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Martin Stam ^a, Wietske Miedema ^b, Jeroen Onstenk ^c, Willem Wardekker ^d & Geert ten Dam ^e

^a Department of Society and Law, University of Applied Sciences of Amsterdam, Amsterdam, The Netherlands

^b Institute for Education, University of Applied Sciences of Amsterdam, Amsterdam, The Netherlands

^c School of Education, Inholland University of Applied Sciences, Haarlem, The Netherlands

^d Department of Research and Theory in Education, VU University, Amsterdam, The Netherlands

^e Graduate School of Teaching and Learning, University of Amsterdam, Amsterdam, The Netherlands

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Researching how and what teachers learn from innovating their own educational practices: the ins and outs of a high-quality design

Martin Stam^{a*}, Wietske Miedema^b, Jeroen Onstenk^c, Willem Wardekker^d and Geert ten Dam^e

^aDepartment of Society and Law, University of Applied Sciences of Amsterdam, Amsterdam, The Netherlands; ^bInstitute for Education, University of Applied Sciences of Amsterdam, Amsterdam, The Netherlands; ^cSchool of Education, Inholland University of Applied Sciences, Haarlem, The Netherlands; ^dDepartment of Research and Theory in Education, VU University, Amsterdam, The Netherlands; ^eGraduate School of Teaching and Learning, University of Amsterdam, Amsterdam, The Netherlands

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This article describes experiences with a qualitative research project into teachers' learning from innovating their own educational practices. Decades of New Public Management (NPM) in the Netherlands, with its top-down and business-like approach to areas of public interest, obscured the learning and innovating capacity of teachers, teams, and schools. Merely studying the learning processes which take place at a teacher level would present insufficient insight into the deeper mechanisms which hinder or stimulate learning from innovation in a bottom-up manner. We, therefore, focused on the relations between different layers (individual, systemic) within schools. A high-quality design was required for answering the research question: How and what do teachers learn from innovating their own educational practices? This article elaborates upon this design and discusses the methodological findings and complications of this type of research.

Keywords: high-quality multiple case study; bottom-up school innovations; individual and collective learning processes; Learning History methodology; Cultural-Historical Activity Theory

1. Introduction

It is striking that only few articles focus on the methodological findings and complications of qualitative research. The aim of this article is to discuss the research design of such a study into the following question: *How and what do teachers learn from innovating their own educational practices?* The question we address in this article concerns the research design that is necessary for capturing the complexity of the learning of teachers. The methodological issues of this qualitative research are related to the increasing uncertainty about the innovative capability of teachers and schools. This uncertainty is partially the consequence of New Public Management (NPM). According to Marsh (1999),

*Corresponding author. Email: M.Stam@hva.nl

NPM started in the 1980s, when globalization spread and an economic crisis forced a new model of the organization and provision of public services in all western countries. The Weberian principles of bureaucratic hierarchy, planning, centralization, and direct control were replaced by a management culture, which wanted to make the social sector as market-oriented as any business. Social professionals (such as teachers, social workers, or health workers) became part of a compliance culture in which meeting management demands became the dominant focus rather than meeting the needs of students, patients or clients (Munro, 2011, p. 20). The NPM businesslike approach caused a split between managers and professionals, and also between top-down and bottom-up perspectives on the development of the social professions. ‘At shop floors, professionals not only become part of strict organizational regimes, with planning and control, performance measurement, quality models, strategic frameworks, and divisional structures [...], they are also forced to become managers, at least partly’ (Noordegraaf, 2007, p. 776). In education, the increasing influence of NPM is responsible for large-scale innovations carried out as a consequence of market norms. Teachers experienced these norms as unfamiliar because they do not result from the problems and tensions which they encounter in their practice. Meeting NPM assessment reinforces a defensive routine based on a procedural perspective which hampers professional learning (Munro, 2011, p. 21). ‘In education it precipitated a crisis of sinking professional motivation and classroom creativity’ (Hargreaves & Shirley, 2009, p. 11), resulting in a ‘mindlessness’ that promotes habit, ritual, and compliance, rather than learning, creativity, and change (p. 28).

In *Musings of a former QSE editor*, J. Amos Hatch (2006) pleads for high-quality qualitative studies which focus on complex contexts and, by doing so, emphasize the importance and efficacy of research done in areas beyond the positivist paradigm. Our research question and the underlying motives (i.e. studying what hinders and stimulates teachers’ learning from bottom-up innovations) mirror Hatch’s plea. In the positivist paradigm that NPM promoted, convergent deductive thinking is dominant, as it places specific cases into well-known general categories, whereas studying innovation requires divergent inductive thinking, which cherishes the unique and that which has not yet been classified. Deductive thinking is far too limited to solve tough problems in the social domain. Operating in a deductive manner helps an organization to meet the demands of a sponsor by using predictable and measurable forces. It ignores what cannot be planned or perceived from the top, as NPM did with innovative capacities of teachers. The lack of knowledge about the innovative capacity of ‘local’ teachers, teams, and schools made it essential that we focused on tensions, solutions, and conflicts (dilemmas) that teachers who are innovating their own educational practices experience. According to Hargreaves and Shirley (2009, p. 33), these dilemmas ‘fly under the technocrat’s radar’. Yet we could not limit ourselves to tracing and analyzing these dilemmas. We also had to take into account that these dilemmas, just like the innovations from which they stemmed, were influenced or even dominated by external powers, such as the discourse of NPM. If we limited ourselves to individual teachers’ learning we would not be able to gain insight into the deeper mechanisms which hinder and promote the learning from bottom-up innovations. In order not to reproduce these mechanisms in our research, we had to seek contact with teachers who were carrying out an innovation, consider their dilemmas

and the slow and painful nature of this process of change (Mintzberg, 1993, p. 210), and simultaneously gain insight into macro-forces in this process, such as NPM.

