

Studies of expansive learning: Foundations, findings and future challenges

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ABSTRACT

The paper examines studies based on the theory of expansive learning, formulated in 1987. In recent years the theory has been used in a wide variety of studies and interventions. The theory builds on foundational ideas put forward by Vygotsky, Leont'ev, Il'enkov, and Davydov, key figures in the Russian school of cultural-historical activity theory. Studies based on the theory are reviewed in six sections: expansive learning as transformation of the object, expansive learning as movement in the zone of proximal development, expansive learning as cycles of learning actions, expansive learning as boundary crossing and network building, expansive learning as distributed and discontinuous movement, and formative interventions. A separate section is devoted to critiques of expansive learning. It is concluded that the ultimate test of learning theories is how they help practitioners to generate learning that grasps pressing issues the humankind is facing. The theory of expansive learning currently expands its analyses both up and down, outward and inward. Moving up and outward, it tackles learning in fields or networks of interconnected activity systems with their partially shared and often contested objects. Moving down and inward, it tackles issues of subjectivity, experiencing, personal sense, emotion, embodiment, identity, and moral commitment.

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1. Introduction

Consider the following two complex learning challenges:

- (1) The municipal home care in the City of Helsinki supports elderly people who live at home with various kinds of medical problems. Home care workers visit their clients to dispense medications and conduct various routine chores such as showering and preparing meals. The home care managers and workers are now struggling to redefine their work and services so as to meet such demanding problems as increasing loneliness and social exclusion, loss of physical mobility, and dementia. The challenge is complicated by the fact that the population of Finland is aging very rapidly and it is increasingly difficult to recruit and retain competent home care workers. How can the managers, workers and clients learn to work in such a way that the new needs are met and the society can afford to provide the service?
- (2) As journals and books have increasingly become available through the Internet, researchers seldom need to visit university libraries physically. University libraries are becoming automatic mediators of digital information for researchers on the one hand, and physical book repositories or reading halls for students on the other hand. This threatens the

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professional competencies and jobs of librarians. The managers and workers of the libraries of University of Helsinki are struggling to redefine their work and services on the basis of creating partnerships and flexible practices of collaboration with research groups in need of comprehensive design and maintenance of their information management. How can librarians and research groups learn to operate in such a new way?

These two are examples of efforts at expansive learning,² that is, learning in which the learners are involved in constructing and implementing a radically new, wider and more complex object and concept for their activity.

Sfard (1998) suggested that there are two basic metaphors of learning competing for dominance today: the *acquisition* metaphor and the *participation* metaphor. While such a dichotomy does reproduce some recent debates, for example between computationalist and situated explanations of cognition, it is an oversimplification that may eventually be more misleading than useful (for an earlier critique, see Edwards, 2005).

The key dimension underlying Sfard's dichotomy is derived from the question: Is the learner to be understood primarily as an individual or as a community? This is an important dimension, largely inspired by the notion of community of practice put forward by Lave and Wenger (1991) and Wenger (1998). However, an attempt to construct a one-dimensional conceptual space for the identification, analysis and comparison of theories is bound to eliminate too much of the complexity of the field of learning. The potential and significance of the theory of expansive learning (Engeström, 1987) calls for a more multi-dimensional treatment.

To locate the theory of expansive learning more adequately in the conceptual field of learning theories, three additional dimensions may be usefully employed:

- Is learning primarily a process that transmits and preserves culture or a process that transforms and creates culture?
- Is learning primarily a process of vertical improvement along some uniform scales of competence or horizontal movement, exchange and hybridization between different cultural contexts and standards of competence?
- Is learning primarily a process of acquiring and creating empirical knowledge and concepts or a process that leads to the formation of theoretical knowledge and concepts?

The 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. Even though Felstead et al. (2003, p. 362) write that the theory of expansive learning merely extends the participation metaphor, this theory does not fit into either one of the two metaphors suggested by Sfard (1998). In fact, from the point of view of expansive learning, both acquisition-based and participation-based approaches share much of the same conservative bias. Both have little to say about transformation and creation of culture. Both acquisition-based and participation-based approaches, the latter especially in the original legitimate-peripheral-participation framework (Lave & Wenger, 1991), depict learning primarily as one-way movement from incompetence to competence, with little serious analysis devoted to horizontal movement and hybridization. Acquisition-based approaches may ostensibly value theoretical concepts, but their very theory of concepts is quite uniformly empiricist and formal (Davydov, 1990). Participation-based approaches are commonly suspicious if not hostile toward the formation of theoretical concepts, largely because these approaches, too, see theoretical concepts mainly as formal 'bookish' abstractions.

So the theory of expansive learning must rely on its own metaphor: expansion. The core idea is qualitatively different from both acquisition and participation. In expansive learning, learners learn something that is not yet there. In other words, the learners construct a new object and concept for their collective activity, and implement this new object and concept in practice. This shift in metaphors has been noted by Paavola, Hakkarainen and Lipponen (2004) who suggest knowledge creation as a new, third metaphor, and by Fenwick (2006b) who suggests participation, expansion, and translation as relevant alternative and complementary metaphors for theorizing work-based learning.

In this paper, we will examine studies based on the theory of expansive learning. The theory was initially formulated some 20 years ago (Engeström, 1987). Especially during the past five years or so, it has been used in a wide variety of studies and interventions. The topics range from adult mathematics learning in workplaces (FitzSimons, 2003) and hybrid educational innovations (Yamazumi, 2008) to the impact of ICT reforms on teacher education (Rasmussen & Ludvigsen, 2009). The theory has been used in a study of the development of a conflict-monitoring network (Foot, 2001), in a study of multi-organizational change efforts in an industry (Hill, Capper, Wilson, Whatman, & Wong, 2007), and in an analysis of the emergence of biogas production as a learning process (Pereira-Querol & Seppänen, 2009). These studies also deal with learning in and for interagency working with youngsters who are at-risk of exclusion and have special educational needs (Daniels, 2004), as well as with the uses of weblogs in e-learning (Makino, 2007), and learning among nurses and adult educators who function as 'portfolio professionals' in that they contract their services to multiple employers and organizations (Fenwick, 2004). The theory has been used as framework in a study of simulated clinical experience in university nursing education (Haigh, 2007), in a study of learning as boundary crossing in a school-university partnership (Tsui & Law, 2007), and in a study of promoting new types of transfer between school and workplace (Konkola, Tuomi-Gröhn, Lambert, & Ludvigsen, 2007). The

² The terms expansive learning and expansive learning activity are in this paper used synonymously, as they were in the original formulation of the theory of expansive learning (Engeström, 1987).

work of Gutiérrez and her colleagues on expanded 'third spaces' for learning and literacy development has been influenced by the theory of expansive learning (Gutiérrez & Larson, 2007; Gutiérrez, 2008; Gutiérrez & Vossoughi, 2010). Barowy and Jouper's (2004) study of school change as personal and systemic co-development built on the theoretical idea of expansion. Although necessarily incomplete, the list indicates that the theory of expansive learning has been found particularly useful in analyses of learning in non-traditional, hybrid and multi-organizational settings.

The theory of expansive learning has been most systematically and cumulatively used in studies conducted at University of Helsinki, in the Center for Activity Theory and Developmental Work Research (since the beginning of 2009, called Center for Research on Activity, Development and Learning CRADLE; hereafter called the Helsinki Center). In this paper, we devote a lot of attention to analyses and findings of the 25 doctoral dissertations³ and other published studies produced in the center. As the Helsinki Center has been and continues to be literally the cradle, that is, the main site of systematic and cumulative development, of the theory of expansive learning, this choice of focus enables us to go deeper into the potentials and problems of the evolution of the theoretical framework itself. We will also discuss a number of studies produced elsewhere, especially the section on critiques of expansive learning.

This article cannot go deeply into the general development of activity theory. For gaining such background, a useful complementary text is that of Sannino, Daniels, and Gutierrez (2009). Also this article is not intended to cover the broad spectrum of uses of cultural-historical activity theory in educational research. Such a review has been published by Roth and Lee (2007). A volume edited by Daniels, Edwards, Engeström, Gallagher, and Ludvigsen (2009) presents a selection of studies on learning across boundaries and agencies, largely inspired by the theory of expansive learning. A volume edited by van Oers, Wardekker, Elbers, and van der Veer (2008) offers a selection of activity-theoretically inspired studies of learning that are not based on the theory of expansive learning.

In the next section, we will briefly sketch the historical and societal landscape in which demand for expansive learning has emerged. We will then discuss the theoretical roots of this approach. After that, we will lay out the main ideas of the theory of expansive learning. The following seven sections are each devoted to a specific aspect of the theory. The two final sections deal with critiques and future challenges of the theory of expansive learning.

2. Societal and historical demand for a new kind of learning

In *Learning by Expanding*, the emergence of expansive learning activity was seen as a consequence of historical transformations in work.

"The increasingly societal nature of work processes, their internal complexity and interconnectedness as well as their massive volumes in capital and capacity, are making it evident that, at least in periods of acute disturbance or intensive change, no one actually quite masters the work activity as a whole, though the control and planning of the whole is formally in the hands of the management. This creates something that may be called 'grey zones', areas of vacuum or 'no man's land', where initiative and determined action from practically any level of the corporate hierarchy may have unexpected effects." (Engeström, 1987, pp. 113–114)

The inner contradictions of capitalist production and organization of work have remained at the center of research on expansive learning. In the Helsinki Center these studies have been carried out within a research program called developmental work research (for earliest studies, see Engeström & Engeström, 1986; Toikka, Hyötyläinen, & Norros, 1986). Most of the empirical studies and interventions completed by researchers of the Helsinki Center have been conducted in workplace settings (for recent representative collections, see Engeström, 2005; Engeström, Lompscher, & Rückriem, 2005).

The basic argument for such a focus on work settings is that traditional modes of learning deal with tasks in which the contents to be learned are well known ahead of time by those who design, manage and implement various programs of learning. When whole collective activity systems, such as work processes and organizations, need to redefine themselves, traditional modes of learning are not enough. Nobody knows exactly what needs to be learned. The design of the new activity and the acquisition of the knowledge and skills it requires are increasingly intertwined. In expansive learning activity, they merge (Engeström, 1999a).

Pihlaja's (2005) study adds to this argument the important aspect of historically changing types of generalizing in work processes. Generalization is at the root of learning. Generalization is based on identifying and mastering variation. In mass production, what needed to be mastered was variation in the ways different workers performed the same tasks. This led to standardization of key actions and action sequences. In modern flexible mass production or 'lean production', what needs to be mastered is variation in the form of deviations from an optimal streamlined process, that is, breaks, disturbances and waste. This leads to continuous process optimization.

Today the life cycles of entire product, production and business concepts are rapidly becoming shorter. Correspondingly, the rhythm of overall concept-level transformations is accelerated. In other words, what needs to be mastered is variation in the sense of constantly shifting product, production and business concepts. This is not anymore achievable by means of technical optimization of isolated actions and processes. Accelerated concept-level changes in work and organizations

³ In Finland, doctoral dissertations must be published in the form of printed books. They are regularly also available free of charge in digital form in the Internet.

require generalization and learning that expand the learners' horizon and practical grasp up to the level of collective activity systems.

There are two additional factors that add weight to the societal need for expansive learning. The first one is the emergence and escalation of social production or peer production (Benkler, 2006) that utilizes the interactive potential of the Internet, or Web 2.0. This opens up a field of possibilities for the formation of new types of activities and use values with huge expansive potentials, such as Linux and Wikipedia.

