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## **KNOWLEDGE IN TEACHER LEARNING: NEW PROFESSIONAL CHALLENGES**

### INTRODUCTION

How are teachers equipped to meet the new challenges of continual learning in the knowledge society as a professional group? As Feinman–Nesmer (2001), Borko (2004) and others have pointed out, if we want schools to offer powerful learning opportunities, we have to provide more powerful epistemic environments for teachers. Such environments are both grounded in a conception of learning to teach as a lifelong endeavour and designed around a continuum of teacher learning opportunities. In this chapter, we apply insights from the sociology of knowledge to seek answers to questions that are frequently raised in concurrent discussions of professional development (Ball & Cohen, 1999; Hiebert et al., 2002; Borko, 2004; Koellner et al., 2007; Timperly & Alton Lee, 2008; Horn & Little, 2010). The analysis is based on interviews and log material from Norwegian novice teachers' experiences in the transition from their initial training to assuming their role as newcomers in their workplace.

Since the 1980s, research on teacher learning has been characterised by an emphasis on experience-based and individual knowledge, i.e. shared skills and understandings within local community settings (Hargreaves, 2000; OECD, 2003; Borko, 2004; Little, 2002). Also, Ball and Cohen claimed in their contribution to *Teaching as the Learning Profession: A Handbook of Policy and Practice* (1999): “In the absence of these key resources, the system limps along, with teachers collecting material from a wide range of sources, their teaching experience the principal site for their individual and idiosyncratic development” (1999, p. 5). What has typically been explored is the manner in which teachers perceive their own professional learning (Fishmann et al., 2003), and how they express their attitudes and epistemological beliefs within daily practices (e.g. Elbaz, 1991; Clandinin & Connelly, 1991; Van Manen, 1994; Doyle, 1997). The idea of teachers as reflective professionals (Schön, 1983, 1987) captures the essence of this approach. However, when attempting to explain how teachers meet the challenges of the knowledge society, it is not enough to examine professional learning as a matter of personal belief, individual opinion and reflection. This emphasis on communicative dispositions and personal skills downplays the crucial role that abstract and theoretical knowledge play in the development and continuous revitalisation of professional expertise. A central issue we raise in this chapter is how to provide support structures for teachers as they collectively develop their profession towards a situation in which abstract knowledge works together with

experience-based knowledge, in what Foray (2001) and others have described as “epistemic communities.”

Bernstein (1996), Beck (1992), and Drucker (1993) have noted that the relationship that practitioners have to abstract and theoretical knowledge is a driving force behind professional development in post-industrial society. The dynamic relationship to knowledge that recognises workplace learning as “object-centred” is also emphasised in recent studies on technological and scientific work (Latour & Woolgar, 1979; Knorr Cetina, 1997, 1999; Pels et al., 2002). Blackler (1995) follows the same line of argumentation, and stresses that the dichotomy between differences in knowledge types should be downplayed, with focus instead directed at the way in which abstract knowledge works together with experience-based knowledge. Inspired by these insights, we challenge the traditional divide in empirical research on teachers’ learning as individual and experience-based vs. teachers’ learning as abstract and theoretical. Rather, we discuss how existing professional communities in teaching could profit from being more embedded within a theoretically framed workplace.

Supported by reviews of research on teachers’ professional expertise (Borko, 2004; Penuel et al., 2007; Timperly & Alton Lee, 2008; Grossman & McDonald, 2008), we claim that the role of abstract and theoretical knowledge has been clearly emphasised in recent studies of strategies of professional learning among teachers. In this chapter we add to this discussion by presenting an analysis of the extent to which novice teachers are equipped to meet the challenges of dealing with rapidly changing knowledge and expertise. How do established knowledge practices and knowledge sources within the teaching profession facilitate, stabilise and support emerging epistemic challenges? We address these research questions through analyses of learning logs and interviews with novice teachers from Norwegian comprehensive schools. The data are drawn from the more extensive material compiled under the ProLearn project, which analyses professional learning across professions (cf. introduction to this volume).