We wanted to study divergent inductive thinking and in this, we placed value on Latour's culture of 'research' in which, when compared to science, research is uncertainty:

Science is supposed to be cold, straight, and detached; research is warm, involving, and risky. Science puts an end to the vagaries of human disputes; research creates controversies. Science produces objectivity by escaping as much as possible from the shackles of ideology, passions, and emotions; research feeds on all of those to render objects of inquiry familiar. (Latour, 1998, p. 208)

Our study aims to generate knowledge which could also inspire other teachers who are working on their own educational innovation. This had consequences for both the research methodology as well as the selection of the object. A simple case study which would only produce context-immanent, local knowledge would be unsuitable. The study had to be set up in such a way that a wealth of empirical information could be generated about what and how teachers – who are jointly working on bringing about educational innovation – learn, on the basis of which a carefully developed theory could be formed. Such a theory should encompass the conditions for long-term transformation in teaching and learning. In brief, we focused on a research methodology which enabled us to generate decontextualized knowledge from the qualitative information about specific and contextual 'slow and painful' processes of change. Moreover, we were looking for a methodology which would enable us to look into connections between processes on an individual and a systemic (school) level. In this article, we describe our experiences with this high-quality qualitative research methodology.

In short, our original study of the learning of teachers consisted of three levels of questions.

The first level related to questions about the problems teachers encounter in the innovation of their teaching. This resulted in the analysis and clarification of background processes in a relatively unexplored field – the learning of teachers in relation to the learning of the team and the school of which they form part, within the context of a bottom-up innovation. The second level of questions aimed to contribute to theory formation about learning in the context of educational innovations, in order to provide more effective support for these learning processes. The third level of questions related to the experience with high-quality qualitative research methodology. This 'study' of a qualitative study is the focus of the present article.

2. Methodological framework

2.1. Case studies

For answering our research question, we designed a multiple case study. However, the question then emerged: Where should we start with our collection of information about bottom-up educational innovation and the corresponding learning of teachers? We have chosen the field of vocational education, which has been characterized in recent years by a large variety of actual innovations. Taking into account that schools of vocational education – due to NPM – had been transformed into huge institutions with thousands of students and hundreds of employees, we have

chosen that a case would not concern the entire school, but a department of a school. We have applied the following criteria:

- the innovation in question should put an emphasis on active learning, on an increasing independence of the student, and on a coherent curriculum directed to identity formation. With this criterion, we wanted to select schools engaged in innovations aimed at the development of (vocational) competences;
- the innovation should have tangible consequences for the learning environment of students. With this criterion, we wanted to select innovations concerning school learning in general, and not just in one single subject area;
- the innovation should be, at least partly, initiated from the bottom-up, through the ambitions and efforts of the teachers participating in the innovation. With this criterion we wanted to select innovations in which the teachers themselves had an important voice in the development of the innovations.

With the help of these three criteria, we asked consultancy agencies for educational innovation which schools of pre-vocational and higher vocational education in the region of Amsterdam met this profile. Partially on the basis of these sources of information, we came up with four cases: two cases concerned schools for pre-vocational secondary education for students up to 16 years of age (a Department of Technology and a Department of Business Administration) and two cases concerned departments of higher vocational education within a University of Applied Studies (the Department of Physical Therapy and a Teacher Training Institute). At the time of the study, all four innovations were well underway in the implementation stage and were starting to consolidate the new vision and associated work processes.

2.2. *The Learning History methodology*

For securing a focus on ‘the humble and human dilemmas of real life in real schools and communities’, we used the Learning History methodology (Kleiner & Roth, 1996). ‘A learning history approach captures stories people tell about learning and change efforts and reflects them back to the organization and others’ (Field Manual).

In the case studies, we followed the teachers who were involved in the innovation of their own educational practices for two years. The actions and statements of these teachers formed the core of our research data. In our research design, we made a distinction between an inner circle (the teachers) and an outer circle (staff, management, students, and practitioners from neighboring institutions). All respondents of the inner circle were interviewed four times, and all respondents of the outer circle once. After almost two years, these stories of the inner and outer circles, supplemented with the results of the analyses of documents, were resubmitted to respondents in the form of a learning biography. This document was used to connect different layers of an organization in their conversation about the ongoing innovation.

2.3. *The Cultural–Historical Activity Theory*

In order to answer the question of how these sensemaking processes – including the feedback on the learning biography as a jointly-told tale – developed over time, we made use of two related theories: Cultural–Historical Activity Theory, as developed by Engeström (1987) and Creative Learning (Meijers & Wardekker, 2002).

