...)

4266 ST3: *# This is invigorating.*

4267 ST5: *It's invigorating when we speak, but that also that we actually do because we're kind of forced to do so by outsiders.*

4268 ST3: *To do, yes, and not just dither.*

The participants seemed clearly committed to the model and were excitedly speaking how it would be implemented to the whole elementary school in the fall. When compared to the difficulties in the first session, the tone of the discussions has dramatically changed. The individual knowledge of the teachers, who had worked elsewhere had a vital role in the final shape of the Compass Model. It was their experiences and public statements thereof that prompted the innovation. Another important factor in the creation process was the eagerness of the participants to find shared understanding through the use of questions, clarifications and examples. The lengthy discussion of the current and historical challenges in sessions 1-4 as well as the upcoming new curriculum proved to confirm the need for this type of collaboration and new structures. It also seemed that the participants saw collaboration in a new light as they reflected on the entire CL method as well as the model itself after the drawing.

7 Discussion

This chapter combines the presented literature review with the empirical findings of the study. Firstly, it discusses individual and collective knowledge creation and transition in between them. Then, it moves on to analyse learning in the sessions. Finally it discusses the transformation from individually held knowledge towards a collaborative model of practice.

7.1 Transition of Knowledge Creation in the PedaLaboratory

Based on the analysis, the most important forms of individual knowledge creation are sharing examples from previous schools, current practical examples and other private examples, opinions and thoughts. The individual knowledge creation identified in this paper can be interpreted as what Stahl (2000) refers to as public statements.

As people were discussing their own ideas and experiences in the first CL session, they were presenting their own tacit knowledge and making it more explicit. As Gourlay (2006) defined, tacit knowledge is implicitly private and explicit knowledge is built into our everyday language. Both of these forms of knowledge were expressed during the PedaLaboratory intervention. When comparing to the SECI model by Nonaka and Takeuchi (1995), this can be identified as externalisation. In this phase, different individuals are sharing their knowledge with the group. As the participants listened to each other, they were internalising what the others had to say. Sharing personal experiences and practices through practical examples allowed the participants to also engage in socialisation (i.e. transfer tacit knowledge and combine it with tacit knowledge). Throughout the discussions the participants also externalised information as different stakeholders exchanged explicit knowledge with each other by explaining for example the CL method or school history.

The findings are also in line with Stahl (2000), who underlines the importance of personal understanding in the knowledge creation cycle. According to him, people become aware of personal beliefs through activities and thus, through language, their personal beliefs can enter the social process by interacting with people and their shared culture. As personal

beliefs are articulated in words, they can become public statements, which can then be argued and rationalised with other people's public statements.

Collective knowledge creation can be identified through the focus of the participants' speaking turns. If the focus is on true dialogue and shared goals, the knowledge creation is most likely collective. This requires a shared grammar and understanding as well as clarified meanings, which are in line with Stahl's (2000) findings. According to Stahl (2000), shared understanding is created through the argumentation and rationale of people's public statements as well as by clarifying meanings. It is then possible to obtain collaborative knowledge through negotiating perspectives. The lengthy discussions and explorations of the participants can be interpreted as searching for shared understanding. These findings are also similar with Arvaja and her colleagues (2007), who found that students were constructing shared knowledge through shared perspectives.

Further, collaborative knowledge can be formalised and materialized as cultural artifacts, which then in their part can be used in activity. In this study, the new collaborative knowledge of past experiences, current practices and benchmarking has been formalised into the new Compass Model. In August 2015, when the principal introduced the model to the rest of the elementary school teachers the diffusion of the new organisational model began. As the implementation phase is currently in progress, the teachers are using this new cultural artifact in their working activity.

Just as Nonaka, Toyama and Konno (2000) note, knowledge is relational. In this study, it was vital for the participants to relate and interpret the knowledge gained from others to the context of themselves and the school. The colourful examples and the lengthy discussions on meanings are linked to this contextualisation of knowledge. The drawing of the new Compass Model can also be seen as an illustration of this contextualisation. The creation process of the new model also presented the transition of tacit to explicit knowledge.