The second factor is the emergence and increasing presence of global threats and risks, or 'runaway objects' (Engeström, 2008), exemplified by global warming, new pandemic diseases and global financial disasters. This opens up a field of tremendous challenges for concept formation and practical redesign in a scale that has to exceed the boundaries of any single discipline, profession or organization.

3. Theoretical roots of the concept of expansive learning

The theory of expansive learning builds on foundational ideas put forward by four key figures in Russian cultural-historical school: Lev Vygotsky, Aleksei Nikolajevitch Leont'ev, Evald Il'enkov, and Vasily Davydov. Six ideas developed by these scholars form the conceptual basis of the theory of expansive learning. Two additional roots come from the work of Bateson and Bakhtin. We will briefly characterize each of these eight roots.

- (1) Leont'ev (1981) demonstrated how the emergence of division of labor within a community leads to the separation of action and activity. In a tribal hunt, for example, certain participants chase the game away, toward other participants who wait in ambush and kill the game. These two groups perform different actions (chasing, killing) in the collective activity of hunting. The half-life of an action is finite; an action has a definite beginning and an end. A collective activity, on the other hand, reproduces itself without a predetermined endpoint by generating seemingly similar actions over and over again. Yet there is continuous and at times dramatically discontinuous change in the activity. The very idea of expansive learning is built on this theoretically consequential *distinction between action and activity*. Expansive learning is movement from actions to activity.

"The essence of [expansive] learning activity is production of objectively, societally new activity structures (including new objects, instruments, etc.) out of actions manifesting the inner contradictions of the preceding form of the activity in question. [Expansive] learning activity is *mastery of expansion from actions to a new activity*. While traditional schooling is essentially a subject-producing activity and traditional science is essentially an instrument-producing activity, [expansive] learning activity is an *activity-producing activity*." (Engeström, 1987, p. 125)

- (2) Vygotsky's concept of *the zone of proximal development* is another important root of the theory of expansive learning. Vygotsky (1978, p. 86) defined the zone as "*the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers.*" In *Learning by Expanding*, Vygotsky's individually oriented concept was redefined to deal with learning and development at the level of collective activities:

"It is the distance between the present everyday actions of the individuals and the historically new form of the societal activity that can be collectively generated as a solution to the double bind potentially embedded in the everyday actions." (Engeström, 1987, p. 174)

In effect, the zone of proximal development was redefined as the space for expansive transition from actions to activities (Engeström, 2000).

- (3) Being an application of activity theory, the theory of expansive learning is foundationally an *object-oriented* theory.

"Properly, the concept of its object (*Gegenstand*) is already implicitly contained in the very concept of activity. The expression 'objectless activity' is devoid of any meaning. (...) The object of activity is twofold: first, in its independent existence as subordinating to itself and transforming the activity of the subject; second, as an image of the object, as product of its property of psychological reflection that is realized as an activity of the subject (...)" (Leont'ev, 1978, p. 52)

In other words, the object is both resistant raw material and *the future-oriented purpose of an activity*. The object is the true carrier of the motive of the activity. Thus, in expansive learning activity, motives and motivation are not sought primarily inside individual subjects – they are in the object to be transformed and expanded. As Leont'ev (1978, p. 186) pointed out, motives cannot be taught, they can only be nurtured by developing "the content of actual vital relations" of the learners. Expansive learning is a process of material transformation of vital relations.

- (4) Activity theory is a dialectical theory, and the dialectical concept of *contradiction* plays a crucial part in it. Following Il'enkov (1977, 1982), the theory of expansive learning sees contradictions as historically evolving tensions that can be detected and dealt with in real activity systems. In capitalism, the pervasive primary contradiction between use value and exchange value is inherent to every commodity, and all spheres of life are subject to commoditization. This pervasive primary contradiction takes its specific shape and acquires its particular contents differently in every historical phase and

every activity system. Most importantly, contradictions are the driving force of transformation. The object of an activity is always internally contradictory. It is these internal contradictions that make the object a moving, motivating and future-generating target. Expansive learning requires articulation and practical engagement with inner contradictions of the learners' activity system.

- (5) Il'enkov's dialectics were most powerfully translated into learning theory by Davydov (1990). Davydov developed a theory of learning activity based on the dialectical method of *ascending from the abstract to the concrete*. This is a method of grasping the essence of an object by tracing and reproducing theoretically the logic of its development, of its historical formation through the emergence and resolution of its inner contradictions. A new theoretical idea or concept is initially produced in the form of an abstract, simple explanatory relationship, a 'germ cell'. This initial abstraction is step-by-step enriched and transformed into a concrete system of multiple, constantly developing manifestations. In learning activity, the initial simple idea is transformed into a complex object, into a new form of practice. Learning activity leads to the formation of theoretical concepts – theoretically grasped practice – concrete in systemic richness and multiplicity of manifestations. In this framework, abstract refers to partial, separated from the concrete whole. In empirical thinking based on comparisons and classifications, abstractions capture arbitrary, only formally interconnected properties. In dialectical-theoretical thinking, based on ascending from the abstract to the concrete, an abstraction captures the smallest and simplest, genetically primary unit of the whole functionally interconnected system (see Il'enkov, 1977; Davydov, 1990; also Bakhurst, 1991; Falmagne, 1995).

Ascending from the abstract to the concrete is achieved through specific epistemic or learning actions. According to Davydov (1988, p. 30), an ideal-typical sequence of learning activity consists of the following six learning actions: (1) transforming the conditions of the task in order to reveal the universal relationship of the object under study, (2) modeling the identified relationship in a material, graphic or literal form, (3) transforming the model of the relationship in order to study its properties in their 'pure guise', (4) constructing a system of particular tasks that are resolved by a general mode, (5) monitoring the performance of the preceding actions, (6) evaluating the assimilation of the general mode that results from resolving the given learning task. In the theory of expansive learning, Davydov's concept of learning activity is developed further, to deal with the challenges of learning outside the school and the classroom (see the next section).

- (6) Vygotsky and his colleagues saw the essence of human psychological functioning in the mediation of action by means of cultural tools and signs. Traditional experimental methods largely excluded cultural mediation from their analyses. But the human subject always 'imports' into an experimental setting a set of psychological instruments in the form of signs that the experimenter cannot control externally in any rigid way (van der Veer & Valsiner, 1991, p. 399).

"The person, using the power of things or stimuli, controls his own behavior through them, grouping them, putting them together, sorting them. In other words, the great uniqueness of the will consists of man having no power over his own behavior other than the power that things have over his behavior. But man subjects to himself the power of things over behavior, makes them serve his own purposes and controls that power as he wants. He changes the environment with the external activity and in this way affects his own behavior, subjecting it to his own authority." (Vygotsky, 1997, p. 212)

In other words, the subject's agency, his or her capacity to change the world and his or her own behavior, becomes a central focus. Vygotsky built his interventionist methodology of *double stimulation* on this insight. Instead of merely giving the subject a task to solve, Vygotsky gave the subject both a demanding task (first stimulus) and a 'neutral' or ambiguous external artifact (second stimulus) the subject could fill with meaning and turn into a new mediating sign that would enhance his or her actions and potentially lead to reframing of the task. Expansive learning typically calls for formative interventions based on the principle of double stimulation.

- (7) Besides the Russian activity theorists named above, the theory of expansive learning owes a great deal to the innovative thinking of the anthropologist Bateson (1972). His conceptualization of levels of learning, particularly the notion of *Learning III* and the associated concept of *double bind*, must be identified as the seventh theoretical root of the theory of expansive learning. Bateson's Learning III is basically the same as expansive learning activity. Within the theory of expansive learning, Bateson's notion of double bind may be interpreted as "a social, societally essential dilemma which cannot be resolved through separate individual actions alone – but in which joint co-operative actions can push a historically new form of activity into emergence." (Engeström, 1987, p. 165, italics in the original)
- (8) Finally, Bakhtin's (1982) idea of *multi-voicedness*, or heteroglossia, needs to be included among the roots of the theory of expansive learning. "Applied in expansive learning and research, this means: *all the conflicting and complementary voices of the various groups and strata in the activity system under scrutiny shall be involved and utilized*. As Bakhtin shows, this definitely includes the voices and non-academic genres of the common people. Thus, instead of the classical argumentation within the single academic speech type, we get clashing fireworks of different speech types and languages." (Engeström, 1987, pp. 315–316, italics in the original.) Expansive learning is an inherently multi-voiced process of debate, negotiation and orchestration.

4. Central tenets of the theory of expansive learning

The theory of expansive learning focuses on learning processes in which the very subject of learning is transformed from isolated individuals to collectives and networks. Initially individuals begin to question the existing order and logic of their

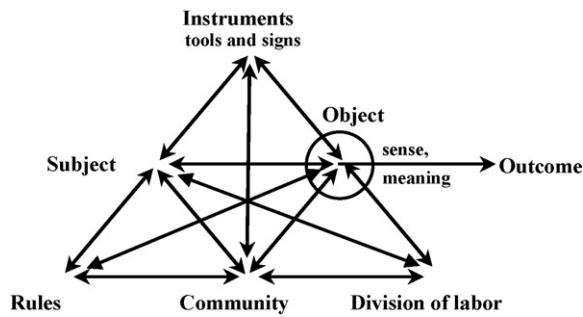


Fig. 1. General model of an activity system (Engeström, 1987, p. 78).

activity. As more actors join in, a collaborative analysis and modeling of the zone of proximal development are initiated and carried out. Eventually the learning effort of implementing a new model of the activity encompasses all members and elements of the collective activity system (Fig. 1).

In Fig. 1, subject refers to the individual or subgroup whose position and point of view are chosen as the perspective of the analysis. Object refers to the 'raw material' or 'problem space' at which the activity is directed. The object is turned into outcomes with the help of instruments, that is, tools and signs. Community comprises the individuals and subgroup who share the same general object. Division of labor refers to horizontal division of tasks and vertical division of power and status. Finally rules refer to the explicit and implicit regulations, norms, conventions and standards that constrain action within the activity system.

The circle around the object in Fig. 1 indicates at the same time the focal role and inherent ambiguity of the object of activity. The object is an invitation to interpretation, personal sense making and societal transformation. One needs to distinguish between the generalized object of the historically evolving activity system and the specific object as it appears to a particular subject, at a given moment, in a given action. The generalized object is connected to societal meaning, the specific object is connected to personal sense. For example, in medical work, the generalized object may be health and illness as societal challenges, whereas the specific object may be a particular condition or complaint of a particular patient.

As activity systems are increasingly interconnected and interdependent, many recent studies of expansive learning take as their unit of analysis a constellation of two or more activity systems that have a partially shared object. Such interconnected activity systems may form a producer-client relationship, a partnership, a network, or some other pattern of multi-activity collaboration.

Consider again the first complex learning challenge we presented at the beginning of this article. The home care worker activity system is currently oriented at completing a list of separate routine task during a home visit. The client's life activity is oriented at maintaining a meaningful and dignified life at home while struggling with threats such as loneliness, loss of physical mobility and the ability to act independently, and memory problems commonly known as dementia. The two activity systems are intertwined in that they must act together to produce the services of home care; yet their objects are very different and there is increasing tension between them (Fig. 2). This deteriorating state of affairs can be changed by means of an expansive learning process in which the two parties together generate a new shared object and concept for their shared activity.

Obviously this kind of extension of the unit of analysis makes it more demanding to identify and give voice to the actual flesh-and-blood human subjects in each activity system. The theory of expansive learning cannot be reduced to the learning of abstract organizations without concrete human subjects. Movement between a systems view and a subject view is of crucial importance: "The system view of an organization is blatantly insufficient when the researchers try to understand and facilitate qualitative changes by means of expansive learning. Changes must be initiated and nurtured by real, identifiable people, individual persons and groups. The interventionist researcher must find within the activity system flesh-and-blood dialogue partners who have their own emotions, moral concerns, wills and agendas. Organization must necessarily be translated back into a workplace inhabited by human beings." (Engeström & Kerosuo, 2007, p. 340).