We used Engeström's Cultural–Historical Activity Theory to focus our analysis more systematically on the different stakeholders involved in the innovation and on their mutual relations. The Cultural–Historical Activity Theory holds that systemic learning takes place when tensions and conflicts in the workplace have outgrown the possibility of solving them within existing frameworks. Only a transformation of the activity system can offer a solution. According to Engeström (1999a, 1999b), when such a transformation is successful, an innovation has been established and the learning that has taken place can be characterized as expansive learning: a new object of action would have been realized. Activity Theory shows that such a realization and reproduction of an activity system proceed step-by-step, in the form of cyclical processes made up of phases, which Engeström regards as 'zones of proximal development (ZPD)' of the activity system. He adopts the concept of ZPD from Vygotsky (1978), who uses it to describe learning processes on a micro level. Engeström defines such a zone in a broader sense as the:

distance between the everyday actions of individuals and the historically new form of the societal activity that can be collectively generated. ... The study of an activity system becomes a collective, multivoiced construction of its past, present and future zones of proximal development. (Engeström, Brown, Christopher, & Gregory, 1997, p. 174)

Engeström (1987) distinguishes the following phases in a cycle of proximal development:

- The primary contradictions of the *need phase* concern the basic tension and basic oppositions in an activity system and its environment. They lead in the first instance to questioning the existing activity system.
- The secondary contradictions of the *double bind phase*: in this phase, primary oppositions come to a head. The participants channel their discontent towards more sharply defined goals.
- The tertiary contradictions of the *Object/Motive construction phase*: the participants construct a new *Object*, from the *Motive* to find a solution for the primary and secondary contradictions. In the course of this process, they are confronted with strong conflicts between old and new ways of acting (and thinking).
- The quaternary contradictions of the *application and generalization phase* appear when the modification of the object is brought in line with the surrounding activity systems.
- The *consolidation and reflection phase* is when the new activity is consolidated and subjected to critical reflection; the beginning of a new cycle.

Our four school cases were all in the phase of realizing a new *Object* and were facing tertiary contradictions. The Cultural–Historical Activity Theory generated categories for analyzing how the innovation in the schools was constructed and improved over time. Retrospectively, we analyzed the primary and secondary contradictions which had caused the sense of urgency for the innovation to actually take place.

According to Activity Theory, subjects – in our case, teachers – learn from innovating their own work, by developing new work processes, and by solving problems that are central to the new work processes and to the implementation

processes. By doing so, teachers experience critical incidents and moments when they do not know what to do. Engeström recognizes that this desperation can result in existential doubts, it can result in ‘personal crises’, ‘breaking away’, ‘turning points’ or ‘moments of revelation’ (Engeström, 1987), but he does not pay much attention in his model to such moments as a possible origin for individual learning processes. He mainly approaches the existential tensions and conflicts which stem from the system contradictions as a collective affair.

2.4. *Model of Creative Learning*

While Engeström’s Activity Theory offered us insight into the expansive learning of an activity system, we also wanted to investigate how the object change is expressed in the learning processes and development of the competences of each individual teacher. Beforehand, we had assumed that teachers would react to object change very differently and, as a consequence, go through different developments. We therefore interviewed the teachers with regard to their personal learning and other experiences. In the interviews, the teachers talked about how participating in the innovation helped them to develop specific competences. We recorded any possible growth in competences for every teacher on a scale of seven competences derived from the official Dutch teacher competency Stichting Beroepskwaliteit Leraren (SBL) model (www.lerarenweb.nl). This model consists of open categories, which each teacher can personalize in a specific way. Subsequently, the interviews were analyzed using the model of Creative Learning (Meijers & Wardekker, 2002). This model aims at understanding the development of professional identities: acquainting oneself with professional roles and growing into existing professional practice. In the model of Creative Learning, a connection is made between social and personal processes of sensemaking.

From the perspective of Creative Learning, teachers who participate in an innovation process sooner or later will encounter boundary experiences. This kind of experiences occurs when teachers cognitively and emotionally experience a gap between present beliefs, routines, and competences customary for the ‘old’ activity, and beliefs, routines, and competences that are necessary in order to be able to function in the ‘new’ activity. It is precisely the discontinuity between the old and the new object which brings about boundary experiences (Meijers & Wardekker, 2002). Teachers’ actual beliefs and competences are neither sufficient nor suitable in the new situation. Using the model of Creative Learning enabled us to investigate how teachers reach the limit of their capabilities. However, although the concept of boundary experience has a great clarifying value in understanding the necessity of starting a learning process, it does not explain why certain persons react to new situations and new exigencies by starting a process of identity learning, and others do not. In order to grasp these differences, we enriched the concept of boundary experience with Vygotsky’s concept of *discontinuity*. Vygotsky ascribes important developmental potential to individuals experiencing a crisis: developmental crises arise when a person is involved in conflicting activities or emotions. ‘Discontinuity and crisis essentially belong to the concept of development, on a personal and on an organisational level’ (Van Oers, 2001, p. 15). Discontinuity is thus an essential feature of boundary experiences. It occurs when having a boundary experience, and feelings of fear, sadness, and anger dominate.

With the Activity Theory of Engeström and the model of Creative Learning of Meijers and Wardekker, it is possible to relate this individually sensed discontinuity to systemic contradictions.

