Chapter 10
Learning to Teach in a Remote School Context: Exploring the Organisation of Teachers' Professional Development of Digital Competence Through Networked Learning

Fanny Pettersson and Anders D. Olofsson

Abstract This chapter takes a school management perspective and investigates an upper secondary remote school in northern Sweden and its ambitions to create conditions for teachers' professional development (TPD) of digital competence. More specifically, the chapter explores possibilities and challenges in how TPD of digital competence can be organised, facilitated, and sustained. By means of Cultural–Historical Activity Theory (CHAT), the results and analysis show that the development of teachers' digital competence requires a school management that is supportive in creating a culture of change that can be sustained beyond single TPD actions and activities. Moreover, teachers need support to elaborate and negotiate on what type of tools, rules, roles, and divisions need to be added to the activity for the networked learning to take place and to proceed both in a short-term and long-term perspective. It is also shown how the school management needs to be sensitive to when and how the learning network is in need of encouragement and external support, that is, the importance of finding a balance between when the learning network can be self-organised and when it is in need of being externally directed with support from the school management.

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Introduction

In July 2015, a Swedish government decision provided new opportunities for Swedish schools to expand the use of remote teaching (The Swedish Government, 2015). Remote teaching is mainly carried out in a synchronous and interactive mode characterised by collaboration between teachers who are geographically separated from each other and is an attempt to, for example, decrease the number of students moving out from remote areas (cf. Pettersson, 2015) and to make it possible for several remote school units to share their teacher capacity and resources (Zhang, 2018). Remote teaching brings with it an increased digitalised educational practice (Yu & Chen, 2016), and teachers have to develop digital competences in order to plan, design, and conduct teaching and learning. In turn, this has put pressure on Swedish schools to create conditions and strategies in order to help teachers develop such competences.

This chapter explores a remote upper secondary school in Sweden and its ambition to create possibilities for teachers' professional development (TPD). Previous research shows both that the school management (school leaders and educational technologists) plays a central part in turning ambitions into practical work (Pettersson, 2018) and that networked learning can facilitate teachers in collaboratively developing strategies to learn and execute digital competence in their daily practice (cf. Chap. 13 by Spante, Johansson, and Jaldemark, this volume). Of importance here is also, as put forward by, for example, Krumsvik (2014), as well as Pettersson and Olofsson (2013), that if teachers are to be prepared to work in technology-rich educational contexts they need to be part of activities that develop their digital competence, including their ability to use digital technologies in a pedagogical way (cf. Niemi, Kynäslahti, & Vahtivuori-Hänninen, 2013). However, attaining digital competence takes time (Pettersson, 2017), and the related TPD often seems to comprise short and decontextualised formal courses with a rather limited connection to teachers' everyday practice (Olofsson & Lindberg, 2012). Alternative ways of organising TPD for the development of digital competence are needed. In this chapter, one such attempt is reported.

With this brief backdrop, the aim of this chapter is to take a school management perspective (school leaders and educational technologists) in order to explore the possibilities and challenges in how teachers' professional development of digital competence can be organised, facilitated, and sustained in a remote educational context. The following research questions are hereby raised:

- How are structural and organisational conditions constructed as a possibility for facilitating teachers' professional development of digital competence through networked learning?
- How do structural and organisational conditions shape the possibilities for sustained professional development of teachers' digital competence?

Following this introduction, the concept of digital competence is described. After this some words about networked learning and learning networks are provided and the theoretical framework, Cultural–Historical Activity Theory (CHAT), for analysis is introduced. Next, the method is presented followed by results and analysis. The discussion and conclusions end this chapter.

Digital Competence

The concept of digital competence has gained increased interest in terms of learning and navigating in today's digitalised knowledge society (Ala-Mutka, Punie, & Redecker, 2008; Balanskat & Gertsch, 2010), and the field of education is no exception (From, 2017; Hatlevik & Christophersen, 2013; Krumsvik, 2014). Today, digital technologies are in some way part of most western educational practices, something that in turn has made the question of digital competences rather central for both school leaders and teachers.