From a collective knowledge creation perspective, personal comprehensions and tacit understandings were made explicit, then discussed and clarified and finally obtained as shared understandings of collaborative knowledge. The clarifying questions and benchmarks had an important role in the transition between individual and collective

knowledge. Through discussions and using the new knowledge in colourful examples and in drawing of the model, it was also possible for the participants to take this new collaborative knowledge as personal comprehension. As mentioned, the researchers and the principal also had an important role in transition knowledge creation to a more collaborative direction. This is also in line with Gourlay (2006), who writes: “as regards consciously influencing (and thus managing) both common sense and scientific knowledge creation processes, it is interesting to note that the presence of informed outsiders appears useful if not critical”. According to him, outsiders have a critical role in making participants’ assumptions and presuppositions of practices explicit.

7.2 Learning during the Change Laboratory

In cultural historical activity theory and in its application to the study of work and organizations, theory of expansive learning, disturbances and distractions at work are perceived as symptoms of inner contradictions in the structures of activities (e.g. Engeström, 1987; Virkkunen et al. 2001; Engeström & Sannino, 2010). Historically accumulated contradictions can be perceived as drivers for change and development (Engeström 1987) and Change Laboratories aim at overcoming the contradictions. Usually, cycles of expansive learning include change resistance (Engeström 1987, 1999b; Sannino 2008; Engeström & Sannino 2010).

The PedaLaboratory process was designed to follow the phases of Engeström’s expansive learning cycle (1987). The resistance in the beginning of the intervention as well as exploring the current state of the working community can be identified as the first learning action of the expansive cycle, namely questioning. The lengthy discussions on current and historical challenges can be interpreted as the second expansive learning action, i.e. the analysis phase. The third learning action, the modelling phase, can be interpreted to begin when the participants began to understand the purpose of the intervention and discussing common objectives in the third session. This modelling phase continued throughout the end of the process as the participants began materializing their knowledge towards a concrete model of collaborative practice. Practical examples and testing the elements of the new model can be interpreted as expansive cycle’s fourth learning action. The practical examples and attempts to understand the model in practice can also be interpreted as the

fifth action of the expansive cycle. The last session can be seen as including multiple small “micro-cycles” of expansive learning (see also Engeström 1999a), as the teachers questioned each other’s ideas, analysed them and asked or gave each other benchmarks. The three iterative drawing rounds also led to the modelling of a new solution and examining and testing the new model imaginatively via discourse. The last session also included elements of the final step of the expansive cycle, i.e. reflecting on the process. The expansive learning process still continues as the model is currently being tested in the Viikki school.

A contradiction at the school can be identified between the constantly increasing workload, fast working pace, decreasing resources and the teachers’ desire to simultaneously provide high quality teaching. Engeström (1999b) discusses the importance of conflicts in redefining and redistributing tasks within organizations and teams in the midst of change. Such conflicts should be openly debated and articulated if progress is to be made towards creating new forms of knowledge and practice. In the PedaLaboratory, the discussions of current and historical challenges allowed the participants to identify the needs for change and to create a new model that could help alleviate the workload and organise their work and management better. Understanding the historical causes of their current challenges also seemed to help in creating common goals. Through the discussions, the teachers began to learn from each other as well as build collective knowledge. This learning would then allow them to begin collaboration and start planning new, more collaborative practices.

According to the knowledge creation perspective, learning takes place through sustained collaborative activities aiming to create new knowledge through work on shared objects (e.g. Paavola & Hakkarainen 2005; Damşa et al. 2010). Collective learning was especially visible in the last session, when the teachers focused on drawing the new model and utilising all the new shared collaborative knowledge that they now had. The participants also focused on using existing ideas and aligning them with others’ in order to create new meanings and understanding as discussed by (Ludvigsen 2010; in Damşa 2014). In expansive learning terms, these new meanings and understandings are learning of something that is not yet there (Engeström 1987). It seems that the teachers were able to create a common grammar, a new object and concept for collective activity (the new Compass Model) and implement it into practice (also Stahl 2000; Engeström & Sannino 2010; Engeström et al. 2015). The learning process was not, however, linear nor is there

any evidence that the learning in these sessions would lead to long lasting change in their behaviour, as in many traditional learning theories (Engeström 2001). Rather, the learning in the intervention occurred as a by-product of the creative development process of the new Compass Model (see also Tuomi-Gröhn & Engeström 2003).

