

Changing Cultural Conditions for Knowledge Sharing in the Teaching Profession: A Theoretical Reinterpretation of Findings Across Three Research Projects

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Abstract

How professionalism relates to developments in society has been widely discussed, and concepts such as “hybrid” and “connective” professionalism have been proposed to account for the way professionals interact with a range of actors and organisations beyond the professional realm. However, the critical role of knowledge-sharing practices for developing and maintaining professionalism has attracted less attention. Such practices have been conditioned by wider cultural dynamics, thus subjected to changes over time. In this paper, we present a theoretical reinterpretation of findings from three projects targeting knowledge-sharing practices in the Norwegian teaching profession over 14 years. We employ Knorr Cetina’s theory of epistemic cultures as nourished by the wider knowledge culture in society to analyse how changes in knowledge-sharing practices relate to cultural conditions. The paper contributes to current debates about professionalism by highlighting how connectivity and legitimacy depend on productive knowledge relations within and beyond professional boundaries.

Keywords

Teachers, Knowledge sharing, Professionalism, Epistemic culture, Knowledge culture

Introduction

Professional work is closely related to knowledge, which includes searching for existing knowledge, creating new knowledge, applying knowledge in specific situations and tasks, and processing and sharing knowledge (Vanthournout, Noyens, Gijbels, & Van den Bossche, 2014; Lehtinen, Hakkarainen & Palonen 2014). In our knowledge-intensive society, it is generally agreed that being cut off from the loop of knowledge and know-how is a disaster for professionals and other expert groups. As Styhre (2011) claims, the very idea of a profession is maintained from the capacity of a specific community to effectively circulate and institutionalise knowledge. However, little attention has been given to the critical role of knowledge-sharing practices in developing and maintaining professionalism.

In the knowledge society, knowledge-sharing practices are conditioned by dynamics that reach beyond professional organisations, workplaces, or institutions. Although professions and professional practice have always been embedded in webs of relations and meaningful connections with state actors, clients and other members of the public, other professionals, and stakeholders (Adams, 2018), it is well documented that the landscapes professionals navigate are becoming more complex and demanding (Adams, 2020; Faulconbride, Henriksen, & Seabrooke, 2021; Francis, 2020; Hoff, 2021). In the wake of these changes, new terms, such as “hybrid professionalism” (Evetts, 2016; Noordegraaf, 2007) and “connective professionalism” (Noordegraaf et al., 2014), have been suggested to account for new modes of professionalism. A contributor to this literature is Noordegraaf (2016, 2020, 2021), who points to how the classic notion of professionalism that rested on closure, protection and entry barriers, jurisdictions, and autonomy (e.g., Abbot, 1988; Freidson, 2001) no longer has exploratory power alone. Rather, Noordegraaf (2020) suggests that analyses have to be widened to include the way a professional community interacts with its stakeholders. Such generic descriptions of new modes of professionalism require specific investigations and elaborations, depending on professional field, periods of time and geographical area. This paper responds to this agenda by investigating the dynamic interplay between the knowledge-sharing practices of the Norwegian teaching profession and the wider culture in which these practices are embedded.

In most countries, a specific feature of the teaching profession is its close association with the state. The literature on teachers thus typically addresses professionalism in relation to state regulations, autonomy, and space of manoeuvre (Sachs, 2016). Following Noordegraaf’s perspectives, however, we address teacher professionalism beyond the relationship to state and state regulations. Noordegraaf’s (2021) key message is that it is neither practice alone (what professionals “do”) nor the regimes of regulations that define a

profession. Professionalism manifests “in-between,” beyond identifiable agents and in relation to broader societal developments, including far-reaching technological developments (Noordegraaf, 2021). These perspectives have, to a limited extent, been used in analyses of the teaching profession¹.

In this paper, we approach professional knowledge sharing as a critical aspect of professionalism and as an important entry point for examining the dynamic interplay between the wider landscapes to which professionals relate and the collective practices in a given field. We thus present a theoretical reinterpretation of the summarised findings from three projects addressing knowledge sharing in the teaching profession (primary and secondary education) in Norway over 14 years. By employing Karin Knorr Cetina’s (2007) theory of epistemic cultures as conditioned by the wider knowledge culture in society, we present a theoretical reinterpretation of the findings to conceptualise how changes in teachers’ knowledge-sharing practices and their cultural conditions can be understood. As expert cultures that generate knowledge and specific forms of know-how, professions can be studied as epistemic cultures constituted by their distinctive practices and knowledge relations (Knorr Cetina and Reichmann, 2015). Such practices and relations exceed the boundaries of the specific workplace or, in our case, school and provide a ground for professionalism by reflecting the professions’ systematic and institutionalised forms of knowledge sharing (Styhre, 2011). As for the teaching profession, the professional knowledge is multifaceted and complex, including knowledge of learning; methods; didactics; subjects, and the use of pedagogical resources, to mention a few. Some of these resources are based on research; others are adapted and shared models, procedures, and instruments that over time are recognized by the profession as part of their common knowledge base.