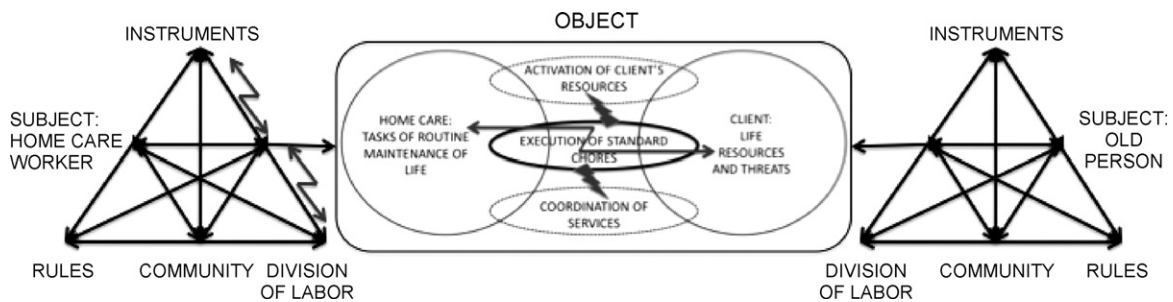


Fig. 2. The interdependent activity systems of home care and its client (see also Nummijoki & Engeström, 2009).

Contradictions are the necessary but not sufficient engine of expansive learning in an activity system. In different phases of the expansive learning process, contradictions may appear (a) as emerging latent primary contradictions within each and any of the nodes of the activity system, (b) as openly manifest secondary contradictions between two or more nodes (e.g., between a new object and an old tool), (c) as tertiary contradictions between a newly established mode of activity and remnants of the previous mode of activity, or (d) as external quaternary contradictions between the newly reorganized activity and its neighboring activity systems. Conflicts, dilemmas, disturbances and local innovations may be analyzed as manifestations of the contradictions. There is a substantial difference between conflict experiences and developmentally significant contradictions. The first are situated at the level of short-time action, the second are situated at the level of activity and inter-activity, and have a much longer life cycle. They are located at two different levels of analysis. The roots of conflicts can be explored by shifting from the action level of conflict to the activity level of contradiction (Sannino, 2005, p. 169).

Contradictions become actual driving forces of expansive learning when they are dealt with in such a way that an emerging new object is identified and turned into a motive: “the meeting of need with object is an extraordinary act” (Leont’ev, 1978, p. 54). The motive of collective activity becomes effective for an individual by means of personal sense: “sense expresses the relation of motive of activity to the immediate goal of action” (Leont’ev, 1978, p. 171).

Expansive learning leads to the formation of a new, expanded object and pattern of activity oriented to the object. This involves the formation of a theoretical concept of the new activity, based on grasping and modeling the initial simple relationship, the ‘germ cell’, that gives rise to the new activity and generates its diverse concrete manifestations (Davydov, 1990). The formation of an expanded object and corresponding new pattern of activity requires and brings about collective and distributed agency, questioning and breaking away from the constraints of the existing activity and embarking on a journey across the uncharted terrain of the zone of proximal development (Engeström, 1996, 2005). In other words, the ‘what’ of expansive learning consists of a triplet: expanded pattern of activity, corresponding theoretical concept, and new type of agency.

Ascending from the abstract to the concrete is achieved through specific epistemic or learning actions. Together these actions form an expansive cycle or spiral. An ideal-typical sequence of epistemic actions in an expansive cycle may be described as follows (see also Engeström, 2001b).

- The first action is that of questioning, criticizing or rejecting some aspects of the accepted practice and existing wisdom. For the sake of simplicity, we will call this action *questioning*.
- The second action is that of *analyzing* the situation. Analysis involves mental, discursive or practical transformation of the situation in order to find out causes or explanatory mechanisms. Analysis evokes “why?” questions and explanatory principles. One type of analysis is *historical-genetic*; it seeks to explain the situation by tracing its origins and evolution. Another type of analysis is *actual-empirical*; it seeks to explain the situation by constructing a picture of its inner systemic relations.
- The third action is that of *modeling* the newly found explanatory relationship in some publicly observable and transmittable medium. This means constructing an explicit, simplified model of the new idea that explains and offers a solution to the problematic situation.
- The fourth action is that of *examining the model*, running, operating and experimenting on it in order to fully grasp its dynamics, potentials and limitations.
- The fifth action is that of *implementing the model* by means of practical applications, enrichments, and conceptual extensions.
- The sixth and seventh actions are those of *reflecting* on and evaluating the process and *consolidating* its outcomes into a new stable form of practice.

These actions bear a close resemblance to the six learning actions put forward by Davydov (1988; see the preceding section). Davydov’s theory is, however, oriented at learning activity within the confines of a classroom where the curricular contents are determined ahead of time by more knowledgeable adults (Engeström, 1991). This probably explains why it does not contain the first action of critical questioning and rejection, and why the fifth and seventh actions, implementing and consolidating, are replaced by ‘constructing a system of particular tasks’ and ‘evaluating’—actions that do not imply the construction of actual culturally novel practices. Recent analyses indicate that particularly the first action of questioning may contain various forms of conflictual encounters and clashes between points of view (Sannino, 2010).

The process of expansive learning should be understood as construction and resolution of successively evolving contradictions. The entire ideal-typical expansive cycle may be diagrammatically depicted with the help of Fig. 3. The thicker arrows indicate expanded scope of and participation in the learning actions. The cycle of expansive learning is not a universal formula of phases or stages. In fact, one probably never finds a concrete collective learning process which would cleanly follow the ideal-typical model. The model is a heuristic conceptual device derived from the logic of ascending from the abstract to the concrete. Every time one examines or facilitates a potentially expansive learning process with the help of the model, one tests, criticizes and hopefully enriches the theoretical ideas of the model. In this light, it is necessary that the model of expansive learning is more detailed than for instance the very general sequence of ‘unfreezing, moving, and refreezing’ suggested by Lewin (1947).

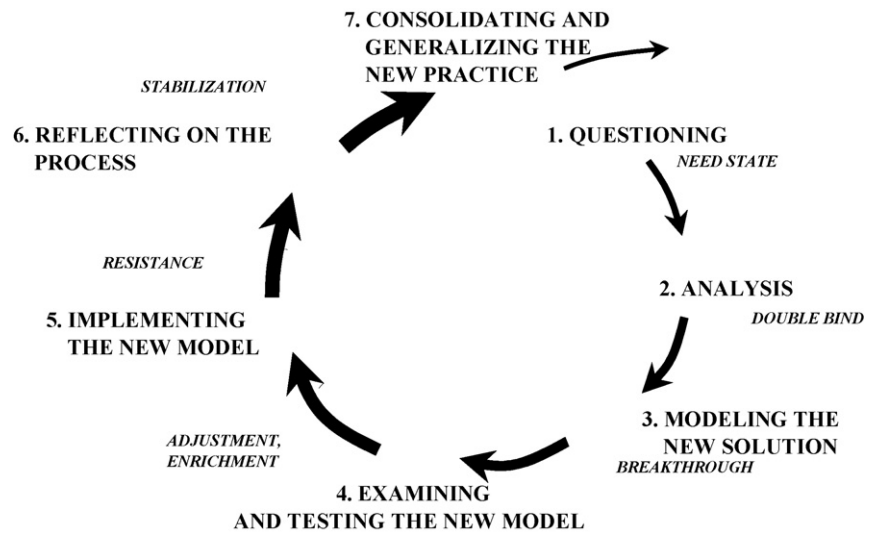


Fig. 3. Sequence of learning actions in an expansive learning cycle (Engeström, 1999b, p. 384).

The key ideas of the theory of expansive learning are enriched and developed further in empirical and intervention studies. We will now examine a series of themes developed in such studies.

5. Expansive learning as transformation of the object

Traditionally we expect that learning is manifested as changes in the subject, i.e., in the behavior and cognition of the learners. Expansive learning is manifested primarily as changes in the object of the collective activity. In successful expansive learning, this eventually leads to a qualitative transformation of all components of the activity system.

In her study of teacher teams, Kärkkäinen (1999) analyzed changes in the object as qualitative *turning points*. She followed a primary school teacher team which embarked on a process of learning to design and execute new kinds of thematic curriculum units that cut across multiple school subjects, went beyond the physical boundaries of the classroom and the school, and lasted longer than the usual single lesson.

Kärkkäinen analyzed the design and implementation of a thematic unit called 'Local Community'. The object evolved in three phases. The first four meetings of the teacher team produced the idea of the work on themes that cut across subjects. The next meetings produced a plan for the 'Local Community' theme. The final five meetings monitored the execution of the plan and evaluated the realization of both the specific theme and the work on themes more generally. Each turning point was characterized by clusters of discursive disturbances (misunderstandings, disagreements, conflicts, and also milder dilemmas), phases of questioning, and concentrations of different voices or perspectives (Kärkkäinen, 1999, pp. 111–116).

Kärkkäinen (1999, pp. 117–126) found eight turning points in the construction of the object. Moving through these phases and turning points, the object evolved from a general notion of cross-subject 'theme working' into a specific theme focused on the local community and finally into a relatively complex a multi-faceted constellation of the main theme and its sub-themes. It is important to note that the focus on a specific theme did not replace the general idea of 'theme working' as the teachers' object. Both the specific theme and general idea were kept in focus and elaborated simultaneously. According to Kärkkäinen (1999, pp. 140–141), this two-level character of the object seemed to explain much of the expansive potential of the process: the teachers moved between the specific and the general without getting stuck in either one.

The expansion of the object proceeds in multiple dimensions. Engeström (2000) and Hasu (2000) identified four dimensions: the social-spatial ("who else should be included?"), the anticipatory-temporal ("what previous and forthcoming steps should be considered?"), the moral-ideological ("who is responsible and who decides?"), and the systemic-developmental ("how does this shape the future of the activity?"). Engeström, Puonti and Seppänen (2003) compared three studies of expansive learning focusing on the socio-spatial dimension on the one hand and the temporal dimension on the other hand. They concluded that space and time are not the whole story; there moral-ideological dimension of power and responsibility is always also at stake. This third dimension was discussed by Puonti (2004) in her study of the investigation of economic crimes.

"A case under investigation consists of a constant interplay of the crime and its investigation. The case, however, is never merely unique: the crime under investigation constitutes a part of economic crime in general, and the investigation is part of economic crime prevention. The interplay between the crime and its investigation can be viewed at two levels: at the specific case level and at the general level. Expansion is a twofold movement: the crime is expanded by the criminal perpetrators, and the investigators have the opportunity to expand the object in their investigation. The

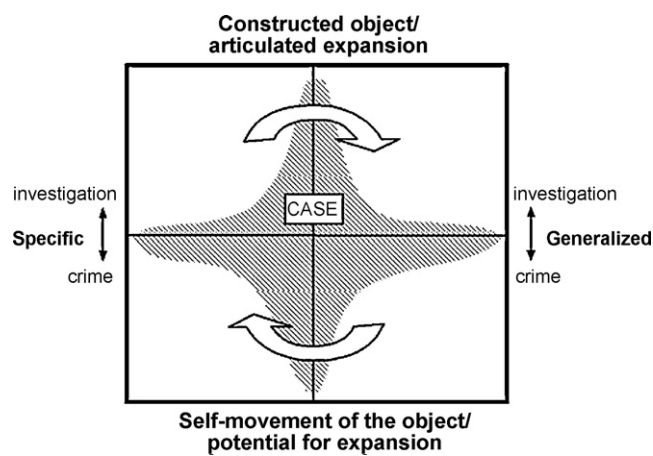


Fig. 4. Expansion of the object in economic-crime investigation (Puonti, 2004, p. 83).

self-movement of the object generates the *potential for expansion*, but the efforts to expand the object of investigation have remained insufficient. (...)