7.3 Transformation to a Collaborative Model of Practice

Previous literature has linked creativity with knowledge creation and sharing (e.g. Paavola et al. 2004; Hakkarainen 2005; Yeh et al. 2012). Engeström (1999a) discusses creative externalisation, in which individuals influence the collective through their ideas and innovations. As externalisation progresses, it develops into searching for new solutions and peaks when a new solution is designed and implemented. As the knowledge creation transitioned from individuals to collective, the participants were able to come up with more creative solutions to the challenges they had discussed in the beginning of the intervention. The peak of creativity and materialization of the collective knowledge creation was reached in the sixth session, when the participants were drawing the new Compass Model and discussing how it would work and how it would be implemented into practice.

Robinson et al. (2010) state that development of collaboration and sharing knowledge can prove to be difficult or even cause anxiety and conflict for professionals. This could be an additional explanation for the participants' need to bring up their background and depict a social pecking order in the beginning of the intervention. However, these tensions were decreased especially after the fourth session. As the sessions continued, it seemed that the intervention setting presented a place for lively discussions and the development of trust. Just as Gourlay (2000) presents, knowledge is created through human activities and practices and an enabling context is vital for the process. It seems that the enabling context of the knowledge created for the Compass Model was the Change Laboratory room. The participants requested for additional CL sessions from the researchers to continue the implementation process and to ensure its success. The researchers agreed to facilitate a couple of follow-up meetings in 2016.

In particularly the sixth session, the teachers were referring to each other quite a bit. Rather in a similar manner as Engeström (1994) noted, there was a large amount of “overlap and immediate response in the teachers' utterances”. Further, in a similar manner, they

“frequently spoke simultaneously, expressed affirmation or disaffirmation during another’s speech or broke in to respond or continue the thought in their own words” (Engeström, 1994, 50). The teachers were so excited in the last session that they had to ask for permission to speak till the end of their idea. They were talking on top of each other quite a bit. They also asked more for permission to speak their mind: “ST2: May I say now”, ST6: “May I say something”. This can also be interpreted as eagerness to contribute to the collective creation of shared practice.

8 Conclusions

This paper has discussed knowledge creation in a Change Laboratory intervention called PedaLaboratory conducted in the Finnish Viikki Teacher Training School. The studied teachers were customary to working independently and there was lack of collaboration. Through the CL sessions, a need for change and transition from individual to collective knowledge creation began to emerge and later materialize into a new collaborative model to guide the teaching practice, the Compass Model for Shared Pedagogical Leadership. This chapter draws conclusions, assesses the quality of the study and presents ideas for further study.

8.1 From Individual to Collective Knowledge Creation

The individually held knowledge of the teachers transitioned slowly to collective knowledge through cycles of expansive learning and social processes of knowledge building. A significant impact on the transition was the development of shared understanding of the current challenges at the school as well as the need for change. The participants constantly asked for questions and clarifying examples, which on their part helped in the transition of knowledge and practices. The previous experiences of some of the teachers impacted the development of the new Compass Model. It was their creative input and use of their experience as benchmark that enabled the group to collaboratively begin planning for a new organisation model in the school. As noted by one of the teachers, none of them could have done it alone, or “it would have been dumb” to do so. During the intervention process, the participants transformed from individuals to a collaborative collective that aimed to create a new collaborative practice.

The findings of this paper are in line with those of Virkkunen (2006), who noted that “only after the group became frustrated in its attempt to find a solution were these principles questioned, and a new principle, team-based organization, was taken as the starting point for solving the problem”. In the beginning of the CL intervention called PedaLaboratory, the participants created knowledge very individually. The participants had long speaking turns to prove or discuss their own opinions and experiences. Towards the third and fourth sessions, the participants began to build on each other’s speaking turns and thus transition

towards collective knowledge creation. Towards the end of the intervention, the teachers began to collaborate in earnest efforts to create a new collaborative practice. The created shared tool, the “Compass Model for Shared Pedagogical Leadership” is a materialization of these efforts. The implementation of the new Compass model is currently in progress. The follow-up sessions and further interviews with the teachers will provide more information on how the model has worked in practice. Future studies of our research team will address these issues.