In that sense, knowledge sharing is about the systems, arrangements, and principles that make up “how teachers know what they know”, to paraphrase Knorr Cetina (1999, p. 2), including how they get access to learn in practice. Hence, attending to changes in a profession’s knowledge-sharing practices are not solely about how knowledge is shared, but equally about *what* is shared. The latter, then, becomes a question of what is valued and considered important in the epistemic culture; and what counts as valid knowledge worth sharing at given points in time. Against this backdrop, we ask the following research question: *How do changes in knowledge sharing practices in the teaching profession relate to wider cultural conditions?*

We commence with a brief description of the characteristics of the organisation of teachers’ work and the conditions for professional practice in the period in which the three projects

¹ For exceptions, see for instance Hilferty (2008) and Osmond-Johnson (2018).

were conducted. Then, we introduce the theoretical framework used in the reanalysis before presenting a summary of the three projects. We provide a theoretical reinterpretation in which the findings from the three projects are discussed in light of the changing dynamics of teachers' knowledge sharing practices. The paper concludes by discussing possible implications for research and practice.

Contextualising the teaching profession in Norway

The projects that provide the empirical findings for this paper focus on teachers in primary and lower secondary education, which means that their qualification routes comprise four- or five-year teacher education programmes offered by universities and regulated by national guidelines. Furthermore, primary teachers and most secondary teachers specialise in several subjects and primary teachers, in particular, often have responsibilities as class teachers. However, as we describe below, educational routes have become more specialised and research-oriented.

A characteristic of the context of teacher professionals in Norway is a general increasing focus on the knowledge dimension of professional practice, fuelled by new reforms in different parts of the sector in recent years. First, as in many countries, initiatives to reform teacher training in Norway emerged in 2010, in which the teacher training programme differentiated the courses of study required to teach at various grade levels (OECD, 2013). These initiatives were followed by other efforts to improve teacher education, such as upgrading to a master's level and competitive entry requirements. Second, a new competence development model for schools to develop collaborative professionalism at every layer of the education system was recently introduced and consisted of in-service professional development (OECD, 2019). Partnerships with universities and higher education institutions were considered essential in making this happen (Government of Norway, 2017). Third, the recent curriculum reform called "The Subject Renewal" (effective from 2020) emphasised knowledge work and knowledge sharing, among other things, by explicitly obligating teachers to participate in the professional community in the workplace. Finally, a broad range of other initiatives and actors has appeared in the sector during the last two decades (OECD, 2013). Examples are efforts and national strategies to "boost competence" (Hatch, 2013), including the Assessment for Learning Programme (2009-2017) and the emergence of knowledge brokering initiatives during recent years to facilitate access to and the diffusion of knowledge (Wollscheid & Opheim, 2016). The National Programme for School Leader Training was established in 2009 to strengthen the professional empowerment of school leaders. In 2015, the introduction of teacher specialists was introduced to establish a more differentiated expert teacher role (2015). Put together, the school system in Norway *requires* teachers to engage in collaborative knowledge sharing practices. At the same time, the Norwegian context is characterised by a high level of trust, in the sense that schools enjoy a relatively large degree of local autonomy (Hatch, 2013).

Taken together, the external and internal conditions for knowledge sharing in the teaching profession are in motion. Against this backdrop, the Norwegian context is specifically relevant for analysing changes in knowledge-sharing practices and the conditions for such practices over a longer time span. In line with developments in other professions, the landscapes of the teaching profession have become increasingly complex, involving multiple knowledge producers, and changing infrastructures for knowledge sharing. To our knowledge, few studies have investigated how new modes of knowledge sharing manifest in the teaching profession and have led to new knowledge connections over time.