We will examine the dilemmas and tensions that novice teachers face in their attempts to deal with a wide variety of professional tasks on the basis of what is apparently a workplace characterised by weak theoretical orientation (Ball & Cohen, 1999; Hargreaves, 2000; Nelson, 2000; Grossman & McDonald, 2008) and a highly individualised work culture (Lortie, 1975; Little, 1990; Klette, 1998; Hargreaves, 2003). We aim to take stock of some of the crucial challenges facing the expectations of teachers today, as they encounter the demands of the knowledge society. First, we clarify the meaning and significance of teachers’ learning context and contemporary epistemic challenges. The analytical framework is mainly derived from developments in the field of the sociology of knowledge, from which we take central concepts focusing on the role of knowledge in organising work and learning. We apply these perspectives in our examination of three sets of challenges that form an analytical, interpretive account of teacher learning as a collective endeavour: attraction and recruitment patterns to teacher education; features of teachers’ workplace knowledge culture; and the knowledge sources and mediating tools and instruments currently available in teachers’

workplaces. We discuss our findings on how teachers' knowledge ties influence their encounters with new epistemic challenges, and conclude that teaching as a profession suffers from weak knowledge ties both at the individual and at the community level. On the one hand, our findings show that teachers expect to engage in continuous and lifelong learning. However, their accounts also indicate that their learning environments lack some of the crucial elements needed to stimulate and support such continual professional learning. Relevant elements would include more adequate knowledge resources, and systematic infrastructure for supporting learning at the community level. In addition, better mechanisms of diffusion are needed between the practices of research and theoretical knowledge production, *and* workplace learning.

#### THE THEORETICALLY FRAMED WORKPLACE?

It has traditionally been argued that professions hold an exclusive position in relation to knowledge domains and expertise (cf. Larsson, 2007; Abbott, 1988; Freidson, 2004). Recent developments in knowledge production and distribution have a dual role, as they both challenge and strengthen the privileged position of domain-specific expertise in the professions. As rapid changes in knowledge dissemination underscore the role of abstract and mediated knowledge, one of the key issues in professional expertise today is to empower professional groups to have their own strategy for facilitating and demarcating the limitations of knowledge.

Knorr Cetina (2003) is one of the sociologists to claim that knowledge is the crucial constitutor in post-industrial society: "[...] knowledge has become a productive force replacing capital, labour, and natural resources as the central value and wealth-creating factor" (op. cit., p. 6). Knorr Cetina's work (e.g. 1997) has also identified objectual knowledge as a key dimension of contemporary knowledge development. Based on empirical observations from laboratory scientific work, she argues that the rise of modern science has provided for and reinforced new forms of object-centred relations, extending the social ties previously secured by and within more weakly framed expert communities. According to Knorr Cetina (1997), the functions and foundations of such epistemic cultures are currently diffusing into other communities such as the professions and semi-professions. In this chapter we apply her perspective in our analysis of the empirical material in order to explore what constitutes a theoretically framed workplace for teachers.

First, however, let us take a closer look at the different forms of knowledge that may come into play in the theoretically framed workplace as outlined by Knorr Cetina (1999), Foray (2001) and others. Blackler (1995) differentiates between five modes of knowledge relevant for studying professional expertise and professional work in late modern societies: i.e. *embrained*, *embodied*, *encultured*, *embedded* and *encoded* (op. cit., p. 1023). *Embrained knowledge* is a knowledge mode dependent on conceptual skills and cognitive abilities often labelled within the terms of abstract knowledge (cf. concepts such as "knowing that" / "knowing about" / "declarative knowledge"). *Embodied knowledge* is performance and action-

oriented, and is likely to be only partly explicit (i.e. knowing how, tacit knowledge, procedural knowledge). Embodied knowledge is acquired by doing and is rooted in concrete and specific contexts. *Encultured knowledge* is knowledge processing within collective systems of shared understanding. Such understanding is dependent on language and discursive practices, and is socially constructed and open to negotiation. *Embedded knowledge* is knowledge which resides in systemic routines and procedures. Embedded knowledge is closely linked to social and institutional arrangements. It is linked to the relationships between technologies, roles, formal procedures, and emergent routines. *Encoded knowledge* involves information systems conveyed by signs and symbols, such as books, manuals and codes of practice based on textual and electronically mediated material. Although Blackler himself criticises this categorisation, saying that it pays more attention to diverging distinctions than to the relationships of agreement that constitute post-industrial knowledge work, he still holds that current interests in knowledge and knowledge work mark a change in contemporary society away from knowledge as embodied and embedded to knowledge that is embrained, encultured and encoded (1995, p. 1022).