Since the term "digital competence" was coined, researchers have tried to elaborate on what constitutes the concept (Pettersson, 2017). One example is From (2017) who talks about pedagogical digital competence as teachers' pedagogical use of digital technologies, as well as their ability to plan and conduct and to continuously evaluate and revise teaching and learning activities in their educational practice. Another example is Krumsvik (2008, 2014) who argues for digital competence as teachers' pedagogical use of digital technologies. With the inclusion of pedagogical aspects in the concept, Krumsvik defines digital competence as "the teacher/TEs' [teacher educators'] proficiency in using ICT in a professional context with good pedagogic-didactic judgement and his or her awareness of its implications for learning strategies and the digital Bildung of pupils and students" (2008, p. 45).

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Some Words About Networked Learning and Learning Networks

In broad terms, networked learning concerns connections and social relations between individuals in different social settings. In 2012, Haythornthwaite and De Laat defined social networks as "the configurations of connectivity that exist when people interact with each other by communicating, sharing resources, and working, learning or playing together, supported through face-to-face interaction as well as through the use of educational, and information and communication technology" (p. 352). Adding the dimension of learning, the notion of networked learning has been described as the process in which different aspects of configuration of connectivity support and facilitate learning and development among participants (Hanraets, Hulsebosch, & De Laat, 2011). In this chapter, the concept of networked learning refers to the activities taking place in the network, while the idea of a learning network relates to individuals gathering around a joint task or interest.

According to research, while some learning networks are framed and supported within organisational settings (Gleerup, Heilesen, Helms, & Mogensen, 2014), others are emergent and flourishing with runaway objects beyond formal settings and regulations (Goodyear, Carvalho, & Dohn, 2016; Schreurs & de Laat, 2014). This chapter is concerned with the former description – networks that at some point are organised and that are organisationally supported to be sustained within a specific organisational and educational context in a similar manner to the teacher-learning groups (TLGs) described in Chap. 12 by Vrieling-Teunter, Wopereis, van den Beemt, de Laat, and Brand-Gruwel and Chap. 13 by Spante et al. in this volume. Furthermore, this work is concerned with structural and organisational conditions, as well as support being constructed within and between boundaries of learning networks as a means to facilitate learning and collaboration between participants (e.g. teachers) from a long-term perspective. This also means that less focus is directed towards networked learning that spontaneously occurs and then fades away within educational contexts without any specific support, e.g. relations and connections that "happens 'as they go along' without any attempt at designing for learning" (Dohn, 2016, p. 148). Therefore, in the following sections, aspects of how networked learning can be organised, facilitated, and sustained will be further elaborated on.

Organising for Sustainable Learning Networks

In regard to facilitating and organising for sustainable learning networks, researchers argue for a distinction between what can be organised and designed for and what is emergent (see Ryberg, Sinclair, Bayne, & De Laat, 2016). Goodyear et al. (2016) highlight the need to distinguish between formulated tasks and the actual "doing" in learning networks. These researchers further argue that while tasks and the

boundaries of learning networks can be organised for, at some point the "doing" and "activity" (p. 96) of the participants is generally emergent and is informally constructed as the learning network takes form and develops over time. Conole (2007) points out that the physical and material setting as a boundary can, at least to some degree, be organised for and externally facilitated. This includes, for example, bringing together and connecting participants with digital tools and software to help the networked learning develop and proceed. According to Goodyear et al. (2016), such a physical setting is "often important, but is under-researched and under theorized: it is often taken for granted" (p. 94), and they go on to say that deeper knowledge of the physical setting would help researchers and practitioners "suggest what needs to 'come to hand' for the activity to proceed successfully" (p. 94). This chapter intends to contribute such knowledge.

Formal and Informal Learning Networks

Another central aspect when discussing the organisation, emergence, and facilitation of learning networks is the notion of formal and informal learning. Within school organisations, TPD of digital competences often refers to either formal initiatives that are approached and organised by external experts or informal learning that emerges between teachers in their daily practice (Lindberg & Olofsson, 2010). However, instead of making a clear distinction, Vaessen, Van den Beemt, and De Laat (2014) suggest "a hybrid form of informal-formal learning" (p. 57). Importantly, according to de Laat (2012), "Making a better connection between formal and informal learning will help to make professional development efforts sustainable" (p. 13). Moreover, formal–informal learning "stimulates the appreciation of informal learning formally through sponsorship and calls upon formal training initiatives when needed" (p. 19). De Laat's description can be understood as a way of expanding both formal and informal learning when the school is organising for connected and shared spaces for teachers working towards the same learning goals.