Analytical framework

To investigate these issues, we draw on two theoretical accounts that we find productive in elucidating forms of connectivity that relate specifically to professional knowledge and know-how. First, we elaborate on our stance on professionalism as knowledge sharing by drawing on the work of Alexander Styhre. Next, and as our main analytical frame, we introduce Knorr Cetina's theory of epistemic cultures as dynamically interrelated with the wider knowledge culture in society. While Noordegraaf's perspectives provide a broader intake to our approach to knowledge sharing and professionalism, theoretical accounts from Styhre and Knorr Cetina, on the other hand, are operationalized to gain analytical input into the epistemic dimension that the article addresses.

Professionalism as knowledge sharing

Following Styhre's (2011) notion of professionalism as a form of systematic and institutionalised knowledge sharing, the development of efficient arrangements to circulate knowledge is seen as the very "life-blood of the professions" (p. 165). Professional work, Styhre (2011) asserts, is characterised by authority and the ability to execute agency within a particular domain of expertise. However, to achieve and maintain such qualities, professionals need access to information, knowledge and even small talk, without which they gradually lose their professional expertise (Styhre, 2011, p. 153). Nevertheless, in most professional fields, advancements in knowledge are rapid and can be overwhelming for individuals. Thus, knowledge sharing has increasingly become a collective accomplishment. Further Styhre (2011) notes that different fields underline different conditions for circulating knowledge in different periods. For example, the implementation of new technologies in a field of expertise may restructure that field's "conditions of circulation". More broadly, the key to understanding professionalism, is understanding the exchange and circulation of professional knowledge and the factors that matter in this respect. Styhre (2011) identifies the following factors as critical: (1) types of knowledge forms, resources and infrastructures that serve knowledge sharing; (2) knowledge sharing's communication modes and spatial/geographical outreach; and (3) the wider set of actors, networks and relations to profession-specific knowledge circuits that inform and nourish prevailing knowledge-sharing

patterns. In the presentation of the three projects, we used these three factors to organise the summary of the findings, which allowed us to highlight changes we observed over time.

Knorr Cetina's (2007) "culture in culture" model

Neither knowledge-sharing practices nor the actor constellations that they involve exist in a vacuum. Rather, they are culturally embedded in ways that are partly distinct for each field of expertise—in our case, the teaching profession—and partly influenced by general structures and societal belief systems. To conceptualise these intertwined relations, Knorr Cetina's (2007) model of "culture in culture" is helpful because she has linked the developments in specific fields of expertise to contemporary transformations of what she calls "the global architecture" in society and, in particular, to the growing importance of macro-epistemic agents that serve knowledge at a (trans)national level. Such macro-epistemic agents take on responsibilities for accumulating, warranting, and distributing knowledge that is believed to have general validity manifested, for example, by way of clearing houses or other institutions mandated to provide research-based advice for professional practice. In addition, professional communities, she asserts, may take on new roles as "macro-epistemic agents" (Knorr Cetina, 2007). Although their concrete products may take profession-specific forms, the increased presence of such agents and agencies reflects developments in society at large.

To conceptualise these dynamics further, Knorr Cetina (1999, 2007) uses the concepts of "epistemic cultures" and "knowledge cultures". Her concept of epistemic culture draws on a critique of the all-encompassing concept of *culture* in anthropology and sociology. Knorr Cetina (1982, 1983) limited the use of culture to small and clearly delimited environments. As such, the initial versions of "epistemic culture" focused on laboratories and other environments in which knowledge was produced, disseminated, and applied. In her later work, Knorr Cetina (1991, 1999) shifted attention from the construction of knowledge to the conditions for such construction, that is, the construction of environments, tools and infrastructures, as well as the ways in which these are combined by the form of reason or logic pertaining to the particular system. Thus, Knorr Cetina (1999) defines epistemic cultures as "those amalgams of arrangements and mechanisms—bonded through affinity, necessity and historical coincidence—which, in a given field, make up how we know what we know" (p. 1). Hence, in professional contexts, such cultures comprise different actors and their various knowledge-generating activities and responsibilities, which together provide the basis for what is recognised as knowledgeable professional practice (see also Knorr Cetina and Reichmann, 2015).