Expansion is commonly understood as positive development. My empirical setting, however, shows the dark side of expansion as well. It may be seen as a shift of a contradictory phenomenon from one developmental phase to another. There is a constant battle between the criminals and the authorities: Which side is able to move first to the next phase of development? The investigation is not merely in the hands of the investigators, but the crime 'strikes back' and forces the investigators to adopt new ways of action." (Puonti, 2004, p. 82)

Puonti captured this double movement of expansion in an instructive diagram (Fig. 4). It is useful reminder of the fact that expansion is not reducible to the efforts of learners aimed at emancipation and empowerment. Expansion is also generated from within the object, and it is never only a benign process.

The expansion of the object can be assessed when the dimensions of expansion are specified. In a study of expansive learning among the teachers of a Finnish middle school (Engeström et al., 2002), the central learning challenge was of moral-ideological nature: to move beyond a negative and cynical image of the students and to discover positive potential in them. The teaching faculty of the school went through a Change Laboratory process and the consequences were followed up for several months. Altogether eleven collective discussions of the teachers were recorded over a period of 11 months. This large longitudinal corpus was transcribed and analyzed to identify sequences of teachers' negative and positive talk about students. Three important findings emerged. For the first, the amount of talk about students increased consistently as the intervention went on and after it, as the new practices designed in the Change Laboratory were implemented in practice. Secondly, at the beginning of the process, negative talk was dominant, but toward the end of the process positive talk began to dominate and remained dominant until the end. Thirdly, negative talk did not disappear; it did not even decrease. "In other words, the emergence of positive talk about students was truly an expansion and enrichment of the repertoire; it did not emerge at the cost of previous ways of talking" (p. 220). This 'expansion by enrichment' meant also increased diversity of topics related to students. In the early planning phase of the process, teachers' talk about students was limited to seven topics. In the final evaluation phase of the process, teachers' talk about students dealt with 16 different topics. Again, the early topics did not disappear, but the range was radically broadened.

6. Expansive learning as movement in the zone of proximal development

The common yardstick of learning in school contexts is the individual student's success in exams and various kinds of achievement tests. In theories of organizational learning, the criteria of learning are usually somehow connected to measured improvements in the performance of the organization. In the theory of expansive learning, criteria and yardsticks of learning are built by means of historical analysis. Such an analysis aims at identifying the contradictions that need to be resolved and charting the zone of proximal development that needs to be traversed in order to move beyond the existing contradictions. This calls for effective ways of articulating and depicting the historically possible zone of proximal development.

Haavisto (2002) studied the expansive learning efforts of a Finnish district court implementing locally the general guidelines of a nationwide court reform. She followed, recorded and analyzed three civil trials before the reform and another three after the reform. Haavisto summarizes the zone of proximal development the court was facing as depicted in Fig. 5. The court proceedings in Finland were traditionally very formal and non-interactive, based on lengthy written briefs read aloud in front of the judge. At the same time, the judges traditionally left it to the attorneys to decide what issues to cover and how long to continue with the exchange of briefs. In other words, the old proceedings were both formal and unrestricted, which often meant multiple hearings extended over a period of several months. The new legislation aimed at proceedings based

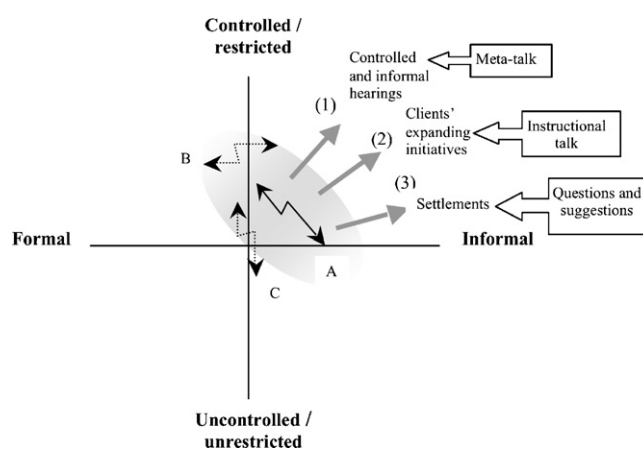


Fig. 5. Spearheads, new ways of talking, and tensions in the zone of proximal development of Finnish court proceedings (Haavisto, 2002, p. 298).

on informal oral discussion and, yet actively controlled and guided by the presiding judge. This should lead to a compact process in which all points of view come to light in one and the same hearing. This transformation is intertwined with transition from the traditional notion of justice as material truth to the idea of negotiated justice and pragmatic compromise.

In Haavisto's study, expansive learning took place by means of relatively small incremental steps led by 'spearheads' such as trials in which the clients (not attorneys) began to take active initiatives and proceedings in which the judges intervened actively to promote settlement between the parties. In these spearheads, new ways of talking emerged, such as instructional talk of the judge directed at lay clients taking initiatives in the hearing. At the same time, new tensions also emerged, such as the tension between increased client initiatives made possible by the informality and the increased emphasis on active control and leadership on the part of the judge (arrow A in Fig. 5). Arrow B in Fig. 5 represents the tension between the intrinsically formal character of the talk of legal professionals and the informal character of the talk of lay clients. Arrow C represents the tension between controlled/restricted and uncontrolled/unrestricted discourse in the hearings, inherent in the alternative logics that have been used to legitimate the new proceedings: "the first one assumes that the truth will emerge in free and unlimited communication, the second that it will evolve in communication that is regulated and rationalized by procedures" (Haavisto, 2002, p. 295).

In her study of learning challenges in organic vegetable farming, Seppänen (2004, p. 21) uses a somewhat similar structured diagram to depict the zone of proximal development of organic farms. Through historical analysis, Seppänen opened up layers within the two dimensions she identified. The horizontal dimension was initially understood in terms of sustaining soil fertility; environmental protection is a more recent layer within that dimension. Societal integration was initially understood in terms of market relations, EU subsidies have added the layer of administrative relations, and the most recent layer consists of 'organic' relations to other farmers and advisors.

Kerosuo (2006) used a somewhat more elaborate way to depict the zone of proximal development in health care, specifically from the point of view of the care for chronic illnesses (Fig. 6). Using increasing diversity of care providers and rise of chronic illnesses as the key dimensions of historical development, the figure presents two alternative models for the future of health care, namely the care package model and the negotiated care model. The former is based on the notions of productivity, market values, and diagnosis-related groups (DRGs). The latter is based on the notions of public good, continuity of care, and care agreements. The tension between these two directions of development manifests itself in disjunctions and uncertainties in the care of each single patient.

Representations such as Figs. 5 and 6 are used as conceptual tools for the interpretation of data and findings from specific activity systems and events. Their virtue is that the zone of proximal development is depicted as a multi-dimensional and tension-laden space in which qualitatively different developmental directions and priorities struggle and choices are made by real actors between alternative futures. These representations facilitate comparisons and debates about what is actually progress in learning.

7. Expansive learning as cycles of learning actions

The expansive cycle of learning actions depicted in Fig. 3 has been used as framework of interpretation in studies of relatively large-scale and lengthy processes of transformation. Seppänen (2004), for example, used the expansive cycle to interpret the significant steps in the learning of two farms in transition from traditional to organic farming over a period of nearly ten years. Nilsson (2003) analyzed three successive expansive cycles in the integration of preschool, leisure-time center and elementary school in Sweden, the first cycle spanning from 1981 to 1999, the second one from 1998 to 2000, and the third one from 2000 on, being incomplete at the time of the analysis. Similarly, Foot (2001) analyzed the development of a monitoring network of ethnic conflicts (EAWARN) over a period of several years, identifying two successive cycles.

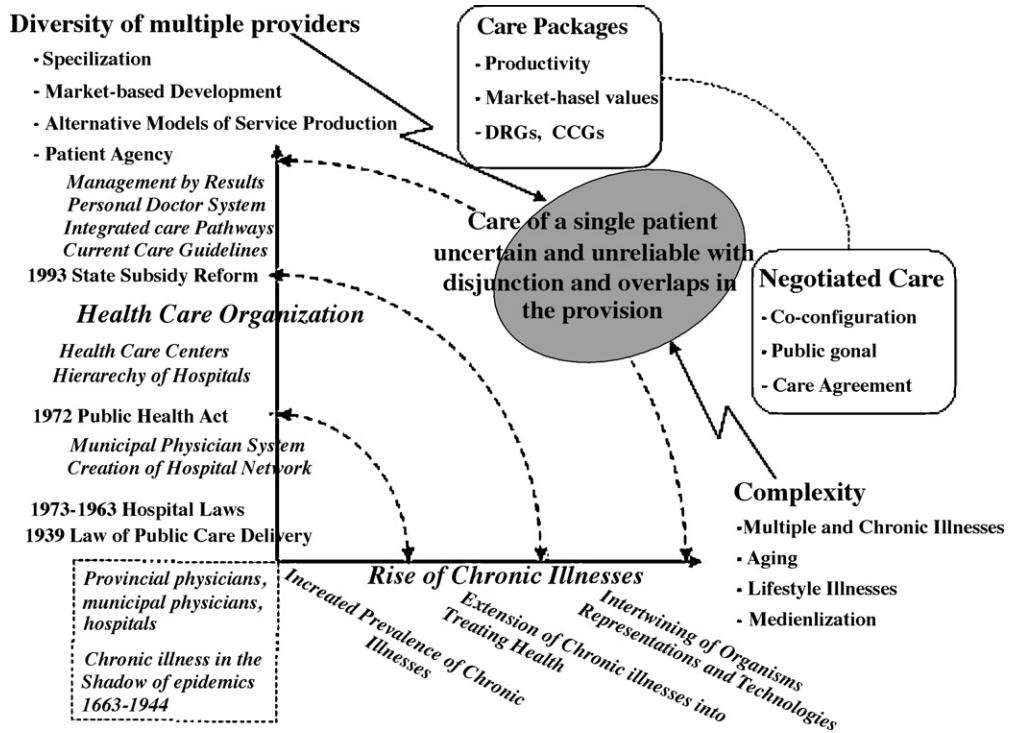


Fig. 6. The zone of proximal development in health care for patients with chronic illnesses (Kerosuo, 2006, p. 67).

The cycle model forces the analyst to make sense of events in terms of epistemic learning actions. This often leads to important insights, exemplified by a point noted by Foot (2001, p. 74).

“Viewing the two cycles next to each other reveals that, chronologically, there is a partial overlap between them. As spiraling cycles, the second is contingent upon the first, though not strictly successive to it. The introduction of the indicator model [a new tool for the network] occurred in the evaluation phase of the first cycle and in the analyzing phase of the second cycle. In other words, the introduction of the indicator model was an action with dual meaning. On the one hand, it was an action of evaluation and consolidation. On the other hand, it was an action that led to the modeling of a new form of activity.”