The findings of this study are in line with the previous literature noting that collective knowledge creation is linked with increasing creativity compared to its individual form. This study also agrees with the knowledge creation perspective (Paavola et al. 2004; Hakkarainen 2005), as it has shown that the creation of the new Compass model showed increasing learning through collaborative actions surrounding it. Throughout the sessions, the participants learned from each other and were able to collaboratively create something completely new, something that had not yet been there. It can be concluded that collective knowledge creation can be seen as leading to expansive learning.

The findings of this study resonate with learning actions of expansive learning and also with Stahl’s study (2000), according to which learning can be seen as a multi-phased social process of individual and collective knowledge creation. The findings of this study can be utilised to further elaborate the diagram of knowledge building and learning processes presented in Figure 4. In Stahl’s (2000) diagram, the transition is seen occurring through clarifying meanings, shared understanding and negotiating perspectives. The transitions between collective and individual knowledge creation are now also added to the figure. This would be the transition arrow on the left in Figure 14. More research is needed, however, to theoretically further elaborate the diagram.

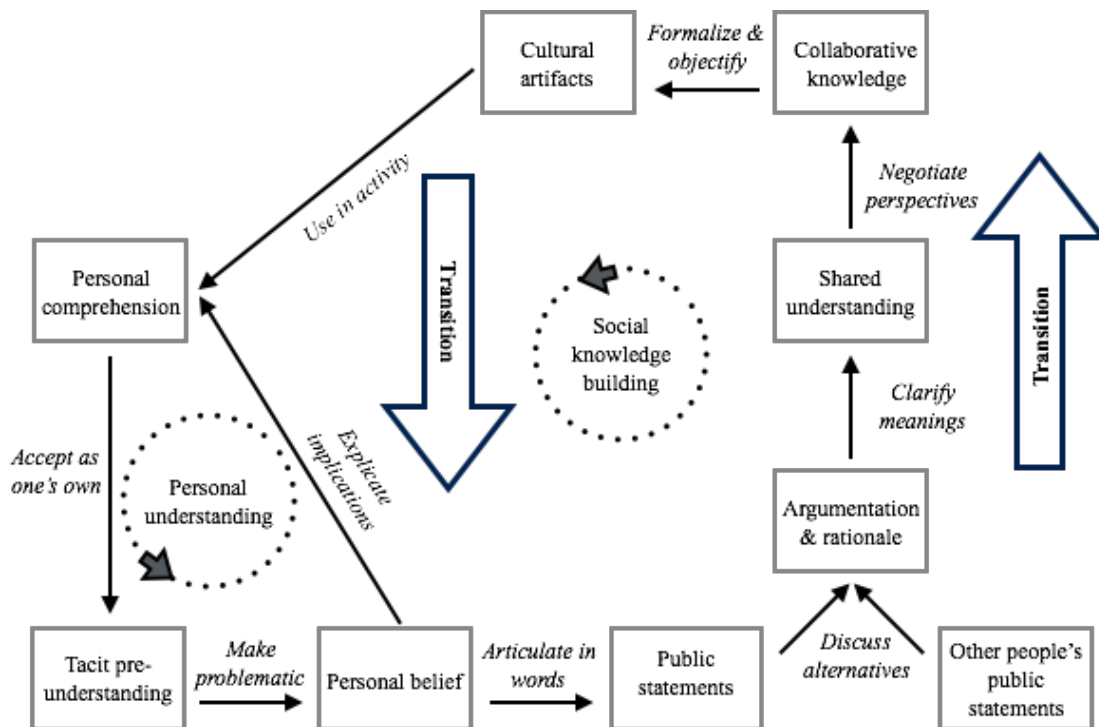


Figure 14 Diagram of knowledge creation, transition and learning (adapted from Stahl 2000)

Individually held knowledge of teaching transformed to a new collaborative practice through multiple small cycles of expansive learning (also Engeström 1999a) as well as through the social process of knowledge building as presented by Stahl (2000). Understanding and agreeing upon current challenges, decreasing tension between the participants and sharing and comparing knowledge proved to be vital for the transition of individually held knowledge of teaching. Another important aspect was the finding of common goals, which enabled the transition of knowledge towards a more collaborative direction. As the participants became more familiar with each other and started to trust each other's opinions, they began to share more knowledge of their current and past teaching practices.