In her studies of organisations or other small environments of knowledge production, Knorr Cetina attempted to reconstruct the emic distinctions and forms of reason that mark these environments. A main tenet of her work is that epistemic cultures cannot be understood without referring to an internal logic or form of reason; that is, the very factors that Styhre (2011) identified as important for knowledge sharing (infrastructures, methods, concepts, and tools) cannot be understood without referring to a particular form of reason or mission. However, while recognising this internal logic's power, Knorr Cetina did not envision epistemic cultures as closed environments. Rather, she viewed society as an encompassing environment; thus, the notions prevalent in society at large can influence epistemic

cultures. Examples of such notions are general trust in large-scale studies or the notion of user involvement in experts' knowledge generation. However, their influence is indirect because elements are not copied from the environment or shared with the environment. External factors exert different effects in different cultures because everything is reinterpreted according to the receiving culture's internal logic. As Knorr Cetina (1999) suggests, if everything was shared and the boundaries of epistemic cultures had no implications for the flow of knowledge, the concept of epistemic culture would be rather pointless. Thus, in Knorr Cetina's (2007) frame, knowledge cultures can be understood as a wider concept – specifically, as the culture nurturing or hindering the working of epistemic cultures. For instance, a knowledge culture that emphasises global infrastructures, transparency in professional decision making and open access to research may provide better conditions for professional knowledge sharing than cultures that highlight individual discretion and give preference to local variations in ways of knowing.

We argue that Knorr Cetina's (2007) approach provides a useful starting point to understand changes in knowledge-sharing because it encourages us to consider the ways in which teachers' professionalism is nested within a broader context and how the relationship between the two may differ over time. Moreover, the originality of Knorr Cetina's contribution regarding discussions about teachers' professionalism goes beyond an oversimplified "either/or" logic regarding the influences that often have characterised debates on professionalism (see Noordegraaf et al. [2014] for an overview of the literature that examines this issue). Rather, her model encourages an investigation of what fault lines run between the inner and outer in different periods and how they inter-relate. Elaborating further on the challenges of our times, Knorr Cetina (1999) describes how expert groups continually turn inward or, in her words, "curl up upon themselves" (p. 2), focusing on and further developing a densely articulated, symbolic world of their own making. On the other hand, expert groups need to look outward and struggle to make use of what is offered elsewhere to become increasingly dependent on external support. Thus, expert groups must grapple with the dilemmas, risks, and ambiguities as they act to webs of relations and the wider outside world (Noordegraaf, 2021).

In our reinterpretation of knowledge-sharing practices among Norwegian teachers, we applied Styhre's and Knorr Cetina's perspectives to understand more of knowledge sharing as an aspect of connective professionalism and as a condition for professionalism between internal and external dynamics. We organized our process in two stages. First, we conducted an overview of the main findings from the three projects. We used Styhre's three key factors of knowledge sharing as a focal point for summarizing findings. Next, we used Knorr Cetina's theory to analyse how changes in knowledge-sharing practices relate to cultural conditions. The approach of synthesising and integration of findings across sets of case studies and projects is not common in research on professionals' work. However, a growing literature calls for cross-study syntheses, as they are particularly fruitful when seeking to build integrative understandings of a problem space taken up in the individual

cases and for identifying generative theories (see e.g., Rossman and Yore 2009). The next section presents a summary of the three empirical projects and their findings.

A summary of the three projects and their findings

Project 1 (2004-2008): Locally bounded knowledge-sharing practices and opportunities

The first project, conducted in 2004-2008, examined how novice professionals in four professions related to knowledge and continued to learn during their first working years after graduation. Using survey data, in-depth interviews and learning logs, the project analysed how knowledge sharing and learning opportunities took distinct forms in different professions, depending on powerful knowledge discourses and practices, as well as ways of organising work. These analyses were further related to ways of regulating knowledge in the wider profession, manifested in the strategies of the teacher's union and in national regulations for teacher education (for more details, see Jensen et al., 2012).

The analyses pertaining to the novice teachers showed that teachers' knowledge-sharing practices predominantly concerned the sharing of *personal and experience-based knowledge*. These practices often took spoken forms, in which the teachers shared examples and experiences from their own teaching with colleagues in informal contexts. The results also showed that the teachers' epistemic environment was marked by a scarcity of profession-specific knowledge resources (Lahn, 2012). The lack of such resources strengthened the focus on experience-based knowledge as the main component of professional expertise. A common narrative was that the individual teacher needed to build up a wide repertoire of first-hand experiences gained in a variety of teaching and learning situations and that knowledge sharing took place on a need-to-know basis. Thus, knowledge sharing was related to informal interactions in which teachers were implicitly asked to take personal responsibility for seeking advice and ideas (Nerland, 2012; Klette & Smeby, 2012). Regarding *spatial/geographical outreach*, the teachers' practices were mostly limited to local workplaces and communities, thereby lacking stimulating connections to wider knowledge networks that we could observe in other professional groups. Moreover, when considering the wider set of actors and relations that support knowledge sharing in the profession, the results showed that the forms of knowledge sharing were supported by the main discourses in the profession. For instance, analyses of the Union of Education Norway's (UEN) strategic documents and discussions stressed the importance of practice-based and personal knowledge (Karseth & Nerland, 2007). Furthermore, the teachers' union was more concerned with protecting teachers' space for discretion in their choice of teaching approaches than with supporting the sharing of procedural models and advice based on international research ². In sum, the analyses conducted in this project found that