Supporting the Transfer from Externally Directed Learning to Self-Regulated Learning

Because learning networks might be formal and externally directed within an organisation, Akkerman, Petter, and De Laat (2008) point out the importance of enabling participants to also learn in a self-organised manner (see also Hanraets et al., 2011). According to Vrieling, Bastiaens, and Stijnen (2010), such a transfer from externally directed learning to self-organised learning should, however, be a step-wise process supported by facilitators helping to develop functional structures and guiding the group towards a shared object. Following Akkerman et al. (2008), there are

two central questions that can be used by facilitators to drive the process: (1) "How are we relevant to each other?" and (2) "Who are we and where we are going?" (p. 398). Vrieling, Van den Beemt, and De Laat (2016) report that when "the group facilitator discusses these questions at an earlier stage with group members, a meaningful, shared context within the group develops with the promise of a development towards an active, self-regulating group" (p. 280).

Networked Learning as an Object-Oriented Activity

For exploring and analysing how TPD of digital competence can be organised, facilitated, and sustained in a remote educational context, this chapter draws on Cultural–Historical Activity Theory (CHAT). CHAT is a historical- and contextual-oriented theory focused on the development and formation of learning practices within a given context (Engeström, 1987; Vygotsky, 1978). The basic view of CHAT is that learning and development is embedded in, and is a result of, object-oriented activities that are undertaken and driven by a group of individuals (in this chapter, the teachers). Learning is created and negotiated in a specific context, mediated by culturally and historically developed tools and artefacts. This mediated act (between *subjects*, *objects*, and *tools*; see the upper part of the triangle in Fig. 10.1) also means that individuals' learning and doing are constantly shaped and regulated by cultural tools developed and made available in the given context. In this regard, structures and mediating tools are developed and made available within the given context (in this chapter, the school organisation) and become central for both how and in what form knowledge and practices can be developed over time.

Building on the concept of mediation, Engeström (1987) paid attention to collective structures and forces that were framing and regulating activities. He expanded the concept of mediation to also include aspects of the *rules* regulating the activity, the *division of labour* between individuals participating in the activity, and the *community* in which the activity is taking place. Moreover, it is important to account for how these components or elements influence the formation of knowledge and practices in a long-term perspective.

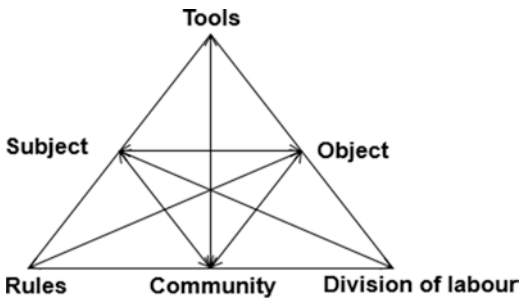

Fig. 10.1 An illustration of Engeström's (1987) structure of a human activity

In this chapter, networked learning is understood as a collectively created activity in the upper secondary remote school and, furthermore, as an activity that takes place within an educational context and with the shared object of TPD. Within the collectively created activity, the architecture, structure, and framing are understood as being important for the potential to learn and develop. The networked learning activity is understood as being shaped by available tools (digital technologies, learning spaces, and knowledge of teaching and learning methods), rules and regulations (decisions, regulations school and educational structures, and time), and the division of labour between participants (agreements influencing the conditions in the group, connections, and roles). Moreover, it is a community in which different people (educational technologists, school leaders, teachers) with different competences are involved.

The use of CHAT shall be read as an attempt to unravel the complexity in how networked learning can be organised, facilitated, and sustained as different sociocultural elements shape and regulate the ability to achieve the object of TPD of digital competence. In the analysis, special attention will be on how, and in what way, the school management acts in relation to different elements of the activity system, for example, how shared learning objects are formulated as well as how actions are taken towards making tools, rules, and aspects of community available and how these organisational and structural conditions might facilitate, support, or hinder how the networked learning activity is given room to proceed and sustain itself over time. This analytical framing should also be read as allowing for the exploration of the networked learning activity's potential to move back and forth between being formal and being externally regulated, towards informal and self-regulated learning. Put differently, the study explores how the school management acts in terms of being supportive, regulating, or waiting for the network to flourish on its own.