3. Evaluation of the research and interpretation process

What are our experiences with the multiple case study? By means of 120 reflective interviews, with 23 teachers – whom we interviewed four times – and 28 other stakeholders taking part in these four educational innovations – whom we interviewed once – we produced data in the form of narratives. Together, they consisted of more than 2000 pages of typescript. With the help of these stories and reflections, we aimed to shed light on the relation between innovating and learning of individual teachers and their schools. We will now reflect on our use of Learning History, of Engeström's analytical tools and of the model of Creative Learning.

3.1. *What did we – as researchers – learn from this form of data collection and what comments do we have on the Learning History instructions?*

The reflective interview form gave us the opportunity to build a relationship with the interviewees based on mutual trust, gratitude, and 'attractiveness' (resulting in rich information for the researcher, and new ways of reflection and communication for the teacher). This helped us to distinguish between stories about the innovation told by those who had initiated it and by those who had developed it in practice. To gain deeper insight into the innovation and learning processes in the schools, we compared the stories within a case with each other and distinguished different positions, ambitions, and interests between the teachers, managers, staff, and pupils/students. We gave differences a place in the written learning biography.

In the interviews with respondents, four different instruments were used: the learning biography, Cultural–Historical Activity Theory, the Model of Creative Learning, and a self-evaluation by teachers, with the help of the SBL competence model. Additionally, documents were analyzed. By basing the learning biography on data from all three instruments, and by supplementing the narrative method with an analysis of documents, we have tried to achieve an optimal triangulation.

The first interview with the inner circle laid down what the members of the inner circle themselves understood by the innovation. This took place in a semi-structured interview. The aim of the interviews was to allow participants to describe their own role in the development of the innovation, and the meaning they assigned to this role. Teachers spoke about important incidents, persons, and moments. The first interview provides a picture of the various individual perspectives on, and personal experiences of, the innovation.

The second interview with the inner circle provided an opportunity to describe these perspectives in fuller detail, and to situate them in the interpretative framework of the activity system. For this purpose, a semi-structured interview was used to focus more closely on the experiences, tensions, and results that had come up in the first interview. In this way, we could get on the track of historical, current, and expected developments. The second interview enters more deeply into the kind of tensions and contradictions that had led to this innovation (what were the problems the innovation was meant to solve?), into the contradictions that had been solved by the innovation, and into new tensions and conflicts that had manifested themselves, meanwhile.

In the third interview, teachers express themselves about their inspiration and motives, and also about what they themselves and their teaching mean for pupils/students, colleagues, the school, and society. During this reflective third interview, they examine their own development: is this development continuous, or does it show a break? They express themselves about how they stand with respect to the discussion of innovation in the team, and how they deal with emotions attendant on these sweeping changes. They also tell about the personal qualities they have developed in the course of the innovation, and about the personal obstacles they have encountered while working on and in the innovation.

In the fourth interview, we asked teachers to assess their own competences with the help of the SBL competence matrix. The matrix specifies the responsibilities of the teacher by distinguishing four professional roles: the interpersonal role, the pedagogical role, the role of the subject teacher, and the role of the teacher in the organization. These professional roles are fulfilled in four situations that characterize the teaching profession: working with pupils/students, working with colleagues, working with the environment of the school, and working on oneself. The last of these situations refers to professional development. We used the matrix to let the interviewed teachers make statements about the learning effect of innovative actions in terms of knowledge, insight, and skills. With the help of this open model, teachers describe their competences in their own words, and determine how far they have advanced in each of these competences, by being active in the innovation.

With members of the outer circle, we focused on two different aspects of the innovation: members of management or project management were interviewed on the innovation *process*; with interviewees involved in the curriculum aspect of the innovation, such as students, or teachers active on the next higher level of operational education, we primarily discussed the contents and results, the *products* of the innovation.

We stimulated the members of the community to make judgments about the validity of our inquiry. The cyclical framework of validation gave interviewees the opportunity to affirm, recapture or complete earlier utterances and to comment on the utterances of others. By bringing these isolated judgements together in a meeting in which the interviewees commented and evaluated the learning biography, we worked out on what scale our proposed insights were affirmed and/or denied by the group. By the end, we could consider the stories of the teachers not only as utterances of individuals whose opinions and interests developed during the course of time, but also as signs of an expanding, 'learning' school. It enabled us to bring together patterns of conflict, its resolution and decision-making, and trends in defining and overcoming persistent problems. With the help of the Learning History methodology we could do justice to the multivoiced nature of school reality, by researching, describing, and analyzing it from different perspectives.

3.2. Did the data arranging with Engeström's analytical tools enable us to investigate relations between the different layers (individual, team, systemic) within each of the four schools?

How did we process the corpus of data? And how did we relate these data to one another? The learning biography was analyzed with the help of the components of the activity system: *Subject, Object, Tools, Rules, Division of Labor, and Community of Practice*. A teacher or group of teachers can be regarded as the acting

Subject, with its specific characteristics and qualifications. The *Subjects* strive for the best possible realization of the *Object*. This is called the *Motive*. Along these lines, *students* in the activity system of vocational education are schooled by the activities of *teachers* to achieve a starting competence as practitioners of their vocation. *Tools* refer to the use of artifacts (conceptual artifacts such as plans, diagnostic instruments, models, and scientific theories, as well as material artifacts such as the physical environment, computers, etc.). The *Community of Practice* includes all the participants in an activity system who share the same *Object*; it is the community in which the activity takes place. *Division of Labor* refers to the distribution of tasks, powers, and responsibilities between the participants and makes clear who does what in the activity system. *Rules* refer to the explicit or implicit regulations with which actions have to comply.