8.2 Assessing the Quality of the Study

This chapter examines the quality of the conducted study. Firstly, it discusses the validity and reliability of the study. It then moves on to presenting the role of the researcher. Finally, it discusses the limitations of the study.

The study was conducted in a Finnish Teacher Training School along with the teachers and principal of its elementary school. The data has been collected in collaboration with the other members of the research group. Due to the school's teacher training task, the teachers have more versatile job description than the average elementary school teacher. As the study has been conducted at only one school with limited participants and mostly qualitative research methods, the findings cannot be straightforwardly generalised. Generalisation is not, however, the goal of a qualitative study nor is it entirely possible to achieve by qualitative means. The main purpose of a qualitative study is to gain rich, deep understanding of a phenomenon or setting (Gibb 2007). More research is needed on the knowledge creation practices of other schools in different settings to increase the validity and reliability of this study.

Qualitative research is interpretative research, as the researcher typically is involved in a sustained and intensive experience with the participants. The primary goal is therefore not on the validity and reliability of measurements but rather on providing trustworthy representations and authentic information. The primary means of achieving external validity is the development of a rich, robust, descriptive narrative of the findings. (Creswell 2009, 177) Validity in a qualitative study cannot be measured or ensured in a similar fashion as in quantitative studies. Instead, it requires checking the accuracy of the qualitative findings by employing certain procedures (Creswell 2009, 199; Gibb 2007). These procedures have been followed and the accuracy has been checked accordingly in this study. The transcripts and codes used are checked according to the procedures suggested by Gibb (2007). Any identification of the respondents has been removed from the data to ensure anonymity in reporting the findings.

To increase its validity and reliability, this study used both qualitative and quantitative methods in analysis of the six CL sessions. The methods have been chosen to present the findings of the study as neutrally as possible. Complete objectivity is not possible in studies in social sciences and as the studied sample is limited, generalisations based on it are not possible either. According to Gibb (2007), qualitative reliability is reached, when the researcher's approach is consisted across different researchers and projects. The methods and analysis of this study have been discussed thoroughly with the other members of the research team as well as with my supervisors. The second supervisor, Yrjö Engeström, did not take part in the PedaLaboratory process.

The validity and reliability have been assessed through the procedures suggested by Gibb (2007) and enforced by Creswell (2009, 190). One of these steps is the identification and clarification of the bias that the researcher brings to the study. Thus, in the following I will explain my role as a researcher. I have had the opportunity to participate in this research from the beginning. Following from the qualitative case study framework chosen for this researcher, I, as the researcher, was the primary means of data collection, interpretation and analysis. As the role of the researcher is crucial in qualitative research, consumers of this research need to know about the human instrument (Creswell 2009, 177). My background is in business and adult education, as I also have a Master's degree in Economics. My first Master's thesis utilised quantitative methods. Through my education and my work experience in accounting and IT, I am more familiar with using quantitative methods and thus I wanted to use some quantitative element in this study as well. Before this research project, I was not at all familiar with the Change Laboratory method. Further, I had no prior experience from the school context apart from studying at a Finnish elementary school in the 1990s. This enabled a more neutral stance towards the school context, as the schooling system has changed drastically since my school years.

I collected interview data asking questions about the history of the Viikki school and took part to the creation of the history sheet (depicted in Figure 5). Other than that, my role in the CL sessions was that of the outsider observer. I was present in all six sessions and the observer's role allowed me to obtain insight from the customs and practicalities of the studied organisation without interfering with it. Having been part of the research group and present in the CL sessions has given me great insight into the knowledge creation process of the teachers. Gestures, closeness of the participants and tones of voices played an important role in the sessions, but are not conveyed in the transcripts. Thus, participating in the CL sessions and in collecting the additional data allowed me to gain more information to use in my analysis.