Professional work draws on all these sources of knowledge – with certain distinctive traits and fashionable features figuring within different periods. Following Blackler’s modified argumentation, we find the claim made by Drucker that “knowledge [is now] being applied to knowledge itself” (Drucker, 1993, p. 45). In the knowledge society, knowledge has become *the* resource rather than *a* resource (ibid). Accordingly we observe a shift in focus, moving from embodied and embedded knowledge towards embrained and encultured knowledge. We find it fruitful to combine the ideas of Knorr Cetina with the argumentation of Blackler and Drucker that abstract and theoretical knowledge are beginning to assume a more privileged position within professional work. Of special interest is how teachers – as professionals – meet and draw on the changing roles of knowledge.

#### STUDYING EPISTEMIC PRACTICES AMONG TEACHERS

It is clear from the reviews of teachers’ professional expertise mentioned earlier that the role of abstract and theoretical knowledge is being downplayed. Such epistemic perspectives are, in fact, barely discussed and brought to the fore in the research on teachers’ professional knowledge literature (Grossman & McDonald, 2008; Rowan et al., 2002; Bryk et al., 2010). As noted, however, the role of abstract knowledge has been widely acknowledged and debated within organisational and sociological studies (Blackler, 1995; Drucker, 1993; Foray, 2001; Knorr Cetina, 1997, 1999; Latour & Wolgar, 1979). In the analyses that ensue we aim to combine approaches from studies of teachers’ professional knowledge with perspectives from the sociology of knowledge to understand the epistemic practices novice teachers are challenged with today.

According to Knorr Cetina, epistemic cultures are object-mediated and based on object-centred relations, rather than person-centred relationships (1999, p. 243). As such, they exemplify a theoretically framed workplace. It should be noted that

Knorr Cetina has developed her concepts based on studies of laboratory scientific work in bounded systems. However, she argues that such epistemic strategies are in a state of “spill-over” to knowledge work in general. Therefore, we apply this argumentation as we explore knowledge work within the teaching profession. Epistemic cultures as outlined by Knorr Cetina are characterised by their “liminal approaches to truth” – they are knowledge cultures that have an inherent apparatus for demarcating the limitations of knowledge through the working methods of *unfolding, framing and convoluting strategies* (op. cit., p.71).

The incomplete and *unfolding* character of knowledge objects is what gives the objects their energy, attraction and enchantment (ibid). Epistemic objects are always in the process of being materially defined. They continually acquire new properties and change the ones they have. It is this open and unfolding feature of epistemic knowledge that puts new demands on the subjects and systems of knowledge engagement, and that accounts for creative performance and strong personal commitment in expert work (Knorr Cetina, 1997). In this chapter we ask how knowledge objects may be seen as a factor in shaping teachers’ workplace learning opportunities.

In early articles Knorr Cetina discusses the knowledge-seeking processes ascribed to expert cultures as a largely mental disposition, i.e. the will and ability to enter into looping practices. She pays less attention to the instruments and material infrastructure supporting and surrounding these practices. In later work (1999), however, attention is drawn to framing and convoluting practices accompanying unfolding processes central to epistemic practices. *Framing* as an epistemic strategy refers to the consideration of objects and pieces of information in light of other components. The strategy serves to check, control, extend or compensate for former pieces of information. Through framing, different components of an experiment or of the field are related to one another (op. cit., p. 72). In order to explain how teachers are equipped to meet the new challenges of continual learning in the knowledge society as a professional group, we therefore look at the knowledge sources, instruments and other theory-mediated objects that are available to them in their workplace. These instruments should be of a nature that supports the unfolding processes as well as informs the mechanisms found in regulation, i.e. strategies of quality assurance and accountability on a professional community level. In Knorr Cetina’s conceptualisation this is referred to as convoluting strategies.