For each concept, the quotes were analyzed for primary, secondary, tertiary, and quaternary contradictions. This collection of quotes was also examined for conditions facilitating the learning of participants. These conditions were specified in the report of the case study. Each of these reports begins with an introduction in which the primary and secondary contradictions providing the impetus for the innovation are situated in a national framework. In this operation, we have consistently observed the requirements of the learning biography as to the nature of the reported stories: the stories are founded in data, are told ‘dramatically’, and are recognizable by respondents.

How were the different levels of practice reconstructed? The Cultural–Historical Activity Theory of Engeström (1987) enabled us to give the system aspect its own place in our research design. For the teacher training program, there was the concept of school-based teacher training which was developed nationally and subsequently had to be elaborated upon and implemented locally with project subsidies. For the physiotherapy program, the urgency for innovation came from the management: they were worried that problem-based learning would not meet accreditation requirements of the Dutch Ministry of Education nor the evidence-based requirements of the professional associations of physiotherapists. For the Department of Technology education, there was the national and local pressure of making technical departments more up-to-date and attractive. It was only at the Department of Business Administration education that the innovation was driven relatively strongly from the bottom up, even if it was the case here that the management was very insistent about innovation. We do not want to suggest by this that all systemic dynamics come into existence in a top-down fashion, but it does demonstrate how, under the influence of NPM, bottom-up innovative powers have become strongly dependent on the quality of the management. We found that the two cases in which the management gradually withdrew as initiator and facilitated the innovation from the bottom up – the Departments of Business Administration and Physical Therapy – also ultimately appeared to be the most successful innovations. This is in keeping with the insights which Hargreaves and Shirley (2009) reported from their research: ‘When leaders refuse to “let go” at the right moment, it is not strength they display, but rigidity’ (p. 29). In contrast, in the other two cases, we saw that the retention of the top-down model by the management strongly contributed to stagnation (at the teacher training program) and confusion (at the technical program) concerning the innovation.

The use of Activity Theory gave insight into systems contradictions which ultimately led to change. Activity Theory enabled us to connect the system level with the team level, by analyzing how, and to what extent, teachers collaborated while

innovating their school. Within the group of teachers at the four schools, we encountered fundamental differences in opinions about good learning and about the essence of the vocation for which their students were being trained. We traced these contradictions through the tensions and conflicts the individuals and teams experienced.

The analytical model and concepts of the Activity Theory also helped us to focus our analysis more systematically on the different stakeholders involved in the innovation and on their mutual relations: teachers, team leaders, staff, directors, and students. Because Activity Theory provided focus on collective processes, we were able to establish that a hesitant innovation occurred not only on a team level, but also on a systemic school level (tensions between directors and team leaders and between staff and teams). However, with the Activity Theory we could not make a link between the collective and individual learning processes. We could establish that in two cases – the teacher training program and the technical program – the team did not succeed at arriving at a joint approach. We did notice that in these two cases, teachers – compared to the physiotherapy program and the Department of Business Administration education – were more often confronted on an individual level with experiences which they could not bridge, or, if they did manage to overcome them individually, it did not result in a more shared, collective approach.

3.3. Did the model of Creative Learning help us to investigate relations between the individual and collective levels of learning?

How were ‘boundary experiences’ empirically reconstructed? The reflective interviews over a period of almost two years brought us insight into how innovating one’s own educational practice brings about uncertainty and discontinuity. The ‘warm’ interviews created the necessary nearness and confidentiality for expressing these emotions. Especially the conversations during the third interview were charged, and full of emotion. Teachers were glad to tell about their positive emotions: commonly, they proved to be proud of the innovation and of their own contribution. All teachers also reported negative emotions: painful experiences and painful confrontations. Incidentally, one respondent realized only during the interview which negative emotions the innovation process had called up in him or her, and was temporarily reduced to tears. Eventually, we found out that the teachers tried to develop a sense of continuity in order to overcome these kinds of experiences, by reassuring themselves that they could learn and develop in order to participate fully and competently within the new paradigm. Although all teachers did their utmost to bridge the gap which came into existence, 6 of the 23 teachers in the four cases we examined did not succeed. It appeared to be impossible for them to find and articulate their own perspective in the new paradigm. These teachers experienced such extensive disappointment in the innovation and their views differed with those of their colleagues to such a degree that they were forced to resign. However, most teachers (17) did overcome the discontinuity experienced between the old and the new situations. These teachers reported major benefits in terms of feelings of satisfaction and joyfulness. They felt proud of themselves, of the team, and of their students. They fought the discontinuity evoked by boundary experiences by building up their self-confidence.