Networked Learning in the Upper Secondary Remote School

In Sweden, remote teaching is mainly carried out in a synchronous and interactive mode characterised by collaboration between teachers who are geographically separated from each other. This specific mode of teaching is looked upon as important for schools having difficulties in meeting the need for qualified teachers on site in combination with organising and carrying out teaching due to a continuously decreasing number of students (cf. Yu & Chen, 2016).

The context for this study is an upper secondary remote school that, since the beginning of 2010, has consisted of four schools located in four different municipalities in Sweden. The number of students ranges from approximately 200 to 1000, and the distance between schools varies between 94 and 240 km. The motive for this arrangement can be seen in light of an ongoing political strategy to facilitate remote teaching between schools in rural areas in Sweden and, by means of remote teaching, to attract and offer students a wider range of programmes to attend. Furthermore, it is designed to enable students to stay in their municipalities and, in

the long run, thereby strengthen the supply of competence in the region. During the 2016 school year, a total of 10 subject courses were offered to the students by means of remote teaching. The remote courses were conducted online, primarily synchronously through live-streamed lectures, seminars, and group work. Most of the remote teaching courses included a blend of students online and students located in the same school as their teacher. Among the remote teachers, there was also a mix between those sharing the physical classrooms with their students and those conducting their lectures in another room, facing all students online. All lectures were synchronous (often by means of Adobe Connect®), meaning that the students had the opportunity to interact with the teacher and other students during the lecture. A specific remote facilitator was also available for supporting students who were online. The remote facilitator helped the teacher and students to start up the lecture and was ready to give support during the lecture. The remote facilitator also had the possibility to support the teacher in administrative and in some pedagogical aspects during the lecture. To facilitate remote teaching and learning, the learning management system (LMS) Moodle was used for distributing hand-outs, instructions, and schedules. Some teachers also used Moodle for uploading short lectures and other teaching and learning materials for the students to use whenever needed during the course.

At this upper secondary remote school, the development of TPD of digital competence can be traced back to 2012 and the developmental needs when facing challenges in how to teach with digital technologies. Since then, TPD activities have been implemented intermittently and have taken different forms depending on teachers' learning needs. To shape the possibilities for the sustained TPD of digital competence, a number of organisational support measures and organisational conditions have been developed and constructed. This includes, for example, supporting teachers in formulating learning objects, the careful selection of tools supporting learning and collaboration, the development of rules regulating and directing learning, and the elaboration of the division of labour between educational technologists, remote facilitators, and teachers. These aspects will be further elaborated on from a school management perspective (educational technologists and school leaders) in the final parts of this chapter.

Method

This study is the first in a larger research project investigating remote teaching and learning in upper secondary school. It targets the school management perspective on the networked learning initiative for TPD of digital competence, while the two forthcoming studies will target the teacher and the student perspectives. Data were collected through semi-structured interviews in order to be able to capture a qualitative understanding of how structural and organisational conditions (a) are constructed as a possibility for facilitating TPD of digital competence and (b) how they shape the possibilities for sustained professional development of teachers' digital competence. These interviews were conducted in June 2017 with educational technologists

($N = 3$) and school leaders ($N = 3$) who were on the steering committee for the upper secondary remote school. A semi-structured interview guide was constructed to guide the talk (Kvale & Brinkmann, 2009) and concerned, in broad terms, three different themes – (a) networked learning, (b) organisational support, and (c) ways of facilitating and organising for TPD. The goal of the interviews was to capture deep and comprehensive discussion related to these themes. The approach used for guiding the talk can be described as inspired by in-depth interviewing (see Johnson, 2001), embracing questions like "tell the story about how you…" and "give examples and discuss possibilities and challenges you have experienced in…". This enabled the respondents to talk freely on the given themes while still providing possibilities for guiding the respondents through the interview. The interviews were conducted via telephone and lasted between 38 and 98 minutes. The main reason for conducting telephone interviews was the busy schedules of the project and school leaders and the fact that telephone interviews made short-term scheduling changes possible (cf. Pettersson, 2015). All interviews were subsequently transcribed.