*Convoluting* means folding something together. Convoluting is a special form of framing – a way to push the framing method to its limit (op. cit., p. 76). Convolution as an epistemic plan describes the general strategy of mixing resources that come from different origins “... in an attempt to come to grips with the limitations of specific data or approaches” (ibid). It is a strategy of framing rather than a strategy for testing out specific theories. Convoluting is “... a strategy for generating experimental outcomes in a world that refers back upon itself and seeks recourse in manipulation its own components” (op. cit., p. 78). As such, convoluting strategies refer to the epistemic infrastructures regulating the profession. Emphasis is placed on aspects found within and around knowledge

resources themselves rather than those that are external to professional learning as an epistemic practice.

In the empirical analysis to follow, we link the two research foci dealing with features of teachers' workplace knowledge culture and their knowledge sources and mediating tools in a discussion of how the three limitation strategies of unfolding, framing and convoluting play out within the teaching profession, as expressed from the point of view of novice teachers. In order to make a critical examination of our third research focus on attraction and recruitment patterns to teacher education, a brief introduction is given to the role that knowledge mediation plays when it comes to fostering expertise in teaching.

#### TEACHERS' ENGAGEMENT WITH KNOWLEDGE

Teaching has a long history as a mainly normative and ideologically-driven profession with weak ties to empirical research and investigations. Teachers rarely draw from a shared empirical and theoretically-driven knowledge base to improve their practice. They do not routinely locate and translate research-based knowledge to inform their efforts (Grimmet and MacKinnon, 1992; Huberman, 1989; Richardson & Placier, 2001). As novice teachers begin to examine their students' learning of the curriculum, for example, they rarely search the research archives for help in interpreting their students' conceptions and misconceptions, plotting their students' learning trajectories, or devising alternatives that are more effective in helping their students master the curriculum.

Significant studies document that the knowledge teachers use is of a very different kind than that normally produced in laboratories and research communities (Lortie, 1975; Schön, 1983; Huberman, 1985; Leinhardt, 1990; Clandinin & Conelly, 1991; Elbaz, 1991; Eisner, 1995; Doyle, 1997; Cochran Smith & Lytle, 1990; Cochran Smith & Zeichner, 2005). Called "craft knowledge" by some, teachers' knowledge is characterised more by its concreteness and contextual richness than its generalisability and context independence. Paraphrasing existing literature, teachers' professional knowledge is described as practical (Leinhardt, 1990), personal (Elbaz, 1991), concrete and specific (Doyle, 1997), integrated (Eisner, 1995), narrative (Clandinin & Conelly, 1991) and reflective (Schön, 1983, 1987). This resembles what Blackler (1995) described as embodied and embedded, which is linked to shared skills and understandings typically understood as tacit and/or embodied. Abstract and theoretical knowledge is either taken for granted or pushed into the background in these studies. Objectual knowledge and knowledge linked to technologies, tools and other mediated artefacts are equally poorly recognised.

In his classical study "Schoolteacher. A sociological study" dating back to 1975, Lortie claims that teachers and their knowledge sources are characterised by three basic orientations which impede and frame their professional orientation and potential development – *presentism*, *conservatism* and *individualism*. *Presentism* combines with *individualism* and inhibits work with others in the search for common solutions, thus constraining the development of teaching as a

collaborative and reflective practice. This combination also gives priority to the interpersonal role over the engaged and creative involvement with knowledge. *Conservatism* Lortie links to recruitment patterns, organisational features of the workplace and available knowledge sources. He documents how dominant reward systems in teaching derive warrants primarily from interaction with children and youngsters – what Lortie labels interpersonal and psychic rewards (op. cit., pp. 39-40). Structural and cultural aspects of the professional commitment emphasise the use of psychic rewards as a primary reward mechanism in teachers' work. As a profession, teachers are involved with knowledge and its diffusion; their work has often been described as “an art of knowledge mediation” requiring special sensitivity to context and a high degree of personal creativity. Involvement with knowledge and the call for creativity could therefore quite logically serve as the lens of attraction to teaching, Lortie suggests (op. cit., p. 28). It is therefore interesting he continues, “... that neither of these aspects of the role receives as much attention as the interpersonal” (ibid.).