The concept of boundary experience as derived from the model of Creative Learning enabled us to relate individual and system learning. It helped us to link the fight for continuity of the individual teacher with the development of shared vision, shared values, and a shared sense of future with colleagues. Boundary experiences

appeared to form the intersection between on the one hand teachers' personal ambitions, competences, and life histories and on the other hand, tensions, conflicts, and contradictions evoked by the expansive learning cycle of the school. Neither the boundary experiences nor the learning processes which they evoke proved to be strictly private matters. The concept of boundary experience helped us to see how teachers draw a sense of continuity from their own educational views, their professional identity, their self-confidence or from lifelong experiences and professionalism. The concept (and the restoration of continuity it implies) also helped us to see how they used each other for this: by creating shared vision, mutual support, and joint action. This appeared to be necessary for transforming boundary experiences into learning experience. The more the team was capable of looking at boundary experiences in terms of system contradictions instead of individual experiences, the more the individual teachers could understand their learning process as a collective process and the more they could claim ownership of the transformation process. This requires the team to approach differences of opinion, conflicts, and tensions as manifestations of system contradictions and as a starting point for individual, collective, and system learning. This does not mean that boundary experiences are less emotional or less painful in a team where they can be transformed into collective learning processes. In these circumstances, however, personal beliefs and convictions tend to be less fixed and less resistant to change. Teachers appeared to be more able to deal with issues resulting from contradictions about the profession and training. Even though teachers' attitudes towards innovation may differ, what and how they learn seem to relate strongly to the learning processes in their team.

Due to our research design, we were able to make the relationship evident between the individual level and the system level of learning, via the collective learning within the team. Moreover, our study showed the relative autonomy of each level. Neither the systemic level nor the individual level determined the progress of the teachers' learning processes. Boundary experiences can therefore be regarded as the source of individual learning as well as manifestations of fundamental contradictions in schools. They form the expression of the relation between learning at a system level, a collective level and an individual level.

4. Conclusions

Activity Theory begins with the premise that shaping and changing activity systems is a collective, large-scale, and continuous process, requiring much effort and deliberate interventions (Engeström, 1987, 1999a). As our research was limited by time and means, this study did not cover the whole of the expansive cycle, but focused on part of that cycle, the phase of tertiary and quaternary contradictions. In all four cases, the study zoomed in at the point when the transformation of the activity system was actually taking shape that same moment, and when old and new features of the activity system came into collision with one another. The situation at that moment and the history behind it were reconstructed from interviews.

4.1. Bottom-up vs. top-down

Is the dichotomy bottom-up vs. top-down valuable? We examined educational innovations which were (partly) initiated by teachers themselves. These innovations resulted from dissatisfaction with the then existing practice of teaching and from a

desire to create a new learning environment that would be more attractive to students and teachers. That teachers should (at least partly) give shape to their own innovation was one of the three criteria on which the cases were selected. This criterion was based on the idea that, to the extent that teachers had more authority over their own educational innovations, they would work on these innovations with more pleasure and less resistance, and would also learn more from these innovations. Naturally, teams and teachers are always directed by the school management; that is what school management is for. However, in three of the four cases, the top-down element of the innovation proved to be considerably larger than had been foreseen, even by those people who gave advice about the selection of cases. It turned out to be that these three innovations were evidently initially conceived top-down. This also appeared to be the case for the steering of the process which brought the innovation from idea to concrete plan. During this process, teachers were indeed involved, but the management stayed in charge. Later, in the following stage of implementing the innovation, the management kept more distance, while a team of teachers became increasingly responsible for the innovation.

Only in one case was this top-down direction of a completely different nature. It was only in this case that the initiative in the whole process, from idea to realization of the innovation, was in the hands of a team of teachers. In this case, the management facilitated and stimulated the teachers, with instructions like: take two days at the seaside and discover how you want to solve these problems. In the other cases, the contribution of teachers was limited to merely filling in and working out of relatively complete frameworks that had been supplied by the management. As a result, the original definition of the object of our study (only innovations that were developed and implemented by teachers themselves) became untenable. Eventually, the cases turned out to be less exceptional than we had at first believed, a circumstance which, for that matter, may make the conclusions of the study more representative. In all our cases – as probably in most educational innovations nowadays – we found a myriad of mixed top-down and bottom-up processes in which the innovation and learning actually took place. It also showed that in all four cases, there was a struggle between the leaders and followers within the teachers' team in this implementation stage. In most cases, the leaders had the approval and support of the management. It appeared that, more than the individual approach of teachers, it was the approach of managers which was decisive for the innovation succeeding or failing.

So the original criterion by which we selected each case, appeared to be not univocal. In hindsight, we can say that the cases that we selected were not the rarities we had originally conceived them to be. Possibly it would have been better, instead of using the criterion of bottom-up development, to look for innovations in which teachers take part with a firm commitment, independently from the question of who took the initiative for the innovation.

4.2. *Emotions and learning processes*

Our study makes clear that innovating one's own teaching, in the context of a (partly) self-designed innovation, is attended by a lot of enthusiasm, but also by a lot of pain, trouble, and conflicts. Innovating one's own teaching turns out to be no holiday treat for anyone, but a chastening experience for almost everyone. Teachers learned a lot from confrontation with their own shortcomings, from the disappointment of others, and from having to find more and less durable solutions to the more and less struc-

tural problems that they ran up against in the practice of teaching. Working together with colleagues provided mutual support for many teachers, but at the same time, many teachers had difficulty taking leave of their earlier autonomy. Learning from innovating is not an easy thing. It is an energy-consuming, emotional, and painful process, in which self-confidence, belief in one's own capacities, and belief in the innovation itself are made to hang in the balance, and the people involved are made to wonder whether they can make a contribution to the innovation and, if so, how.