The use of the expansive cycle as an interpretation framework in analyses of relatively long periods of development have also led to the observation that what initially looks like an expansive transformation may in the end become something else. Thus, in his analysis of the development of a nursing home over a period of approximately 25 years, Mäkitalo (2005, p. 179) concluded that at a certain point the cycle began to narrow down. While this is certainly plausible, it may also be problematic to use the cycle to cover excessively long periods. In other words, it is important to articulate and argue the criteria of the starting point and end point of a cycle. The logic of the expansive cycle is such that a new cycle is assumed to begin when an existing, relatively stable pattern of activity begins to be questioned. Correspondingly, the cycle ends when a new pattern of activity has become consolidated and relatively stable. It might be argued that a narrowing cycle emerges if one interprets the questioning and increasingly aggravated contradictions typical to the beginning of a new cycle merely as end phases of the previous cycle. On the other hand, it is indeed to be expected that many transformations in activity systems are not predominantly expansive. Mäkitalo's (2005, p. 99) tentative distinction between expansive, narrowing, repetitive, and divided cycles is therefore warranted and needs to be developed further in empirical analyses. Expansion necessarily involves also the possibility of disintegration and regression.

Large-scale cycles involve numerous smaller cycles of learning actions. Such a smaller cycle may take place within a few days or even hours of intensive collaborative analysis and problem solving. Careful investigation may reveal a rich texture of learning actions within such temporally short efforts. But can such a miniature cycle be called expansive? This question was addressed in a study focused on miniature cycles of learning actions in team meetings of an industrial plant (Engeström, 1999b).

“Miniature cycles of innovative learning should be regarded as *potentially* expansive. A large-scale expansive cycle of organizational transformation always consists of small cycles of innovative learning. However, the appearance of small-scale cycles of innovative learning does not in itself guarantee that there is an expansive cycle going on. Small cycles may remain isolated events, and the overall cycle of organizational development may become stagnant,

regressive, or even fall apart. The occurrence of a full-fledged expansive cycle is not common, and it typically requires concentrated effort and deliberate interventions. With these reservations in mind, the expansive learning cycle and its embedded actions may be used as a framework for analyzing small-scale innovative learning processes.” (Engeström 1999b, p. 385)

In the study of the team meetings, expansive learning actions did not strictly follow the order presented in the ideal typical cyclic model of Fig. 3. For instance, in one of the meetings, modeling the new solution was attempted at the very beginning, and later completed after actions of analysis and questioning. Among the expansive actions, there were also some nonexpansive learning actions, such as reinforcing the existing practice (Engeström, 1999b, pp. 390–391). The entire miniature cycles were socially distributed accomplishments. Thus, in one of the meetings, seven successive expansive learning actions were initiated by six different participants (Engeström, 1999b, p. 401). A larger sample of potentially expansive miniature cycles of learning actions was subsequently analyzed by Lambert (1999).

The Change Laboratory interventions (Engeström, Virkkunen, Helle, Pihlaja, & Poikela, 1996; Engeström, 2007c; see also the section later in this paper devoted to formative interventions) occupy an intermediate position between multi-year macro cycles and miniature cycles that may last a couple of hours. A Change Laboratory intervention often takes place as a series of six to twelve weekly meetings of a pilot unit of an organization, plus one or two follow-up meetings several months later. This kind of an intervention attempts to accelerate and intensify the expansive learning process by introducing successive tasks that require specific expansive learning actions.

Expansive learning cycles and learning actions generated with the help of Change Laboratory interventions have been analyzed by Engeström (2001), Ahonen and Virkkunen (2003), Virkkunen and Ahonen (2004), Pihlaja (2005), and Hyrkkänen (2007), among others. The studies show that the learning actions taken by participants do not necessarily correspond to the intentions behind the tasks assigned by the interventionist. Time and again, the participants take over the leading role in the intervention process, rejecting and reformulating tasks and performing actions that change the plans of the interventionist. This dialectic between planned and actually realized courses of expansive learning is of great importance in future research (see Rasmussen & Ludvigsen, 2009).

Expansive cycles are historically conditioned, although not predetermined. Not just any kind of expansion of the object is possible at any given time. A good example is the new media company studied by Koistinen (2007). The firm was operating in a craft mode. Its products were successful and it grew rapidly, taking on more demanding jobs. As pressures to master more parallel projects under tight time schedules grew, these projects started to have increasing troubles with budget, timetables and technical quality. The company management envisioned that they could move directly from craft-based production to an advanced mode of co-configuration (Victor & Boynton, 1998) which would involve continuous negotiation and collaboration with the customers. This leap failed, and eventually the company was sold and became defunct. The failure seems to be a direct consequence of ignoring the crucial step between craft and co-configuration, namely the demands of standardization and efficient lean mass production. We do not have to accept Victor and Boynton’s claim that an organization must necessarily develop through a fixed order of modes of production. But clearly there are historical conditions that make it very difficult if not impossible in many cases to jump over such historically formed modes as mass production, for example. The later modes of production, such as co-configuration, are to a large extent based on both mastery and conscious critical transcending of previous modes.

8. Expansive learning as boundary crossing and network building

Important processes of innovation and learning are increasingly taking place in collaborative constellations and networks of multiple activity systems. In studies of expansive learning, this was first taken up in a paper that put forward boundary crossing as a serious theoretical concept (Engeström, Engeström, & Kärkkäinen, 1995). Boundary crossing was characterized as “horizontal expertise where practitioners must move across boundaries to seek and give help, to find information and tools wherever they happen to be available” (p. 332).

“Boundary crossing entails stepping into unfamiliar domains. It is essentially a creative endeavor which requires new conceptual resources. In this sense, boundary crossing involves collective concept formation.” (Engeström et al., 1995, p. 333)

Lambert (1999) examined boundary crossing in the field of vocational teacher education. Traditional teacher education tends to take the standard practices of classroom teaching for granted. The culmination of Finnish vocational teacher education has been the ‘proof lesson’ given by the student teacher to demonstrate her ability to teach in practice. In such a mode the new challenges and development efforts of the work organizations that eventually employ the students of vocational education are all but completely absent. Teacher education is an encapsulated world of its own.

In her experimental program, Lambert replaced the proof lessons with a boundary-crossing arena called Learning Studio. The student teachers in the program were already working as teachers in vocational education in the field of health care and social welfare; they attended the teacher education program in order to acquire a full formal teacher qualification. The student teachers were asked to conduct development projects in the workplaces, aimed at improving their curricula and teaching practices. Each student teacher presented a report of his or her project in the Learning Studio. The participants of the studio included (a) representatives of the teacher education institute, (b) teachers and students of the vocational

training school in which the student teacher worked, and (c) representatives of one or more employer organizations (in this case, health care and social welfare service delivery organizations) for which the specific project was relevant. In the studio session, the participants discussed the student teacher's project as a possible shared innovation. In other words, the studio sessions required discursive crossing of multiple boundaries. This led to reciprocal exchange and adoption of ideas driven by a shared, potentially expansive object—a process called developmental transfer.

Lambert videotaped and analyzed 11 Learning Studios as processes of expansive learning and boundary crossing. She found that successful boundary crossing and developmental transfer were largely dependent on the employment of appropriate tools. In particular, 'boundary objects' (Star & Griesemer, 1989), such as forms, knowledge repositories, and graphic models, played an important role in the expansion of the shared object.

The idea of developmental transfer as an outcome of boundary crossing in an expansive learning process has been developed further in a number of subsequent studies (Konkola et al., 2007; Tuomi-Gröhn & Engeström, 2003). In these studies, the focus has moved to the practice periods or internships of students of vocational and professional education. These practice periods or internships are jointly redesigned as development projects aimed at meeting real needs and challenges in workplaces. The student or group of students may act as a crucial boundary-crossing change agent, carrying, translating and helping to implement new ideas between the educational institution and the workplace.

The relatively general idea of boundary crossing was further developed in a series of studies of expansive learning in the medical care of chronic patients with multiple illnesses, using multiple care providers (Engeström, 2001a, 2001b, 2003; Engeström, Engeström, & Kerosuo, 2003; Kerosuo, 2006; Saaren-Seppälä, 2004). The learning challenge in such fields of activity is to acquire a new, negotiated way of working in which patients and practitioners from different caregiver organizations will collaboratively plan and monitor the patient's trajectory of care, taking joint responsibility for its overall progress. The key concept developed in these studies is negotiated knotworking.

"The notion of knot refers to rapidly pulsating, distributed and partially improvised orchestration of collaborative performance between otherwise loosely connected actors and activity systems. (...) Knotworking is characterized by a pulsating movement of tying, untying and retying together otherwise separate threads of activity. The tying and dissolution of a knot of collaborative work is not reducible to any specific individual or fixed organizational entity as the center of control. The center does not hold. The locus of initiative changes from moment to moment within a knotworking sequence. Thus, knotworking cannot be adequately analyzed from the point of view of an assumed center of coordination and control, or as an additive sum of the separate perspectives of individuals or institutions contributing to it. The unstable knot itself needs to be made the focus of analysis." (Engeström, Engeström, & Vähäaho, 1999, pp. 346–347; see also Engeström, 2005, 2008)

Knotworking is the emerging mode of collaboration in work settings that move toward co-configuration, a form of production aimed at the creation of customer-intelligent products or services which adapt to the changing needs of the user and have very long life trajectories, requiring that the customer becomes a real partner with the producer (Engeström, 2004b, 2008). In the health care studies, the expansive learning process led to the creation of new tools for negotiated care. The key tool was called care agreement. It was complemented by the care map and the care calendar. Together these were aimed at generating a new instrumentality for negotiated knotworking (Engeström et al., 2005b; Kerosuo & Engeström, 2003).

The concept of knotworking has been found useful in recent studies on learning in such diverse contexts as university-school partnerships (Fenwick, 2006a), knowledge sharing among globally distributed anti-doping experts (Kazlauskas & Crawford, 2007), and collaboration between speech therapists and school staff (Martin, 2008).

Boundary crossing has also been analyzed in activity-theoretical studies of technological innovations. In a study of the implementation of a complex technological device in clinical use, Hasu and Engeström (2000) observed that bridging the gap between the developers and users may require new types of software tools: "software agents must operate as boundary-crossing agents that facilitate interaction and mutual intelligibility between the perspectives" (p. 86). Hyysalo (2004) coined the notion of 'network of utilization' to capture the way technology producers, users, and third parties are connected in the creation of operability of technology in use. Such a network resembles knotworking in that the "individuals and artifacts that act within a network of utilization may change each time" (p. 230).

Learning in organizational networks is commonly depicted as horizontal movement of information between organizational units. This view easily forgets that networks are also hierarchies. In other words, learning is also vertical movement and boundary crossing between different organizational levels. This aspect of expansive learning was the focus of Toiviainen (2003) study. Toiviainen analyzed learning in a small-firm network, initially at four levels: the network-ideological level, the project level, the production level, and the worker level. The longitudinal study revealed that the different levels were activated one by one as the expansive cycle progressed (Fig. 7).

The interplay between the levels eventually led to the formation of an entirely new level of functioning and learning located between the project level and the production level – a partnership between several firms in the original network.