8.3 Implications for Further Research

Although the PedaLaboratory project led to a shared model and its implementation and can thus be considered successful, some limitations to the study need to be addressed. More

data is needed from the implementation phase to increase the validity and reliability of the intervention and this study. Methodological and theoretical issues and openings conducted in this study need to be developed in future research. Deeper analysing and discussing of the contents of the new Compass model can shed new light into the findings of this study. Overall atmosphere in the sessions has not been studied in detail, but as it seemed to have a positive effect on the knowledge creation it can form a topic of future research. The Finnish schooling system and teacher training functions are rather unique. The findings of this study could be different, if it was to be conducted in another school context or other country. There is also a certain level of trust and a relatively homogenous culture in Finland. This could also play a role in this study, differentiating its findings from similar studies in other cultures. Further studies should investigate the newly created collaborative practices of the teachers, which have emerged as a consequence of the implementation of the Compass Model. How was the shared knowledge implemented into collective practices?

My on-going doctoral dissertation will look deeper into the knowledge creation and sharing of this PedaLaboratory intervention. It will also utilise the follow-up sessions as data. The focus will be also on how the knowledge created and shared in the intervention has transformed the practices of teaching. The follow-up sessions of a Change Laboratory have rarely been studied. However, they provide vital information on how the intervention succeeded and for developing the organisation and its practices (Kajamaa 2011). Analysing the videotapes and the behaviour of the participants should also be considered, as they can provide some further information for knowledge creation and sharing (see also Weingart et al. 2004).

Further research should also be conducted to create a deeper understanding of why knowledge is created and shared and how these processes can be promoted in and outside school interventions. A similar analysis should be conducted in different knowledge-intensive fields. The methods developed and used in this study could serve as analytical tools and provide useful information also for other types of knowledge-intensive organisations.

9 References

- Arvaja, M., Salovaara, H., Häkkinen, P., & Järvelä, S. (2007). Combining individual and group-level perspectives for studying collaborative knowledge construction in context. *Learning and Instruction, 17*(4), 448–459.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.
- Chou, S.-W., & Tsai, Y.-H. (2004). Knowledge Creation: Individual and Organizational Perspectives. *Journal of Information Science, 30*(3), 205–218.
- Creswell, J. W. (2009). *Research Design: Qualitative, Quantitative and Mixed Approaches*. Sage publications
- Damşa, C. I. (2014). The multi-layered nature of small-group learning: Productive interactions in object-oriented collaboration. *International Journal of Computer-Supported Collaborative Learning, 247–281*.
- Damşa, C. I., Kirschner, P. a., Andriessen, J. E. B., Erkens, G., & Sins, P. H. M. (2010). Shared Epistemic Agency: An Empirical Study of an Emergent Construct. *Journal of the Learning Sciences (Vol. 19)*.
- Definition of transition in English (2016). Retrieved January 20, 2016, from <http://www.oxforddictionaries.com/definition/english/transition>
- Engeström, Y. (1987). *Learning by Expanding: An Activity-Theoretical Approach to Developmental Research*. Orienta-Konsultit Oy. Helsinki.
- Engeström, Y. (1994). *Teachers as collaborative thinkers: activity-theoretical study of an innovative teacher team*. Teachers' minds and actions: Research on teachers' thinking and practice, 43-61.
- Engeström, Y. (1999a). Activity theory and individual and social transformation. In Y. Engeström, R. Miettinen, & R.-L. Punamäki (Eds.), *Perspectives on activity theory* (pp. 19–38). Cambridge University Press.
- Engeström, Y. (1999b). Innovative Learning in Work Teams - Analysing Cycles of Knowledge Creation in Practice. In Y. Engeström, R. Miettinen, & R.-L. Punamäki (Eds.), *Perspectives on Activity Theory*. Cambridge: Cambridge University Press.
- Engeström, Y. (2001). *Expansive Learning at Work: Toward an activity theoretical*