Although Lorties' study is more than three decades old, his sociological account of the schoolteacher is still taken into consideration in debates about teachers, teachers' work and knowledge (Bransford et al., 2005). We argue, however, that changes and challenges in the knowledge economy such as those suggested by e.g. Blacker and Knorr Cetina point to changes in knowledge production and knowledge itself that cannot be interpreted using Lorties' conceptualisation. If we wish to look at teachers' engagement with abstract and theoretical knowledge, we must therefore incorporate additional considerations into our research design. For instance, essential in Knorr Cetina's accounts of epistemic cultures and “the theoretically framed workplace” is the presence of knowledge building and epistemic commitment in a long-term perspective. Warrants are linked to the long-term accumulated processes rather than “quick wins” here and now. This is therefore a focus to be explored in a study design examining how the established knowledge practices and knowledge sources within the teaching profession support and facilitate emerging epistemic challenges.

In order for novice teachers to understand and navigate as young professionals in this landscape, an epistemic infrastructure that both regulates and stimulates further learning processes is required. In the following sections we present our empirical analyses and findings. We start out with a general account of how the novice teachers characterise their workplace, then move on to teachers' attraction and recruitment patterns. After a description of teachers' knowledge cultures as portrayed in the data material, we conclude the empirical analyses with an analysis of the learning resources available to teachers in the workplace.

#### METHODOLOGY

The analyses draw on learning logs and qualitative interviews with ten novice teachers working in ten Norwegian primary and lower secondary schools. The material is part of a larger four-year research project designed to compare teachers' professional learning with that of nurses, computer engineers and accountants. The

informants have been selected on the basis of the longitudinal Database for Studies of Recruitment and Qualifications in the Professions (StudData) in Norway. The informants were interviewed twice, first individually and then as part of a focus group interview the following year. The same informants were also asked to fill in precoded learning logs covering 24 days of work in the period between the interviews.

The interviews were transcribed into qualitative data analysis software (Atlas.ti) and conceptually aligned with the theoretical framework of the ProLearn project (see interview guide in the appendix). This level of cross-professional analysis paved the way for a more contextual text-sensitive interpretation of the teacher interviews.

The learning log material covered two periods of the school year, late autumn and late winter respectively. The precoded learning logs were designed to provide us with insights into teachers' alignment with knowledge sources.

In our representation of the data we draw on the individual interviews, group interviews and the logs. The findings are presented as thematic and codified summaries, and these findings are supported by more concrete quotations and illustrations.

#### PRESENTATION OF FINDINGS: NOVICE TEACHERS TALKING

All our respondents were working in the comprehensive school system. Six of them taught at the primary level and four had positions at lower secondary level. Altogether our novice teachers covered grades 1-10 within the compulsory educational system in Norway.

Within a selection that has taken gender, school level and subject matter into consideration, our informants speak as a relatively unified professional group when it comes to characterising their workplace: They describe their colleagues as "inclusive and tolerant," and their workplace as being pervaded by a "good and friendly atmosphere." When novice teachers talk about their own learning in the workplace, they enthusiastically tell how their colleagues – especially those working in the same grades or in the same team – are open-minded and willing to share their experiences, tips and practical solutions with the newcomers. The informants refer to their own work situation as productive and supportive when it comes to being able to "ask whatever and whenever," as one of them says. These main features are mutually strengthened when we compare data from individual and focus interviews with data from the learning log material. On the whole, these modes of collaborative professional sharing and informal knowledge exchange mechanisms are based on practical problem-solving and practical tips on a day-to-day basis, according to our teachers.

In the following, we pursue these features of novice teachers' workplace learning by exploring three interrelated themes: Attraction and recruitment patterns, features of teachers' workplace knowledge culture; and the knowledge sources and mediating tools and instruments currently available in teachers' workplace settings.



## MYSELF AS A PROFESSIONAL: ATTRACTION AND RECRUITMENT PATTERNS

All informants document a strong dedication to becoming a schoolteacher. Although only a few of them had teaching as their first preference for occupation preference, several of them state that “it had always been there as an opportunity.” The following statement from a young male teacher illustrates this: “Well, it was really a bit coincidental. I had always thought about whether it would be an option. But then I had a year where I just tried to work as a journalist and then as a teacher simply to try it out and find my preference. And then it turned out that teaching was more fun.”