"(...) the emergence of the fifth level of learning, 'the partnership level', was decisive for the dynamics of learning across the levels. It was an intermediate level that was needed, above all, to bridge the gap between the visions and ideals of networking and the practices of production across the firms. On the threshold of the new cycle of expansive learning, the major learning challenge pointed at the partnership level and its capability of encouraging learning-from-

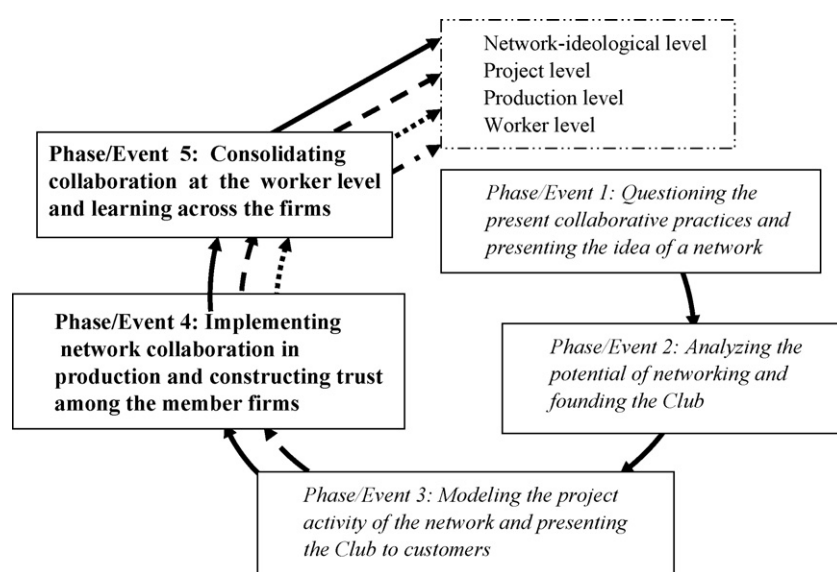


Fig. 7. Activation of different levels of learning in the expansive cycle of a small-firm network (Toiviainen, 2007, p. 354).

below – transforming the creative actions of production units into contributions to the entire network’s learning (Toiviainen, 2007, p. 353)

9. Expansive learning as distributed and discontinuous movement

Toiviainen (2007, p. 355) notes that analyzing learning in distributed networks or multi-organizational fields is a demanding task: “Not only are multiple activity systems participating in a shared activity, but these collaborative knots are creating a variety of activities as they evolve.” This increasingly distributed and discontinuous character of work-related learning was also well characterized by Hubbard, Mehan, and Stein (2006) in their study of a school reform process in a major U.S. city. The authors point out that when change was introduced in any one part of the distributed system, it reverberated throughout the system in ways that could not be anticipated. As a result, the learning process is full of gaps, interruptions, misunderstandings, and conflicts. “Discontinuities between communities, although potentially troublesome, also represent opportunities for learning.” (p. 17).

Analysis of the discontinuous nature of expansive learning calls for new intermediate conceptual tools. A beginning in that direction was made in a study of the consequences of interventions initiated 15 years ago in two Finnish health care organizations (Engeström, Kerosuo, & Kajamaa, 2007). The concept of bridging was introduced as an analytical resource.

“When one small cycle of innovative learning efforts ends, there typically occurs a more or less problematic break in the overall process. Such a mundane discontinuity generally requires actions of *bridging* that enable the next small cycles to build on the results and experiences of the preceding cycle. Such actions of bridging span breaks and gaps in time and social space, between discrete projects or local efforts (. . .).” (p. 323)

Another important finding of this study was the distinction between mundane discontinuities and directional discontinuities. A directional discontinuity emerges when the very aim and rationale of the collective learning effort is dropped and replaced with a different one. Such a break typically leads to the disintegration or cessation of the expansive learning process. Both organizations examined in the study faced a similar nationwide political pressure to make an abrupt change of direction from above. One of the two organizations resisted the pressure and was able to continue the expansive process. The findings of the study suggest that in this organization, “actions of articulation, analysis and argumentation concerning the alternative directions have been repeated time and again and not been limited to the early phases of the expansive cycle” (p. 333).

Recent activity-theoretical studies of school change add an important insight to our understanding of the discontinuous nature of expansive learning.

“Even if local innovation attempts ostensibly die, they can still spread because others may adopt and continue them. In other words, the sustainability of innovations does not refer only to local continuity, but also to diffusion and adaptations in other settings. Such adaptations do not necessarily mean that an innovation is scaled up and becomes a systemwide reform.” (Sannino & Nocon, 2008, p. 326)

10. Formative interventions

Expansive learning cycles may be observed and followed as if naturally occurring processes. However, they are quite rare and difficult to document due to their spatially and temporally distributed character. Most importantly, there is growing demand in work communities for support and facilitation in deliberate efforts at expansive learning to resolve pressing contradictions and to reach qualitatively new modes of work activity. This demand together with the interventionist legacy of cultural–historical activity theory has led to the development and implementation of formative interventions as a methodology for studying expansive learning.

Vygotsky's methodological principle of double stimulation leads to a concept of formative interventions which are radically different from the linear notion of intervention embedded in the traditional idea of controlled experiment. The crucial differences may be condensed in four points (Engeström, forthcoming).

- (1) *Starting point*: In linear interventions, the contents and goals of the intervention are known ahead of time by the researchers. In formative interventions, the subjects (whether children or adult practitioners, or both) face a problematic and contradictory object which they analyze and expand by constructing a novel concept, the contents of which are not known ahead of time to the researchers.
- (2) *Process*: In linear interventions, the subjects, typically teachers and students in school, are expected to execute the intervention without resistance. Difficulties of execution are interpreted as weaknesses in the design that are to be corrected by refining the design. In formative interventions, the contents and course of the intervention are subject to negotiation and the shape of the intervention is eventually up to the subjects. Double stimulation as the core mechanism implies that the subjects gain agency and take charge of the process.
- (3) *Outcome*: In linear interventions, the aim is to control all the variables and to achieve a standardized solution module, typically a new learning environment, that will reliably generate the same desired outcomes when transferred and implemented in new settings. In formative interventions, the aim is to generate new concepts that may be used in other settings as frames for the design on locally appropriate new solutions. A key outcome of formative interventions is agency among the participants.
- (4) *Researcher's role*: In linear interventions the researcher aims at control of all the variables. In formative interventions, the researcher aims at provoking and sustaining an expansive transformation process led and owned by the practitioners.

Intervention may be defined simply as “purposeful action by a human agent to create change” (Midgley, 2000, p. 113). This definition makes it clear that the researcher does not have a monopoly over interventions. Organized activity systems such as schools and workplaces are bombarded by interventions from all kinds of outside agents (consultants, administrators, customers, competitors, partners, politicians, and journalists). And inside the activity system, practitioners and managers incessantly make their own interventions. Researchers should not expect nicely linear results from their efforts.

In the mid-1990s, researchers in the Helsinki Center developed a new intervention toolkit under the generic name of *Change Laboratory* (Engeström et al., 1996). Variations of this toolkit have been used in a large number of intervention studies in settings ranging from post offices and factories to schools, hospitals and newsrooms. The Change Laboratory serves as a microcosm in which potential new ways of working can be experienced and experimented with (Engeström, 1987, pp. 277–278).

A Change Laboratory is typically conducted in an activity system that is facing a major transformation. This is often a relatively independent pilot unit in a large organization. Working practitioners and managers of the unit, together with a small group of interventionist-researchers, conduct five to ten successive Change Laboratory sessions, often with follow-up sessions after some months. When feasible, also customers or patients are invited to join Change Laboratory sessions in which their particular cases are analyzed in detail. Change Laboratories are also conducted as boundary crossing laboratories with representatives from two or more activity systems engaged in collaboration or partnership.

The Change Laboratory is built on ethnographic data from the activity setting in which it is conducted. Critical incidents, troubles and problems in the work practice are recorded and brought into Change Laboratory sessions to serve as *first stimulus*. This ‘mirror material’ is used to stimulate involvement, analysis and collaborative design efforts among the participants.

To facilitate analysis and resolution of the problems, interventionists typically introduce conceptual tools such as the triangular models of activity systems (see Fig. 1) as *second stimulus*. Commonly the conceptual models offered by the interventionists are replaced or combined with mediating conceptualizations or models formulated by the participants.

The participants are challenged to use the mediating second stimulus as an instrument in the design of a *new concept* for the activity they are trying to transform. Implementation of the designed new solution is usually initiated while the Change Laboratory sessions are still running, in the form of pilot experiments. The implementation typically leads to a richer and more articulated concept.

In the analysis and design, the participants are asked to move between the past, the present, and the future. This means that historical origins of the current problems are dug up and modeled, and the ideas toward a future concept are played with in anticipatory simulations such as role play. The laboratory sessions themselves are videotaped for analysis and used as stimuli for reflection. The procedure allows for the collection of rich longitudinal data on the actions and interactions involved in deliberately induced cycles of expansive learning.

In Change Laboratories, participants tend to move from relatively insular or individualistic positions toward the position of a collective change agent. This requires the formation of new shared tools, rules and divisions of labor, a demanding process especially in interventions which bring together more than a single activity system (Virkkunen, 2006b).

While numerous studies (many discussed in this article) have been published based on data collected in Change Laboratory interventions, relatively little research has been done on the methodology as such (see, however, Cole & Engeström, 2007; Engeström, 2000, 2007b; Sannino, 2008b; Virkkunen, 2004; Virkkunen & Ahonen, forthcoming). Pihlaja (2005) describes and analyzes the very first Change Laboratory process conducted in the Finnish postal services. Teräs (2007) analyzes a Change Laboratory process (called Culture Laboratory) aimed at the empowerment of immigrant students in a vocational training college. Ahonen (2008) gives a comprehensive analysis of a Change Laboratory process (called Competence Laboratory) aimed at proactive development of the competences of the employees and teams of a telecommunications company. In the interventions analyzed by Ahonen, the traditional notion of competence was transcended in that work teams began to analyze future challenges of their work and plan their own collective learning practices. Bodrozic (2008) proposes on broad historical perspective for the analysis and future shaping of post-industrial interventions.

The study of Teräs (2007) is of particular interest in that it opens up the challenge of interculturality in studies of expansive learning. Teräs found that in her heterogeneous and hybrid setting, quaternary contradictions between diverse activity systems were present in the process from the very beginning, not only toward the end as the original model of expansive cycle (see Fig. 3) would imply.

“(. . .) in a setting such as the Culture Laboratory, in which different pasts and presents intermingle, the dominant feature of the expansive cycle is externalization rather than internalization at the start. (. . .) The immigrant students had established their ways of learning during their enculturation process, and they needed to externalize their previous practice before learning the current practice at the College.” (p. 193)

A recent study of Toivainen, Kerosuo, and Syrjälä (2009) is another interesting example of methodological innovation. The authors turned the model of the expansive learning cycle (Fig. 3) into a tool called ‘development radar’, used by practitioners and researchers to monitor and manage a complex developmental project. “The basic innovation was how to graphically present both the steps of the developmental cycle and the parallel levels of activities of the development network evolving in the project” (p. 512). Here the joint construction of a collaborative learning tool – or of a second stimulus – became itself a window into the dynamics of expansive learning.

11. Lessons from the research reviewed

It seems that research based on or inspired by the theory of expansive learning has reached a transitional phase. The multiplicity and diversity of research applications indicates that the theory has opened up a rich set of novel research questions and topics. However, the different applications are often not very well aware of one another and there are too few examples of cumulative creation of knowledge that would build on previous studies. It is time to move from a mainly inspirational to a more systematic mode of research on expansive learning.

Studies of expansive learning conducted in the Helsinki Center are mainly focused on change efforts in organized work collectives. A good number of studies conducted in other countries take a somewhat more traditional stance in that they explore expansion from the point of view of individual subjects and often in formal educational settings. It seems to us that these two lines of inquiry should be brought into dialogue. Studies of collective activity systems can benefit from analyses of individual subjects’ development—and vice versa.

Formative interventions such as the Change Laboratory are the focus of methodological development within the theory of expansive learning. An interventionist methodology should be understood broadly. It needs to include also historical and contemporary analyses of expansive learning processes that may not have been induced by any deliberate intervention efforts, at least not by efforts led by researchers.