² A distinctive feature of the Norwegian educational context is that virtually all teachers are organised by this one trade union, which has strong engagement and political influence in knowledge-related issues.

teachers' knowledge sharing was linked closely to their everyday teaching in the local workplace and that few other spaces existed for knowledge to circulate. This pattern distinguished teachers from the other professional groups included in the project, leading to questions about whether the emphasis on personal autonomy in the profession created hindrances in preparing professionals for the challenges of the knowledge society (Jensen et al., 2012).

Project 2: Emerging infrastructures for knowledge sharing and casual connections

The second project was conducted in 2009-2011 and was designed to build upon Project 1 in two ways. First, the project extended the time frame for examining novice teachers' knowledge relations and learning at work by approaching the participants from Project 1 two years later through surveys and in-depth interviews. Second, the project more thoroughly investigated the practices of knowledge sharing that were facilitated by the introduction of new artefacts and objects in the workplaces. This was achieved by conducting observation-based case studies of teachers' collaborative work with new devices and procedures, such as digital tools and assessment guidelines. In addition, the research team performed a follow-up study of knowledge-regulating policies and approaches in the relevant professional associations.

The results showed how epistemic environments for teachers were about to be reconfigured. Synthesising the results from the interview study and the observation-based case studies, we found that teachers' knowledge-sharing practices included a range of artefacts and materialised knowledge resources that incorporated not only research-based knowledge but also experience-based knowledge generated in the local community or from schools nearby that was shared in the form of assessment templates, mapping tools, models for technology use and procedures (Hermansen, 2014; Nerland & Jensen, 2014). Through the circulation of such knowledge resources, knowledge-sharing practices stretched beyond the local school community, and signs of emerging infrastructures were observed.

Simultaneously, an important finding in the project pertained to variations among schools because of infrastructure differences (Hermansen, 2017; see also Vennebo and Ottesen, 2014). Some schools deliberately established connections to research communities by engaging consultants to lead development initiatives and by giving teachers responsibilities to access a wider set of profession-specific knowledge resources, thereby creating new spaces for knowledge sharing and epistemic work. Other schools were still characterised by more informal knowledge sharing, with casual connections to external actors and resources. Regarding the wider set of actors and relations, the results showed how the UEN had developed a more positive position towards "research-based" knowledge during this period (Nerland & Karseth, 2015). However, the union did not involve itself in developing knowledge resources or standards for its members' professional work — in contrast to a

development that we noted in other professional associations, such as those serving nurses and accountants. The UEN was sceptical of the various forms of pre-packaged knowledge and standards that local schools imposed on teachers. Rather than seeing these resources as a way to secure a professional knowledge base and knowledge sharing, they were viewed as a threat to professional discretion and were not endorsed during this phase. Nevertheless, the analysis of the findings from Project 2 depicts a knowledge landscape involving multiple knowledge producers, who, in turn, generated different types of knowledge resources. In particular, this project identified the ways in which engagement with these new resources involved practitioners in wider circuits of knowledge advancement and served as a vehicle for knowledge sharing locally.

Project 3: The intensification and formalisation of knowledge sharing

The third project was conducted in 2012-2016 and was designed as an in-depth study at the school/organisational level. It built upon Project 2 in two ways. First, it investigated how practices of knowledge sharing were facilitated by the introduction and further development of artefacts and objects in the workplace, and second, by tracing emerging infrastructures of knowledge sharing. In addition, the in-depth study was supplemented by ongoing analyses of the educational context of teachers carried out by colleagues in our research group, providing input for the broader dynamics of change (see Afdal and Damsa, 2018; Damsa, 2018).