When we asked the informants to look back and clarify their pathway into their professional preferences, most of them recognised what might be described as a “continuous theme” regarding their choice of the teaching occupation. “I have always found pleasure in interacting with other people and especially children,” several state. They refer to mothers, aunts and others in their home environment as signifiers for own preference of occupation. In addition, some of the female teachers made explicit claims about how they wanted to be trained in an occupation where it would be possible for them to combine work with family life. Although only two of our respondents had had teaching as their primary preference for a future career, all of them indicate that the possibility of becoming a teacher had been there as a sort of “second option” during their entrance to early adulthood. After making the choice to pursue educational training, all novice teachers display a strong dedication and commitment towards their career of choice. As one of our teachers mentions: “After I made my final decision I knew it was meant to be.”

When asked about their reasons for becoming a teacher, all the interviewees paraphrase the interpersonal theme highlighted by Dan Lortie: being part of an encounter with children and youngsters. They either draw attention to interpersonal work as being of special value to them and/or combine this argument with an interest in connecting with and assisting children and young people in learning. One informant puts it like this: “[There is just this] pleasure rooted in working with young people and children.” Another one emphasised the “dynamics and forces inherent in being together with youngsters.” Several refer to the joy of being a part of the students’ learning processes, “to help them when they strive for something” and assist them in order to “ensure that the students get it right.”

All these quotations confirm Dan Lortie’s theses on the interpersonal theme as the key facilitator for entering teaching. Working with people may function as a facilitator for several occupations (i.e. nurses, social workers, service industry). There are few occupations that involve such a steady, time-consuming and unfolding interaction with the young as the teaching profession: [Teaching] presupposes the ability to: “... be there ... in a very ... well, you’re never alone. Only when you need to use the restroom, of course. Except for the restroom excuse you just have to relate to other people the whole time. And this means that you have to be socially competent – for close, interpersonal relations the whole day.”

So, what about the “art of knowledge mediation” as a factor in recruitment patterns? Continuing to apply Dan Lortie’s argument (1975), our novice teachers

tend to be attracted to what he described as the “interpersonal theme in teaching” (p. 27) and have a lesser, more indirect interest in knowledge diffusion as such. Our respondents provide surprisingly clear answers to these questions, i.e. how they perceive and relate to theoretical (and abstract) knowledge. Quite a few of our interviewees had some experience with academic studies at universities and university colleges prior to entering teacher training, within disciplines such as language arts, political science and psychology. However, during the course of their university studies they had realised that they did not identify with a theoretical and academic career: “I just can’t see myself sitting in the library five years of my life studying twelve hours a day. It’s just not who I am.”

Another made the distinction clear: “Yeah, because those who are academics they’re...well, they’re just totally different. In academia they are interested in knowledge and not of being social, you know, empathy, everything I find important in my education.” One of the female respondents in the group interviews followed up on this:

“We are not academics! [...] The last time I went to a party with academics everyone just sat there and discussed, and it was so terribly boring. [...] There were academics as well as artists and musicians, and the ones sitting there quarrelling were the academics. And then I just think: there is after all a difference between teachers and academics, because we are more like craftspeople.”

What does this tell us about how the overall theme of attraction and recruitment patterns affects how teachers are equipped to meet the new challenges of continual learning in the knowledge society as a professional group? While earlier studies have underscored the role of teachers and teaching as public academics and public “Bildung” workers (Klafki, 2007; van Manen, 1994; Slagstad, 2003), we found that the novices in our sample have chosen teaching primarily because of the practical and interpersonal role as learner facilitators. The role of “the art of mediating knowledge” is either treated as mediator or as a background framework primarily linked to their prior formal training. The lack of academic interest may contribute to less than adequate competence in critically assessing and valuing theoretical knowledge for the inherent qualities it may or may not bring to inform professional development.

In the following section we explore this dilemma, moving beyond expressions of intentions and into findings related to teachers’ engagement with the changing roles of knowledge in their current workplace.

#### FEATURES OF TEACHERS’ WORKPLACE CULTURE

The dynamic and unfolding character of the protracted contact with children and young people is what gives teaching its attraction, benefits and rewards, according to our interviewees. As indicated in the section above, it is in the “here-and-now” communication and interaction with children and youngsters that teachers experience their professional wins and losses. All interviewees exhibit a strong link

to and captivation with teaching as primarily “here and now” and what they label as a “non-academic” activity. One of the novice teachers describes how communication skills and practical logistics – “orchestrating communication settings within a learning framework” – lie at the very heart of their professional satisfaction and commitment. Our analyses indicate that it is the quest to ensure that all students feel at ease and comfortable, that they get sufficient support and appropriate challenges, that they have friends and get involved with classmates and others that is of central concern to their professional obligations. All in all, this underlines the picture of teaching as an interpersonal and caring profession. It also reveals, however, that they see themselves as craftsmen rather than academics. Their actions are only to a limited degree based on theoretically and empirically accumulated (i.e. embrained) knowledge.