- reconceptualization. *Journal of Education and Work*, 14(1), 133–156.
- Engeström, Y., Engeström, R., & Suntuo, A. (2002). Can a School Community Learn to Master Its Own Future? An Activity-Theoretical Study of Expansive Learning Among Middle School Teachers. In G. Wells & G. Claxton (Eds.), *Learning for life in the 21st Century: Sociocultural perspectives on the future of education* (pp. 211–224). Cambridge, MA: Blackwell.
- Engeström, Y., Kajamaa, A., Kerosuo, H. & Laurila, P. (2010). Process Enhancement Versus Community Building: Trancending the Dichotomy through Expansive Learning. In K. Yamazumi (Ed.), *Activity theory and fostering Learning: Developmental interventions in education and work* (pp. 1-28). Osaka: Center for HumanActivity Theory, Kansai University.
- Engeström, Y., Kajamaa, A., Lahtinen, P. & Sannino, A. (2015). Toward a grammar of collaboration. *Mind, Culture and Activity, an International Journal*, 22 (2): 92-111.
- Engeström, Y., Kerosuo, H. & Kajamaa, A. (2007). Beyond discontinuity: Expansive organizational learning remembered, *Management Learning Journal*, 38(3), 319-336.
- Engeström, Y., Rantavuori, J., & Kerosuo, H. (2013). Expansive learning in a library: Actions, cycles and deviations from instructional intentions. *Vocations and Learning*, 6(1), 81-106.
- Engeström, Y., & Sannino, A. (2010). Studies of expansive learning: Foundations, findings and future challenges. *Educational Research Review*, 5(1), 1–24.
- Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International journal of qualitative methods*, 5(1), 80-92.
- Gibbs, G. R. (2007). Analyzing qualitative data. In U. Flick (Ed.), *The Sage qualitative research kit*. London: Sage.
- Gourlay, S. (2006). Conceptualizing knowledge creation: A critique of Nonaka's theory. *Journal of Management Studies*, 43(7), 1415–1436.
- Hakkarainen, K. (2005). Asiantuntijuus ja oppiminen työelämässä. In *Asiantuntijuus ja oppiminen työelämässä. Esitelmä CompetenceA-killan seminaarissa Osaaminen murroksessa – työelämälähtöisen osaamisen tunnistaminen ja tunnustaminen, 12.4.2005, Hilton Strand, Helsinki.* (pp. 1–16).

- Hakkarainen, K., Palonen, T., Paavola, S. & Lehtinen, E.: 2004, *Communities of networked expertise: Professional and educational perspectives*. Elsevier, Amsterdam.
- Kajamaa, A. (2011). *Unraveling the helix of change: An activity-theoretical study of health care change efforts and their consequences*. Helsinki: Unigrafia.
- Kerosuo, H. (2011). Caught between a rock and a hard place: From individually experienced double binds to collaborative change in surgery. *Journal of Organizational Change Management*, 24(3), 388–399.
- Kerosuo, H., Kajamaa, A. & Engeström, Y. (2010). Promoting innovation and learning through Change Laboratory: An example from Finnish Health care. *Central European Journal of Public Policy*. Special Issue on Knowledge Governance 4 (1), <http://www.cejpp.eu>.
- Kimmerle, J., Cress, U., & Held, C. (2010). The interplay between individual and collective knowledge: technologies for organisational learning and knowledge building. *Knowledge Management Research Practice*, 8(1), 33–44.
- Kimmerle, J., Moskaliuk, J., Harrer, A., & Cress, U. (2010). *Visualizing Co-Evolution of Individual and Collective Knowledge*. *Information, Communication & Society* (Vol. 13).
- King, W., & Ko, D. (2001). Evaluating knowledge management and the learning organization: An information/knowledge value chain approach. *Communications of the Association for Information Systems*, 5(14), 1–27.
- Kuusisaari, H. (2013). Teachers' collaborative learning – development of teaching in group discussions. *Teachers and Teaching*, 19(1), 50–62.
- Nonaka, I., & Konno, N. (1998). The Concept of “Ba”: Building a Foundation for Knowledge Creation. *California Management Review*, 40, 40–54.
- Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford university press.
- Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation. *Long Range Planning*, 33(1), 5–34.
- Paavola, S., & Hakkarainen, K. (2005). The knowledge creation metaphor - An emergent epistemological approach to learning. *Science and Education*, 14(6), 535–557.