The project investigated practices of knowledge sharing by following teams of teachers during their work with collaborative curriculum making. The results showed how teachers' knowledge-sharing practices not only intensified but were formalised in new ways. First, the teachers had a wealth of knowledge resources and infrastructures to support them in their work (Tronsmo & Nerland, 2018; Tronsmo, 2019). Although some of the resources and infrastructures were internal to the profession, others were established in collaboration with external actors and stakeholders, such as universities and local educational authorities, thereby implying closer relations between teachers and various knowledge-generating actors (Tronsmo, 2020). Tracing the teachers' local curriculum development, the study also revealed how the plurality of knowledge resources and infrastructures gave rise to more collaborative practices that formed collective spaces for work. On the one hand, these spaces paved the way for innovation, creativity, and transformative endeavours in which we could observe systematic knowledge sharing and cumulative development processes among the teachers. On the other hand, these knowledge spaces were typically complex and diverse and created new dilemmas. The findings showed that in these situations, the emergence of explorative practices in which the teachers assumed responsibility for assessing the validity of the various knowledge contributions circulating in the networks was observable (Tronsmo, 2019). Regarding the wider outreach of actors and networks, we noticed knowledge-sharing practices that operated on many layers. The infrastructures and resources for knowledge sharing served to link teachers' work to wider sets of actors and

agendas, engaging the teachers in sorting out connections and delineating between contributions.

Employing a multilevel perspective, the findings from Project 3 also show how teachers' enhanced agency is intricately related to policy changes and developments outside local schools. For instance, international and national standards play a strong role in teacher education through outcome-based curriculum models, which are reflected in dual ambitions to strengthen the programmes' research-based grounding and professional relevance (Afdal & Damsa, 2018). Generally, Project 3 shows that more complex and multi-sited knowledge dynamics were emerging in the organisational landscape serving the teaching profession, thereby generating a need to engage in processes of knowledge reconfiguration at the various sites in which knowledge should be brought to bear on practice (Nerland et. al, 2018).

Taken together, the summarised findings of the three target projects show significant differences in Norwegian teachers' knowledge-sharing practices. A pressing question to be addressed is how these changes can be explained. To answer this question, we turn to a theoretical reinterpretation and discuss the findings from the three projects through a new analytical lens.

Cultural dynamics of change: A theoretical reinterpretation

The summarised findings from the three projects show that the teachers' knowledge-sharing practices have been subjected to change along all the dimensions Styhre (2011) identified as critical and that these are interrelated. The gradual growth in materialised knowledge and infrastructures encourages more diversified communication patterns, which in turn allows for increased interaction with settings and actors beyond the local workplace. Knorr Cetina's (2007) model of "culture in culture" allows us to explore the interdependent combination of influences between the epistemic culture of teaching and the more encompassing knowledge culture of society and to examine how this changes over time.

The findings from the first project portrayed a bounded epistemic culture that realises itself within the context of the profession and its internal interactions. Knowledge sharing rested primarily on local exchanges, with few links to external knowledge worlds. Moreover, the teachers' internal knowledge world was not densely articulated because the exchanges were primarily of a spoken nature and few infrastructures existed for more systematic knowledge sharing. Thus, in this period, we found a profession in which outreach and knowledge opportunities are restricted.

In the findings from the second project, we saw a profession that is being reconfigured slowly to better meet the changes that emerge from the "global architecture" of knowledge (Knorr Cetina, 2007). Instead of clear boundaries between professional work and outside worlds, we discern an epistemic culture that is gradually influenced by new agents in the

wider professional context and endeavour to tap into knowledge resources developed elsewhere. For instance, new assessment methods and principles that circulated in national and international school policies were introduced by way of new infrastructural arrangements and chains of actors. Thus, we saw how the wider knowledge culture provides scaffolding for the epistemic cultures of teaching. This scaffolding was facilitated through an increase in the material tools and arrangements that support knowledge sharing by making it possible to externalise, share and recontextualise knowledge. However, the internal logic of the profession as creating boundaries for knowledge sharing remains because it is the receiving culture's own knowledge structures and belief systems that determine which knowledge is brought in and what changes in existing knowledge structures are made at any given point in time. In other words, new knowledge triggers epistemic work through which whatever is brought in is interpreted and, if accepted, serves to update, or expand current knowledge. This interpretative process is important because it means that "instructive interactions" are still limited; that is, an agent outside the profession cannot determine its effect on the profession. At the same time, the main insight from this project was that local schools differed heavily from each other in their outreach capacities, owing to local possibilities and strategies. Thus, we saw signs of what Knorr Cetina (2007) described as "a divide between global knowledge and its expert cultures [...] and those areas of practice and mentality which remain local" (p. 372) within the same profession.