12. Critiques of expansive learning

Critical discussions of the theory of expansive learning may be roughly divided in three groups. First, there are commentaries from scholars working within cultural–historical activity theory (Lompscher, 2004; Rückriem, 2009). Secondly, there are assessments written by researchers who pursue related theoretical agendas in research on learning and see interesting affinities between their own approach and the theory of expansive learning (Paavola et al., 2004; Young, 2001). Finally, there are colleagues who take a strong Marxist or dialectical stance and criticize the theory of expansive learning for misguided or conservative dilution of the Marxist and dialectical legacy (Avis, 2007; Langemeyer, 2006). We will briefly discuss each of the three strands.

In his valuable book on cultures of learning and competence development, Lompscher (2004) discusses expansive learning at length. His critical commentary is focused on what he sees as neglect of the radical transformative impact of computers, digitalization and the Internet. He argues that computerization will bring about a revolutionary change in culture contrasted with the dominant culture of books and print (Lompscher, 2004, p. 388).

“Internet is more than a novel technical device, it represents the material foundation of new societal activities, it must itself be analyzed as activity with specific contents and structures (not merely as an instrument of already known activities).” (Lompscher, 2004, p. 388)

The same argument is continued and expanded by Rückriem (2009). According to him, activity theory as it presently exists is captive of the historically passing medium of print and writing. For Rückriem, the whole idea of mediation of specific activities by specific tools and signs misses the point of the ongoing societal and cultural transformation engendered by digital media, especially by Web 2.0. Mediation is an issue of the historically leading or dominant media. The entire scope and character of human activities is determined by the dominant media.

We believe that Lompscher and Rückriem are right in that in much of activity-theoretical literature on expansive learning, print and writing are taken for granted as the dominant cultural media. Such tacit assumptions may indeed blind us to the consequences and potentials of digital media. However, Lompscher and Rückriem argue that it is media that determine the nature and possibilities of human activity. If this implies that the object of activity is of secondary importance, then we disagree with Lompscher and Rückriem.

Computerization and digitalization may well be the core and moving force of the current long wave of transformation of production (Perez, 2002). But acknowledging the foundational importance of major upheavals in productive forces does not mean that we should see technology as the direct cause of all societally important developments. The argument on the decisive role of digital media ignores what media are used for – what ends and objects they serve. Consequently, it also ignores the internal contradictions of objects in capitalism. The most interesting issues of Web 2.0 have to do with the aggravation of contradictions between exchange value and use value, between private ownership and public good, between proprietary and freely accessible or open forms of knowledge and production. While this aggravation is greatly facilitated by Web 2.0, it is not simply a consequence of digital media. Forms of similar aggravation are seen in struggles over the production and distribution of generic drugs (Petryna, Lakoff, & Kleinman, 2006), in struggles concerning the private appropriation and exploitation of genetic and biological foundations of life (Cooper, 2008; Rose, 2007), in struggles over the future of and alternatives to the global food system (Wright & Middendorf, 2008), or in struggles over the uses of land and other natural resources in Latin America (Klein, 2007), just to mention a few of timely examples not directly reducible to the consequences of digitalization and Internet.

Rückriem (2009, p. 94) writes that it is actually impossible to analyze adequately the emerging new forms of work or learning outside digitalization: “To discuss co-configuration without mentioning computers and the Internet is like studying the results without considering the causes.” However, studies conducted on co-configuration work in the care of patients with multiple chronic illnesses (e.g., Kerosuo, 2006) show little or no direct causative role of digitalization. The need for co-configuration and knotworking in this domain arises because of the dire human and economic consequences of excessive fragmentation of care. Computerization of medical records may offer new possibilities for implementing co-configuration – but it can also be used as an excuse to avoid or postpone such deep changes in collaboration and division of labor.

In his commentary, Young (2001) discusses the theory of expansive learning from the point of view of a critical researcher in the field of vocational education and training (VET). According to Young (p. 159), the theory of expansive learning seems to be a model of enhancing incidental learning. To what extent can this mode be applied in a context where learning is the explicit goal, not something instrumental to another goal such as better health care or productivity? In this paper, we have discussed a series of studies of expansive learning in formal school settings (Engeström et al., 2002; Hyrkkäinen, 2007; Kärkkäinen, 1999; Lambert, 1999, Nilsson, 2003; Sannino, 2008b; Sannino & Nocon, 2008; Teräs, 2007). Educational institutions are work organizations with their own histories, contradictions and zones of proximal development. If anything, the framework of expansive learning should help the researcher to problematize the taken-for-granted institutional features that shape the ‘motivational sphere’ of schooling behind and beyond the explicit curriculum manifested in textbooks and classroom lessons (see Engeström, 1998).

Young also asks an important question about knowledge involved in expansive learning: “How does the expansive learning cycle enable learners to access knowledge that does not emerge directly out of practice – for example, medical knowledge about new treatments and organizational knowledge about health policies?” (p. 160) In *Learning by Expanding* (Engeström, 1987, pp. 194–209), a key concretization of the theory was made with the help of Kivi’s (1929) classic novel *Seven Brothers*. The novel tells the story of the transformation of the life of seven boys, from a socially isolated pre-agrarian hunting culture to an agrarian culture of farming and village community. A crucial element of the expansive transformation is the painful process of learning to read and write. In many if not all large-scale expansive transformations of organizations and institutions, such painstaking processes of acquisition of culturally established knowledge are involved as important elements. As the story of *Seven Brothers* powerfully illustrates, the very fact that it is subordinated to a broader expansive vision makes the acquisition quite different from the linear notions commonly associated with school learning.

In a workplace, a condensed expansive learning process induced by a Change Laboratory intervention typically involves a diverse group of competent practitioners who, under time pressure, face a set of contradictions demanding a novel solution that cannot be found in textbooks or established canons of disciplinary knowledge. But there is nothing in the process itself that prevents or discourages the participants from seeking various forms of established knowledge and bringing it into the collective analysis and design. Most commonly this takes place in the form of benchmarking, seeking and using information about comparable contradictions and solutions in similar organizations both within the country and abroad. Thus, in the expansive learning process of the home care managers of the City of Helsinki introduced at the very beginning

of this article, the participants gathered information about recent home care solutions from Sweden and United Kingdom using the Internet, reports from site visits, official policy documents, articles from newspapers and professional journals and personal contacts as sources of knowledge. This benchmarking knowledge was analyzed and served as a springboard mainly to identify pitfalls to be avoided in the design of the participants' own model. Correspondingly, in the expansive learning processes induced by the Competence Laboratory interventions conducted by Ahonen in work teams of a telecommunications company, a high-level manager was regularly invited to join a session to tell about the corporate strategy and present challenges of the company from the management's point of view, and to respond to the ideas developed by the shopfloor practitioners in the course of the laboratory (Ahonen & Virkkunen, 2003). Similar actions have been conducted in numerous Change Laboratory interventions. These actions of reaching out for knowledge may be tentatively characterized as anchoring the process of learning upward, downward, and sideways (Engeström, 2004a). Young's question indicates that such actions and forms of knowledge deserve focused analyses and further theorizing of their own.

Young's third question has to do with the role of power in expansive learning. He points out that it is quite possible that "a student or trainee begins by questioning, but later learns to keep quiet – thus providing a barrier to the continuation of the expansive learning cycle" (Young, 2001, p. 160). He asks: "What are the conditions – in terms of company policy and national policy – that make expansive learning possible?" (p. 161) The studies reviewed in this paper include numerous cases in which an expansive cycle has been broken or thwarted, sometimes by active counter-measures of the management, more often due to passivity and lack of support from the management, from practitioners, or from both. Within the framework of activity theory, these setbacks are analyzed in terms of specific object-related contradictions. Explaining them as manifestations of power seems too simple. In this theoretical perspective, power is seen mainly as an instrument and an outcome in the pursuit of some object, not as the root cause of events and actions. In this vein, Young's question concerning the policy conditions favorable for expansive learning seems also partially misguided. Expansive learning takes place because historically evolving contradictions in activity systems lead to disturbances, conflicts and double binds that trigger new kinds of actions among the actors. In this sense, expansive learning is a historical reality rather than an outcome of a designed policy. On the other hand, it does make sense to develop and pursue policies that can make expansive learning less painful and troublesome. Studies on such policies are indeed needed.

Paavola et al. (2004) discuss the theory of expansive learning as one of three important approaches that exemplify the metaphor of knowledge creation, the two others being Bereiter's (2002) theory of knowledge building and Nonaka and Takeuchi's (1995) theory of corporate knowledge creation. Paavola et al. argue that the commonalities and complementarities between the three theories are greater than their differences. We agree that an emphasis on commonalities is warranted at the level of general positioning of metaphors of learning and education. However, educational research is riddled with eclecticism which ignores deep epistemological differences between superficially similar-looking theories. The theory of expansive learning, being a development of cultural-historical activity theory, is epistemologically rooted in Marxist dialectics (Il'enkov, 1977, 1982). Bereiter's theory of knowledge building is epistemologically founded on Popper (1972) theory of three worlds. Nonaka and Takeuchi's theory of knowledge creation is epistemologically based on Polanyi's (1958) theory of tacit knowledge. These three epistemologies are radically different and very critical toward one another. Paavola et al. do not mention Il'enkov and Polanyi in their article. Without being able to go into the contents of these epistemologies in the present paper, we would like to emphasize that a study of the differences may be even more illuminating than an emphasis on commonalities. As Marton has repeatedly shown, the recognition of difference is the mother of all insightful learning. *Variatio est mater studiorum* (Marton & Trigwell, 2000; Marton, 2006).

Langemeyer's (2006) compares and contrasts Engeström's theory of expansive learning with the learning theory of the critical psychologist Holzkamp (1993). She argues that Holzkamp's theory is limited by its exclusive emphasis of the subjective and individual aspects of learning, while Engeström's problem is the opposite, namely "a certain neglect of the subjective problematic" (Langemeyer, 2006, section 4). In other words, the theory of expansive learning "conceptualizes the emergence of an alternative practice, or any solution to contradictions, on a collective, but not really on a *subjective* plane." (section 4). For Langemeyer, this means that the theory underestimates the probability that when practitioners face systemic contradictions, they only accommodate themselves to them in order to avoid any conflict.

Langemeyer's critical observation is a fair assessment of much of the research conducted on expansive learning. But for the theory itself, switching between the perspective of the subject and systemic perspective is foundational.

"(. . .) it is vitally important for the actor to take the system view and for the researcher to take the personal view. This does not imply an attempt to merge or 'bridge the gap' between the two views (. . .). I argue for switching between multiple views." (Engeström, 1990, p. 171)

The switching is aimed at transcending the dichotomy between the subject and the system. This means that an individual subject's ideas and aspirations are not only taken as idiosyncratic expressions of the subject's particular life history; they always also draw upon and interact with generalized cultural models and motives, or social representations. Correspondingly, when for example in a Change Laboratory subjects jointly construct a vision for their own future, or a 'where-to' artifact they generate a tentative, imaginative systems view rooted in their subjective experience, desire, and will.

However, switching between perspectives in practice is very demanding and it is true that theorizing and empirical research on expansive learning have thus far mainly focused on collective and systemic phenomena. In recent studies issues of experiencing, will and agency have started to gain prominence (e.g., Sannino, 2008a, 2008b; Virkkunen, 2006, 2006b). This seems a necessary development (see the next section).

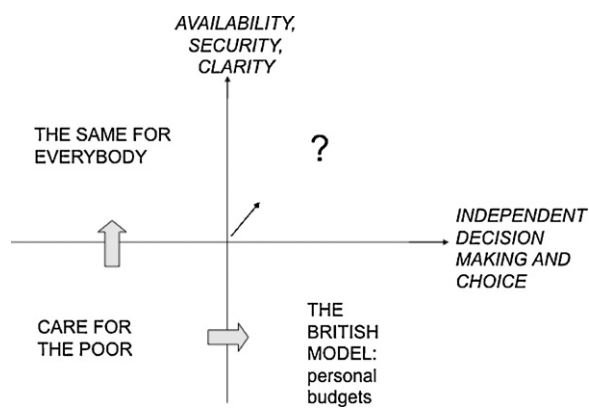


Fig. 8. The historical field of transformation in home care.