Little division of labour and distribution of expertise across community members within the teaching staff may further obstruct the fostering of a knowledge culture of embrained knowledge in the workplace. Rather, the teachers as a group appear to represent an encultured professional culture based on person-centred relationships as opposed to tools and object-centred relationships. On the whole, our novice teachers do not meet and draw on the changing roles of knowledge to the extent suggested by Blackler (1995), Knorr Cetina (2003) and others as a requirement in today’s society. The general outcome of our analyses so far supports the understanding that there is an inherent tension between the teachers’ existing person-oriented knowledge culture and the expected object-orientation.

While the novice teachers describe their colleagues and professional communities as inclusive and supportive, at the same time they describe their job performance as done mostly “on their own” with little external insight and external support: “We are simply on the job alone – each one in her own classroom.” Some of the teachers seek more feedback on how they perform on the job. School leadership is described as withdrawn from direct involvement in the daily classroom life of these novice teachers. They feel they are “left on our own and could do whatever we like to do ...” One of our informants describes this situation as follows: “[The school leadership ...] they are just very open-handed about the whole situation. I could probably have played cards with my students all year if I wanted.”

This call for supervision and support infrastructures is also found in the informants’ wish for a clearer leadership when it comes to knowledge aggregation and structures for knowledge dissemination. The level of complexity resulting from the increase in information and knowledge, technology and new communications is also felt by the teachers: “you can’t always take the initiative yourself, because there is no way you can know the range of everything.”

There are, however, tensions in our material that give us reason to reconsider this lack of correspondence with the general epistemification of society, as described by Knorr Cetina. According to our data, there are also reasons for claiming that teachers acknowledge and accept the rhetoric of the knowledge society, and that being “up-to-date” on theoretical knowledge relevant for their

tasks is seen as a professional duty. There is nevertheless no clear indication in the interview or log material that this attitude has manifested itself in daily workplace activities. This is related to the lack of any comprehensive epistemic infrastructure that would induce and provide collective support structures for such informal day-to-day engagement with theoretical knowledge on the part of the individual teacher. The teachers also expressed a general desire to move beyond their experience-based knowledge culture.

#### WORKPLACE RESOURCES

What new initiatives do teachers think will be expected of them in the knowledge society? And what measures are being taken in their workplace to meet such expectations? So far the results presented in this chapter indicate that there is not a clear-cut answer to these questions. What we see, however, is that teachers want to engage in a lifelong learning process, but they appear to lack the appropriate and relevant knowledge provisions to invoke the looping dynamics that Knorr Cetina considers a crucial driver for persistent learning in the knowledge society (cf. Jensen, 2007). The problem appears to be not so much a lack of *unfolding* theoretical knowledge in itself, but that it is hard for teachers to get an overview of the theoretical knowledge that might be relevant for them. As mentioned, this problem may be a result of their non-academic educational affiliation (Heggen, 2003; Aamodt & Terum, 2003). It may also be an inevitable consequence of an overly present-oriented and individual-oriented knowledge culture that does not have a tradition for decision-making based on accumulated knowledge.

In the section that follows we address the dilemmas and tensions we have found so far in novice teachers' attempts to deal with a wide variety of professional tasks within a workplace characterised by a weak theoretical orientation. How do established knowledge practices and knowledge sources within the teaching profession help novice teachers to navigate in this landscape?

First of all, when asked how they access different kinds of organised theoretical and experience-based knowledge resources, our novice teachers agree that they are in a constant struggle against an almost non-existent support structure. What they appear to lack is a systematic overview of the knowledge sources that are available and their quality. They also express a desire for a higher degree of systematised informal learning opportunities and in-service courses at the institutional and local level, which would align them with available, updated and relevant knowledge sources they could use in their classroom practice (cf. Klette & Smeby, see this volume).