The findings from the third project revealed that the new connections in education, as well as the investments in developing epistemic infrastructures for professional work, increased substantially in later years, and led to what we observed as the potential for the transformation of teachers' epistemic culture in several ways. First, the local infrastructures and collective spaces for work allowed teachers to access larger networks of knowledge-generating actors, with the consequence that the teachers' knowledge-sharing practices were no longer limited to local schools and included a range of opportunities to access knowledge produced elsewhere. Although the school selected for the work-based studies may have been a forerunner, it was not unique, and the findings illustrate how teachers were increasingly part of a network of connections of which knowledge sharing and epistemic work were at the forefront. The networks tended to criss-cross each other so that teachers were located in several different constellations with different tasks—in one, a teacher may be a producer of material or ideas; in another, a recipient; and in yet another, a translator. Second, a range of other initiatives and arrangements existed, aimed at supporting teachers' outreach: new master's programmes, a stronger emphasis on research-based education; and new and more formalised networks for knowledge sharing across research, education, and practice in the teaching profession.

The analyses conducted in the three projects represent observations at given points in time, and the changes in knowledge-sharing practices are thus likely to be more incremental and co-emerging than what this project-based organisation can give the impression of.

Nevertheless, we can see how the epistemic culture of teaching has become linked with and nurtured by the wider knowledge culture in increasingly extensive and systematic ways. Moreover, we also observed that the dynamic goes both ways. By opening up the profession's boundaries and catering more systematically to knowledge sharing in subject-related and profession-specific work groups, the profession, through its responsibilities in educating the next generation, may also serve to nurture society's wider knowledge culture. In this transformational process lies widespread development of the external influences; that is, the profession increasingly was dependent on the goals set by actors external to the profession and the continuous acceleration of underlying streams of support from external agents for the creation and maintenance of its instruments, networks, and environments.

In the context of the discussion on professionalism, an important question is whether external influences and increased connectivity serve to challenge or strengthen the profession as a knowledge-based occupation. Thus, it was important to detail external actors' expanding influences. In doing so, we saw signs that such involvement may put teachers in a position of renewed power and agency, which in turn leads increasingly to renewal and an awakened consciousness. As indicated earlier, we also saw how the combination of initiatives and infrastructures is important from the profession's own perspective, in that they enhance their capacity for interaction. Furthermore, when considering the findings from the three projects, we saw how teachers reshape their identities over time and take on extended roles and responsibilities for knowledge sharing and development in the profession. In these efforts, teachers critically include the new goals that external stakeholders have set in their professional repertoires and are generally more accountable for these broader educational objectives and for their professional knowledge and experience. For instance, in their work to design and develop curricula, they engaged in justifying practices and became more proactive in terms of establishing legitimacy for their work. Rather than undermining the teaching profession's self-creative capacity, the widespread development of external influences is balanced through criteria internal to the profession. Although the question of educational policies and governance is a topic for a larger research programme, we note that a possible reason for achieving this balance is a shift in focus among political agents to emphasise facilitating support rather than exerting more blatant forms of external control and intervention. In particular, we note the work done to build infrastructures that, in Knorr Cetina's (1999) words, were designed to serve knowledge. Rather than dictating teachers' actions, this reorientation facilitates a self-transformation of the profession, the direction of which may coincide with policymakers' intentions but reflect the forms of reason and overall mission characteristics of the profession. This trend is in part continued in the work with the curriculum reform from 2020, which entrusts teams of teachers and subject matter specialists with the responsibilities to renew the subject content and work out the specific framework regulations for the various school subjects (Karseth, Kvamme, & Ottesen, 2020). What this suggests is that although external support and recognition are central, they are insufficient

to generate change. As our analysis suggests, it is still the teachers' practices that transform the profession. This active role requires extended responsibilities and forms of knowledge work from teachers, as well as a wider encompassing environment of actors and knowledge relations through which the professionals are entrusted a continued mandate to secure the quality of schooling as a key sector in society.

Concluding discussion

This article presented and discussed changes in the practices and conditions for knowledge sharing among teachers in Norway over 14 years. The theoretical reinterpretation of how knowledge-sharing practices are interlinked with a range of factors and developments in a society's wider knowledge culture has implications for how we can understand teacher professionalism and how it can be enhanced in the future.