The critique of Avis (2007) takes a more political stance. He argues that in studies of expansive learning, “although contradiction is a central category [. . .], in its applications, “notions of social antagonism, exploitation and oppression become side-lined” which leads to “the marginalization of a radicalized and politicized agenda” (p. 165). Avis maintains that in studies of expansive learning, primary contradictions related to the foundational relationship between use value and exchange value are ‘effectively bracketed’ and attention is focused on secondary contradictions and disturbances as their manifestations. All this means for Avis that expansive learning in fact only deals with ‘peripheral contradictions’ and ‘adaptive change’, thus veering toward ‘a conservative practice.’ Avis even claims that we are dealing with “no more than a consultancy aiming to improve work practices” (p. 169).

It is indeed true that studies of expansive learning aim at analyzing and generating transformations within and between activity systems that do not necessarily require a large-scale political confrontation. Avis argues that “such transformations, being tied to localized contexts, may bear only slight relation to wider structural relations, and indeed may support these, thereby becoming conservative practice” (p. 170; see also Warmington, 2008, for a similar stance).

To examine a bit closer Avis’ argument, let us return to the example of home care of the elderly, introduced at the beginning of this paper and discussed in connection to Fig. 2. One might argue that primary contradictions are indeed not highlighted in Fig. 2. The key contradiction is placed between the object of the home care and the object of the client. So does this mean that the home care workers are at fault, not delivering to their clients the kinds of services they truly would need? If this were the result, we would indeed have here a case of conservative practice that demands workers to improve their work in order to adapt to the needs of their clients.

Such an interpretation can only emerge if one disregards much of the actual theoretical and practical content of the approach and its empirical implementations. The Change Laboratory conducted with the area managers of Helsinki home care in 2008–2009 generated not only the triangles of Fig. 2 but also a historical analysis of the alternatives facing the activity. An outcome of this analysis was condensed in diagrams such as that depicted in Fig. 8.

In the home care case, the participants identified as the main threat the neoliberal political and economic tendency toward privatization and logic of profit, exemplified in the recent British model of so-called personal budgets. This tendency is fed by the dissatisfaction stemming from the inflexibility of the existing hierarchical mass production model. In the existing system, the primary contradiction between use value and exchange value manifests itself mainly in the quest for saving money. In the privatized model, commoditization of care would take a big leap forward and the contradiction would increasingly be manifested in outright abandonment of old people to the mercy of the market.

This kind of analysis is a central feature of expansive learning processes and Change Laboratory interventions. As can be seen in the question mark in Fig. 8, the participants did not find any easy or quick ways out. They were conscious of the difficulty and long-term nature of the challenge of merging the principles of equality and flexibility. This is a challenge of creating something qualitatively new, not a task of adaptation and improvement. However, intermediate steps must be taken and experiments need to be made to open up and test the road toward the envisioned future. Such intermediate steps and experiments include in this case a number of new tools and practices developed within the project by practitioners over a period of three years (for an example, see Nummijoki & Engeström, 2009). Without a historical analysis and a vision such as those summarized in Figs. 2 and 8, these intermediate steps might indeed remain merely adaptations and isolated improvements.

Home care in Helsinki is a ‘local context’. Yet it is much more than a single well-bounded organization. It is a broad and diverse field of activity systems, ranging from legally required public services produced by the city, to third-sector organizations and private service providers. The intermediate steps and experiments designed and implemented by the practitioners in the project encompass these diverse activity systems in various combinations, aimed at generating models of collaboration and coordination which go beyond the hierarchy vs. market opposition depicted in Fig. 8.

Avis suggests that studies of expansive learning need to become “aligned with radical social movements” (p. 174). Examples of such alignments realized thus far in studies of expansive learning include research conducted in alliance with organic

farmers (Seppänen, 2004), with programmers of the movement of Free and Open Source Software (FOSS) (Siltala et al., 2007) and with a movement to revitalize local food production in Japan (Yamazumi, 2009). Further development in this direction seems necessary and productive.

13. Future challenges

The most important outcome of expansive learning is agency – participants' ability and will to shape their activity systems. A major challenge for the study of expansive learning is to conceptualize and characterize empirically the new forms of agency involved in expansive processes (see Edwards, 2009; Sannino, 2008a; Virkkunen, 2006a, 2006b; Yamazumi, 2009). In formative Change Laboratory interventions, we have tentatively identified the following five interconnected forms of participants' emerging agency which seem to be quite specific and characteristic to this type of interventions (Engeström, forthcoming): (1) resisting the interventionist or the management, (2) explicating new possibilities or potentials in the activity, (3) envisioning new patterns or models of the activity, (4) committing to concrete actions aimed at changing the activity, (5) taking consequential actions to change the activity. In Change Laboratory processes, the consequential change actions are mostly taken *in vivo*, after and in between the laboratory sessions. To record and reflect on such actions, various kinds of follow-up data are collected and specific follow-up sessions are included in the longitudinal intervention process.

The five forms of agency mentioned above are certainly not an exhaustive list. Further studies of formative intervention and expansive learning cycles will reveal other forms and open up possibilities of theorizing agency as something that can be purposefully cultivated.

Expansive learning is a process of concept formation. This framework suggests that the very idea of concepts needs to be redefined. As Hall and Greeno (2008, p. 213) point out, "concepts and their meanings develop and evolve in settings of practice and are maintained in practices because they are useful in conducting the community's activities." In this perspective, concepts are consequential for the lives of those who work with them. Such concepts are embodied, embedded and distributed in and across human activity systems equipped with multi-layered and multi-modal representational infrastructures or instrumentalities (Engeström, 2007a). Complex, consequential concepts are inherently polyvalent, debated, incomplete, and often 'loose'. Different stakeholders produce partial versions of the concept. Thus, the formation and change of concepts involve confrontation and contestation as well negotiation and blending. Concepts are future-oriented. They are loaded with affect, hopes, fears, values, and collective intentions. Of particular interest are 'possibility concepts' (Engeström, 2007b) and 'perspectival concepts' (Engeström et al., 2005a, 2005b) which explicate time-bound collective intentions or visions of future development and change.

Complex concepts are formed and changed by movement and interaction in vertical and horizontal dimension (Engeström et al., 2005a, 2005b; also Ahonen, 2008). The vertical dimension may be understood as interplay between everyday (bottom-up) and scientific (top-down) concepts (Vygotsky, 1987), or as the process of ascending from the abstract to the concrete in the formation of theoretical concepts (Davydov, 1990). The horizontal dimension may be understood as making cognitive trails in a terrain (Cussins, 1992, 1993, also Hyrkkänen, 2007). Concepts evolve through cycles of stabilization and destabilization. These principles mean that complex, consequential concepts have expansive potential. The formation, use, maintenance and change of such concepts may be understood as expansive in terms of the concept's social and material distribution, temporal reach, and capability to encompass multiple points of view and cross boundaries. The formation of complex concepts is not just internalization of culturally given concepts but above all externalization, generation of culturally new concepts (which also need to be internalized in use).

In a recent series of studies on expansive learning in organizations moving toward co-configuration work (Engeström, 2007c), a recurring gap was observed between the highly motivated modeling phase in which participants designed a new concept for their work, and the implementation phase in which numerous obstacles and persistent inertia tended to take over. This gap was momentarily overcome in episodes in which the participants put themselves into imagined, simulated and real situations which required personal engagement in actions with material objects and artifacts (including other human beings) that followed the logic of the anticipated or designed future model of the activity.

The concept of experiencing, as put forward by Vasilyuk (1988), seems promising as a bridge between design and implementation. According to Vasilyuk (1988, p. 10), experiencing is "particular internal work by means of which a person overcomes and conquers a crisis, restores lost spiritual equilibrium and resurrects the lost meaning of existence." In other words, Vasilyuk defines experiencing as the working out of contradictions human beings encounter in maintaining their activities.

"If one had to use one word only to define the nature of such situations one would have to say that they are situations of *impossibility*. Impossibility of what? Impossibility of living, of realizing the *internal necessities* of life. The struggle against impossibility, the struggle to realize internal necessities—that is experiencing. Experiencing is a repair of 'disruption' of life, a work of restoration, proceeding as it were at right angles to the line of actualization of life. If the psychological theory of activity studies, figuratively speaking, the way in which a human being travels life's road, then the theory of experiencing studies the way in which he or she falls and rises again to continue the journey." (Vasilyuk, 1988, p. 32)

Practitioners facing major transformations in their work activities are indeed working out contradictions and struggling to overcome the impossible. "The process of experiencing does not lead the participant directly to realize his or her needs.

leads to restoring the psychological possibilities to carry on the activity required for the realization of these needs. In other words, experiencing may be seen as a process through which individual disposition to act is prepared" (Sannino, 2008b, p. 241). Interventions such as Change Laboratories aimed at expansive learning may be fruitfully analyzed as "discourse- and activity-centered processes of experiencing" (Sannino, 2008b, p. 253). In future intervention studies of expansive learning, participants' autobiographical accounts of critical conflicts may be used as an important type of 'mirror material' for experiencing (Sannino, 2005, 2008a).

Perhaps the biggest challenge for future studies and theorizing in expansive learning comes from the emergence of what is commonly characterized as social production or peer production (Benkler, 2006). In social production or peer production, activities take the shape of expansive swarming and multidirectional pulsation, with emphasis on sideways transitions and boundary-crossing. Recently we have suggested the notion of wildfire activities to point out that activities such as for example birding, skateboarding, and disaster relief of the Red Cross have important characteristics similar to those of peer production but predate internet and take place mainly outside the sphere of digital virtuality (Engeström, 2009).

Learning in wildfire activities is learning by swarming that crosses boundaries and ties knots between actors operating in fractured and often poorly charted terrains. These characteristics call for a reworking of Vygotsky (1978) foundational concept of the zone of proximal development, and of the collective and expansive redefinition of this concept (Engeström, 1987). In wildfire activities, a zone is a terrain to be dwelled in and explored, not just a stage to be achieved or a space to be crossed. The zone is explored by moving in it, to various directions and destinations, back and forth and sideways. The dwellers create trails and the intersecting trails gradually lead to an increased capability to move in the zone effectively, independently of the particular location or destination. The zone is never an empty space to begin with; it has dominant trails and boundaries made by others, often with heavy histories and power invested in them. When new dwellers enter the zone, they eventually have critical encounters with existing trails. They both adapt to the dominant trails and struggle to go beyond them. The latter can lead to new trails that expand the collective shape and understanding of the zone, thus also to new boundaries. When the dwellers reach a certain level of mastery of the zone, they begin to collide with the very boundaries of the zone and to break away from the zone, toward new zones.

The ultimate test of any learning theory is how it helps us to generate learning that penetrates and grasps pressing issues the humankind is facing today and tomorrow. The theory of expansive learning currently expands its analysis both up and down, outward and inward. Moving up and outward, it tackles learning in fields or networks of interconnected activity systems with their partially shared and often contested objects. Moving down and inward, it tackles issues of subjectivity, experiencing, personal sense, emotion, embodiment, identity, and moral commitment. The two directions may seem incompatible. Indeed, there is a risk that the theory is split into the study of collective activity systems, organizations and history on the one hand and subjects, actions and situations on the other hand. This is exactly the kind of split the founders of activity theory set out to overcome. To bridge and integrate the two directions, serious theoretical and empirical efforts are needed.

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