- Paavola, S., Lipponen, L., & Hakkarainen, K. (2004). Models of Innovative Knowledge Communities and Three Metaphors of Learning. *Review of Educational Research*, 74(4), 557–576.
- Popadiuk, S., & Choo, C. W. (2006). Innovation and knowledge creation: How are these concepts related? *International Journal of Information Management*, 26(4), 302–312.
- Raike, A., Sunikka, A., & Saarinen, L. (2013). Collaborative Knowledge Building for Accessibility in Higher Education. The inclusion of human diversity on the teaching & learning processes at Aalto University. *Co-Create 2013. Aalto University Publication Series SCIENCE + TECHNOLOGY*, 15, 325–336.
- Ritala, P., Olander, H., Michailova, S., & Husted, K. (2015). Knowledge sharing, knowledge leaking and relative innovation performance: An empirical study. *Technovation*, 35, 22–31.
- Robinson, M., Anning, A., & Frost, N. (2010). “When is a teacher not a teacher?”: knowledge creation and the professional identity of teachers within multi-agency teams, *Studies in Continuing Education*, 27(2).
- Säljö, R. (2003). Epilogue: From Transfer to Boundary-crossing. In T. Tuomi-Gröhn & Y. Engeström (Eds.), *Between school and work: new perspectives on transfer and boundary-crossing* (pp. 311–321). Amsterdam: Pergamon.
- Sannino, A. (2008). From Talk to Action: Experiencing Interlocution in Developmental Interventions. *Mind, Culture, and Activity*, 15(3), 234–257.
- Schultze, U., & Stabell, C. (2004). Knowing What You Don ’ t Know? Discourses and Ulrike Schultze and Charles Stabell. *Journal of Management Studies*, 41(4), 549–573.
- Stahl, G. (2000). A Model of Collaborative Knowledge-Building. Fourth International Conference of the Learning Sciences, 10, 70–77.
- The Viikki Teacher Training School, University of Helsinki (n.d) Official school presentation. Retrieved March 31, 2016, from http://www.vink.helsinki.fi/files/presentation_viikki_tts_en.pdf
- Tuomi-Gröhn, T. (2003). Developmental transfer as a goal of internship in practical nursing. In T. Tuomi-Gröhn & Y. Engeström (Eds.), *Between school and work: New perspectives on transfer and boundary-crossing* (191-231). Taylor & Francis.
- Tuomi-Gröhn, T., & Engeström, Y. (2003). Conceptualizing transfer: From standard

- notions to developmental perspectives. In T. Tuomi-Gröhn & Y. Engeström (Eds.), *Between school and work: New perspectives on transfer and boundary-crossing* (pp. 19–38). Taylor & Francis.
- Virkkunen, J. (2006). Dilemmas in building shared transformative agency. *Activités*, 3(1), 44–66.
- Virkkunen, J., Engeström, Y., Pihlaja, J., & Helle, M. (2001). *Muutoslaboratorio - Uusi tapa oppia ja kehittää työtä*. Helsinki.
- Virkkunen, J., & Newnham, D. S. (2013). *The Change Laboratory. A Tool for Collaborative Development of Work and Education*. Sense Publishers.
- Virkkunen, J., & Tenhunen, E. (2010). Finding a Concept That Integrates Specialists' Know-How: The Case of Special School for Handicapped and Neurologically Ill Children. *Actio: An International Journal of Human Activity Theory*, (3), 1–24.
- Weingart, L. R., Olekalns, M., & Smith, P. L. (2004). Quantitative Coding of Negotiation Behavior. *International Negotiation*, 9(3), 441–456.

Appendix

List of Used Codes

Code	Meaning
Identified Challenges	
X1	Possibility to influence one's work
X2	Lack of common goal, disunity
X3	Size & complexity of building
X4	Commitment issues
X5	Haste, amount of work
X6	Slow pace of changes (the ship turns so slowly)
X7	Decision making issues
X8	Lack of pedagogical leadership
X9	Distribution of work
X10	Sense of community
X11	Belief in "one single solution" that does not exist
X12	Different interests, culture of individuality
X13	Communication issues
X14	Monetary issues
X15	New curriculum
X16	Management / leadership issues
X17	Lack of planning
X18	Not seeing things through
X19	Structural issues
X20	Competition between teachers
X21	Cliques, bad atmosphere, lack of support
X22	Lack of collaboration & knowledge sharing
X23	Accountability
X24	High expectations
X25	Trainees
X26	Previous / on-going developmental discussions
X27	Already made changes, excess of changes
Resistance related to the Change Laboratory	
Z1	Questioning, topic unclear, purpose of the intervention
Z2	Not enough participants, possibility to influence slim
Presentation of background	
W1	Time worked at school
W2	Reference to background at another school or other position