First, by understanding professionalism as a matter of systematic and institutionalised knowledge sharing constituted through dynamic relations between epistemic cultures and the wider knowledge culture in a society, we have suggested a framework that allows for attending to the level of practice while accounting for the wider dynamics of knowledge and change. In particular, the model of "culture in culture" (Knorr Cetina, 2007) opens an analytical space to investigate how the idea of connective professionalism, which was first introduced by Noordegraaf (2016), plays out in daily life. Our analysis suggested that this framework advances thinking about professions in three ways: (1) it requires consideration of the interconnections between a culture's elements, dynamics and relations with the environment; (2) it allows for analysing the boundaries, linkages, synergies and emergent properties with the objective of understanding and considering interdependencies and dynamics; and (3) it reminds us to keep the "bigger picture" in mind, even when a study focuses on a specific aspect or subsystem. Thus, it offers a framework for tracing the broader societal forces that reconfigure professional work. The model of "culture in culture" also emphasises that professional cultures are distinct in their knowledge dynamics and that productive relations between epistemic cultures and the wider knowledge culture will take different forms in different professions. These differences call for more group-specific analyses in studies of professions as a basis for comparative analyses and further theorising.

Second, our analyses bring about methodological reflections on how changing forms and conditions for professionalism can be captured. In this article, we focused on the teaching profession in the context of one country, and we are aware that the cultural conditions in Norway differ from analyses and accounts in some other countries. Norway has, as described earlier, shown several political initiatives to strengthen the research base and knowledge sharing in the profession during the later years. Nevertheless, we think our findings and interpretations are of broader relevance. Although there are signs of an ongoing transformation in the teaching professions in many countries, as well as a growing trend to scrutinise these change processes to learn from them, large-scale studies that

capture global trends and illustrate how professions may be empowered by them are rare. One exception is the work of Darling-Hammond et al. (2017), which explored developments in the teaching profession and serves to illustrate the value of learning from accumulated experience. In a large-scale research project, she assembled a team of leading scholars to gain insights into what is being done in five high-performing countries (Australia, Canada, China, Finland and Singapore) to prepare teachers for a changing world. Although each country has its own history, context and culture for education, all jurisdictions have identified strategies for improving teacher learning and teaching to inspire other contexts. However, despite their usefulness, studies like this are rare, and Darling-Hammond et al.'s (2017) study is unprecedented in scope and scale. Given that ample published qualitative studies on various aspects of teaching exist, another way to benefit from international experience is to draw out the potential added value generated through various types of research syntheses. As this article illustrates, reinterpreting findings from focused studies that bear similarity and that are conducted over a longer period allows for new insights by interpreting the findings from a broader perspective and for theorising beyond what individual studies allow.

Third, the analysis and discussion presented in the current article underline how expert cultures should never be taken for granted. Rather, we suggest highlighting the intricate blend of influences that exist during different periods and enhancing our understanding of the mixed systems of care and attention that drive change processes and render professionalism a truly collective project. Professional expertise is a relational and constantly shifting entity shaped and reshaped according to the altering dynamics of political and social institutions, as well as changing societies. However, an issue that remains unclear and should be researched further relates to the historical change that occurs if external influences become dominant. Although Norwegian studies so far have suggested productive interactions between internal and external influences, we are curious about whether there is a tipping point here and, if so, where does it lead? More research is therefore needed to explore the interplay between the internal and external cultural spheres that currently fuel teachers' work and knowledge-sharing practices.

For the profession itself, one takeaway message relates to how the interactions between external and internal initiatives depend on the professions' capacity to balance influences in a productive manner. How the practices of knowledge sharing are supported and institutionalised is key here because it is through these practices that teachers take ownership of their work and are entrusted with capacities for professional judgment and development. An implication for practice, therefore, is the need to recognise knowledge sharing and epistemic engagement as important to teachers' competencies. This recognition implies shifting attention from individual autonomy to the performance of a collective teacher community and their epistemic agency as well as a recognition of more

specialisation—a research-oriented teacher role in which collaboration, capacity and innovation become part of work.

Questions of autonomy and responsibility continue to lie at the heart of the professionalism debate; however, what these terms imply requires rethinking. Our analysis suggests that the epistemic dimensions of professional work need more attention regarding knowledge sharing, ways of relating to external agents and extended responsibilities for knowledge.

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