During the research process, we discovered that the local, practical and tacit knowledge the teachers gathered while learning and innovating their own educational practice was essential for answering our research question. Even though in each school innovation was a collective endeavor, we explicitly aimed at making visible the learning results of individual teachers. Although we ultimately focused on shared understandings rather than simply on individual constructions, we paid considerable attention to how teachers expressed their position, ambitions, and frustrations.

Ultimately – after analyzing the data with the conceptual frameworks of Activity Theory and Creative Learning – it appeared that it was the emotional dimension which connected individual learning to collective learning. Without the specific relationship between researchers and teachers, we would never have found out about the importance of the emotional dimension. We were able to discover the connection between the individual and the collective learning because in the reflective interviews, the teachers shared so many personal and emotional experiences. Because of our closeness and mutual trust, many of the teachers' emotions emerged, from which we ultimately deduced the importance of boundary experiences for the teachers' learning processes. Precisely because boundary experiences are primarily negative experiences, the fact that we had been able to 'seduce' the teachers to tell us about them provided us with the data that led to this discovery.

4.3. *The complex relationship between researcher and practitioner*

The reflective interviews helped the teachers to reflect on their work. Being interviewed and receiving feedback in reaction to earlier statements or statements of others held up a mirror to teachers. In this way, the interviews contributed to their learning to deal with feedback. Being interviewed and getting feedback on statements they made earlier offered the teachers a more deepened and enriched vision. The interviews also contributed to adjusting and clarifying the self-image of teachers. On the basis of the learning biography, teachers proved willing and able to recognize and acknowledge how things had developed, even if that was at odds with their own image of the innovation. In this way, the learning biography and the attendant process contributed to the reinforcement of each individual development. As partners, we also contributed to the sensemaking of individual teachers, and later to the sensemaking of the team. We carried out our study as closely as possible to the teachers involved in the innovation, but we had not realized beforehand how the quality of the conversations during these interviews would help to create a willingness to cooperate, mutual trust, and gratitude. And vice versa, how this willingness, trust, and gratitude would help to improve the quality of the information communicated. We actively built relations of trust and gratitude on a basis of mutual usefulness. The four interviews allowed both teachers and researchers to develop relationships from contact and trust to loyalty and reciprocity. This established a zone of proximal

development for both teachers and researchers to come to valuable insights about their respective work. For the teachers, the relationship created productive insights, fruitful connections, and illuminating forms of reflective communication that supported them in carrying out the innovation.

The Learning History and the corresponding reflective interviews also contributed to our own development as researchers. So, our study in itself is a learning history about applying Learning History methodology. The learning biography proved to be a useful instrument for reducing the quantity of research material: more than two thousand pages of interviews were reduced to four manageable learning biographies of about 120 pages each. Data reduction is an important and necessary step in qualitative research.

Further, the learning biographies made it possible to build such strong bonds with respondents that our access to schools was ensured to the very end of our research activities. In this respect, we valued the closeness with the teachers we interviewed, but we likewise valued the distance from the daily practice of innovating in the schools.

The final analysis, on the basis of Activity Theory, was carried out using the material supplied by the learning biographies. For us, as researchers, the closeness of the relationship not only meant that we acquired ‘rich’ information (personal and emotional experiences, opinions, and visions) at first hand. This information helped us to correct our own false assumptions about the ownership of teachers in an innovation as a self-steering bottom-up process.

Finally, we made a distinction between the ‘warm’ and ‘cold’ parts of our research. The warm part consisted of the reflective interviews and the feedback meeting concerning the learning biography. The outcomes of this were the result of the partnership and dialog of the researchers with the interviewees. We did not, however, discuss the outcomes of the analysis of the data with Activity Theory and Creative Learning with the teachers. These results were disseminated in an academic context. We had the following reasons for not sharing these results with the teachers. We would have had to take them away from their own context by teaching them to work with the cognitive tools of Activity Theory and Creative Learning. That would have changed our equal relationship into a teacher–student one and we did not want to take an interventionist stand towards the innovation practices. Yet, we nevertheless do hope that the outcomes of the ‘cold’ part of our research can and will be used by professionals who are innovating their own practices. So, at this point, we decided that the direct cooperation between the researchers and teachers should end and we would have to find other ways to connect the development of theory and the development of practice. Our solution was to publish articles in professional journals and give courses.

4.4. *Micro, meso, and macro*

Considered from different perspectives, the study was complex. The theoretical framework was complex, the research methodology using different instruments was complex, the cases were complex, and the research question itself, with which we sought to make connections between learning at the individual and system levels, was complex. As a result, it was difficult initially to connect these levels of learning.