The novice teachers do report the existence of formal professional communities at the institutional level. These professional communities are mostly organised within teams for teachers working in the same grade or unit or for the school as a professional community. Individually, teachers may apply for funding for in-service courses, but according to the interviewees, such initiatives appear to be motivated by individual initiatives. The dominating trend is that these courses are offered outside the schools, and that they are weakly connected to professional life

in the classroom. Nor are they linked to the existing professional communities at the school level. There are no routines, nor any formal infrastructure for knowledge distribution at the school level to serve as bridges between these external courses and the institutional and local level. This makes the strategic coordination of pieces of information and knowledge (e.g. framing) hard to come to grips with.

The formal sites of encultured professional communities among our novice teachers are for the most part occupied with planning activities organised within a horizontal framework that corresponds with what Little (1990), Rosenholz (1989), Hargreaves (2003) and others have described as collaborative and contrived professionalism. It is, in a sense, a “community of learners” (Lave & Wenger, 1991) built on practical and emotional support and exchange mechanisms with little influence from theoretical and other abstract sources of knowledge. The absence of framing strategies makes it hard to develop a professional plan for mixing resources from different origins (cf. convoluting). Lorties’ insights on the negative consequence of the egg-crate organisation of schools are that they continue to preserve individualism and presentism within the teaching profession. These arguments also refer back to Blackler’s typology of knowledge. The ability of teachers to be prepared for the observed shift into the encultured and embrained cultures of knowledge meets potential barriers within the school culture itself.

When asked about quality assurance mechanisms and standards our teachers either describe them as “not existing” or as individual, private, and personal. Rather they legitimise standards and tools for good work by referring to policy documents (cf. National Curricula) or their personal professional decisions. Some teachers report that they take a quick glance in pupils’ workbooks as an aid for assessment; they mention conversations with the pupils, individually or as part of classroom interaction, or they speak about how they use feedback from parents as their complementary tools for ensuring quality in their teaching. The lack of instruments and tools is frequently expressed as a source of frustration: “I feel really insecure about these matters [...] what do I really know [based on my teaching]?”

The frustration over the lack of tools is not only related to assessment, but also appears to point to a more general demand for systematising professional resources. As one informant put it, “I have this dream about keeping an index file. I’ve thought about that so many times. Just think how convenient that would be – you go there and find a file called ‘1st grade: Maths.’ It’s all about recycling really.” He emphasises how such a resource kit could serve both instrumental and creative purposes: “[You] just get so tired of going around searching. Right now we are about to make Easter cards [in my class], and I’m looking for a simple stencil of the Easter bunny. And every single second grade teacher has had to make that stencil ... *every year!*”

The mismatch of knowledge practices and lack of clearly arranged knowledge resources intensify teachers’ emerging epistemic challenges rather than alleviating them. According to our findings the teachers have to deal with an ill-defined domain of relevant knowledge. As such teachers are facing an impossible situation

as they attempt to meet new epistemic challenges within existing structures for the weak theoretically-developed workplace depicted in our empirical material.

#### CONCLUSION

Norwegian novice teachers in comprehensive schools are ambivalent about how to access knowledge and theoretical learning situations. They want to participate in sustainable engagements with knowledge, but lack sufficient support structures and available tools at their workplace to fulfil this ambition.

Findings on attraction and recruitment patterns to teacher education illustrate that (abstract and theoretical) knowledge is a weak driving force for pursuing teaching as a career. Throughout our analyses we have attempted to show how teaching as knowledge work paraphrases contemporary knowledge requirements. Teachers as a professional group have fostered reflective communities of practice. These are, however, mostly linked to the informal exchange of experiences on a day-to-day basis.

Teaching as a profession suffers from weak knowledge ties both at a community level and at an individual level. Recruitment patterns and motivational forces together with the endemic features of teaching (i.e. warrants and work rewards) strengthen presentism and “quick wins” as a professional orientation.

The absence of an accumulation of available professional tools and instruments that enables mediation between general ideas and concrete practices in classrooms is not preparing professionals to meet the emerging challenges of the knowledge society, according to our study. Within a weak theoretically-framed workplace, it seems that teachers will have to learn to deal with unsatisfactory solutions to the responsibilities they face. In sum, these are factors that encourage a new debate on the role of knowledge in teacher learning.

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