The analysis of research data showed that there was no direct relation between the development of the activity systems in the four cases, and the learning of individuals in these systems. In those systems in which the innovation did not properly get

off the ground, teachers still reported an appreciable development of their competences. And in those systems in which the innovation was successful and durable, the learning of teachers still turned out to be painful. The model of Creative Learning provided a way to bring the level of personal experience and the system level together. Boundary experiences of teachers proved to contain an element of *necessity*. The new activity system makes it necessary for teachers to develop their competences, which they undertake in ways that depend on their positions, roles, and tasks. Teachers take up a position and, early or late (but sometimes never), they find a way of dealing with a boundary experience. In this process, system aspects such as differences in position in the *Community of Practice* play a role. Teachers changed their views of their roles and positions, and thereby began to feel more competent or, conversely, more powerless. By connecting the model of Creative Learning with Activity Theory, we were subsequently able to demonstrate the importance of support from the team for this learning and for competence development. Although individual attitudes towards the innovation differed widely, the way in which individual teachers developed proved to correspond closely with the development of the *Community of Practice*. This finally enabled us to make a connection between transformation at the level of the activity system and learning at the individual level. Several scholars, such as Lave (1993, p. 8), had already warned us. She formulated four premises for development of learning:

- (1) Knowledge always undergoes construction and transformation in use.
- (2) Learning is an integral aspect of activity in and with the world at all times. That learning occurs is not problematic.
- (3) What is learned is always complexly problematic.
- (4) Acquisition of knowledge is not a simple matter of taking in knowledge; rather, things assumed to be natural categories, such as 'bodies of knowledge', 'learners', and 'cultural transmission', require reconceptualization as cultural, social products.

In our research design, the first three premises were at the heart of the reflective processes and the sharing of knowledge all the time. Lave's fourth premise forced us to take the concepts in which the teachers formulated their local, practical, and tacit knowledge, and confront them with critical theories that challenged this experience-based knowledge (in this case, Activity Theory and the model of Creative Learning). The mapping of primary, secondary, tertiary, and quaternary contradictions appeared to be fruitful for a comparative analysis of the four cases. It enabled us to establish similarities in the complex relations between individual, collective, and system learning. With the concept of 'conditions', we were able to exceed the particularistic and context-bound experiences and reflections, and see patterns in the data we collected.

4.5. Contribution to theory

Neither Activity Theory, nor the model of Creative Learning, nor the SBL teacher competence model, was developed for the kind of study for which we used them. For the purpose of our research objective, we adapted each of these analytical frameworks. Therefore, this study produced additions to and refinements of these frameworks.

In this study, Activity Theory was not used to research performance, but as an analytic instrument for the reconstruction of contradictions. Research on the basis of Activity Theory usually ends after the first phase of implementing such an innovation. On the basis of data collected over two years, certain assertions could be

made about events after the start of the transformation, which is the period of tertiary and quaternary contradictions. A lot of attention was paid to formulating tensions leading to the learning of the activity system, and ensuring that the activity system continued to learn. For the very reason that the cases – although showing up as many differences as they do – manifest similar primary, secondary, and tertiary oppositions at the same time, it was possible to look generally for conditions that enable an activity system to learn.

In order to make the connection between the emotional focus of boundary experiences and the learning of teachers, we called on the model of Creative Learning. This model was designed as a heuristic instrument rather than as a research instrument. The model is primarily oriented toward the relation between social and individual assignments of meaning. For our own purpose, we turned the model into an analytic instrument, enabling us to garner individual learning processes from boundary experiences. The study of boundary experiences taught us something about culture creation by attaining the ‘zone of proximal development’ (Vygotsky, 1978). In Vygotsky’s view, a more informed participant plays the role of guide for learners within the zone of proximal development. From our study, it appeared that this role can also be played by colleagues, who are not necessarily more competent, but who are facing the same challenges, and with whom a common set of views is shared. Decisive for this learning is a shared sense of urgency as a starting point from which a collective vision, mission and practice can develop. It appears that both the *Community of Practice*, as a set of shared views of the new *Object*, and a shared perspective of the future are able to play the role of a ‘more competent other’. Teachers experience little need in their regular work to develop leadership, cooperation, and coaching skills. But the minute these professionals go beyond regular job descriptions and start questioning existing practices and develop new practices, they need skills of leadership, of cooperation, and of coaching. In the cases we studied, professionals had to develop these skills in order to succeed and overcome their boundary experiences. It was shown that school leaders can do much to coach their team leaders into developing leadership, cooperation, and coaching skills. Lack of such coaching left the individual teacher in an individual and often unsolvable boundary experience.

In this article, we have presented the high-quality research design that we developed for answering the question about how and what teachers learn from innovating their own educational practices. In our research, we were interested in making a contribution to the agency of teachers, in a time in which NPM has obscured the vision on this. We were concerned with establishing a connection between learning and other processes on an individual, team, and systemic level. In our opinion, without our multilayered research design, it would not have been possible to expose the relative autonomy and the connectedness of each of these three levels. On the one hand, we demonstrated that professionals have and take scope for action, also within an overall NPM approach to education, without this being – by definition – a guarantee for success. On the other hand, many current pleas for restoring the autonomy of professionals as a remedy for problems are too naïve. Our research demonstrates that the system level cannot be argued away. Also, within an innovative school, the role of the management – even where a bottom-up innovation can be said to exist – is of overriding importance, at the cost of the professionals who actually do the work.

Notes on contributors

Martin Stam is a professor of Outreach Work and Innovation.

Wietske Miedema is a senior lecturer of Master of Education.

Jeroen Onstenk is a professor of Pedagogy in the Education Practice.

Willem Wardekker is a professor of Education and Identity Development.

Geert ten Dam is a full professor of Education.

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