In order to analyse the data generated from the interviews, we sought a systematic process in order to understand and make meaning of the data. The process followed three step inspired by Kvale and Brinkmann (2009). During the first step, segments and sentences were coded by giving them names and descriptions. During the second step, the codes and descriptions were compared and in different ways related to each other. Related codes were placed into broad categories bearing different meanings. During this step, CHAT and theoretical concepts such as community, division of labour, rules, and tools were used to guide the process. Also during this step, alternative categories from both an empirical and theoretical perspective were elaborated on (Guba, 1978). In the third step, CHAT was used to produce a deeper analytical and theoretical meaning and understanding of the data and the research questions – (1) How are structural and organisational conditions constructed as a possibility for facilitating teachers' professional development of digital competence through networked learning? and (2) How do structural and organisational conditions shape the possibilities for sustained professional development of teachers' digital competence?

Results and Analysis

In this section, aspects on how, and in what way, the school management acts in relation to different elements (*object*, *tools*, *rules*, *community*, and *division of labour*, see Fig. 10.2) of the activity system will be analysed. This includes, for example, how shared learning objects are formulated as well as how actions are taken towards making tools, rules, and aspects of community available and how these structural and organisational conditions might facilitate, support, or even hinder how the networked learning activity for the development of digital competence through TPD is given room to proceed and to sustain itself over time. School managements' responses are coded ET (educational technologists) and

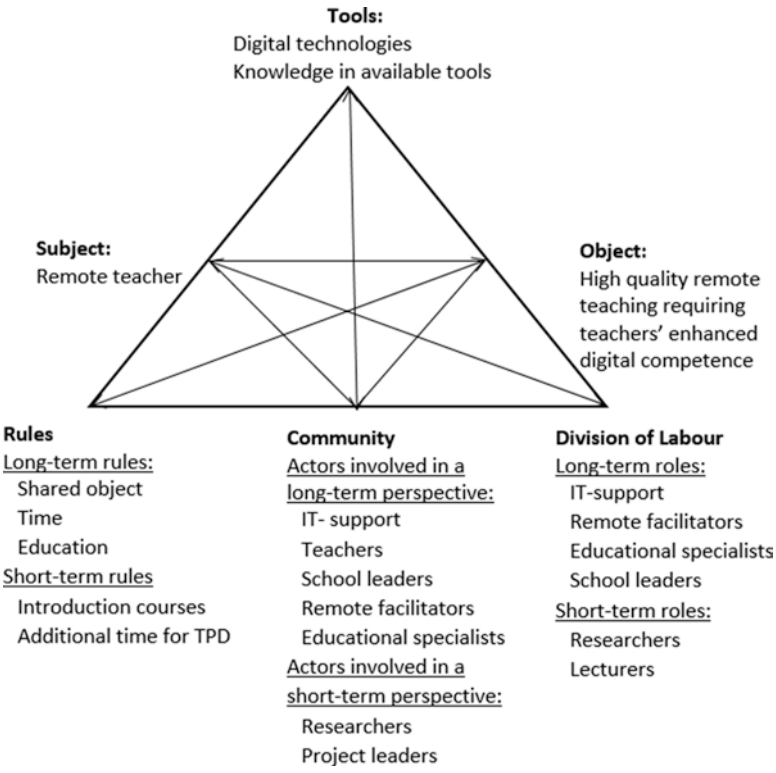

Fig. 10.2 Conditions for TPD of digital competence in a long- and short-term perspective

SL (school leaders). Each sub-section starts with a theory-driven question that will help to make clear the focus in the sub-section and to maintain stringent descriptions of the results that were generated and the analysis that was performed.

Object: The Formation of a New Learning Object

What is the reason for the networked learning activity to take place, and what is the object driving the activity? Through the lens of CHAT, initiating TPD of digital competences in a remote educational context calls for a shared object, formulated by either the subjects in the network activity or by the organisation in which the activity is taking place. When first implementing remote teaching in the upper secondary remote school, the object and structure of TPD and the networked learning were fragmented. The teacher group was given the task of planning and conducting remote teaching activities without having any specific competence or support. The willingness to learn appeared to be rather limited, and teachers struggled in finding ways to collaboratively learn and develop. When discovering this struggle, and the

need for additional knowledge, competence, and support, the school management seemed to agree in supporting the teachers. In doing this, the formulation of shared visions of digitalisation and TPD slowly started to emerge:

> We have had a vision of having all teachers as far as possible into the digital world … a vision of digital development. (SL)

In this case, visions of learning and development were primarily initiated and formulated by the school management. However, for the learning object to progressively take form and to stabilise within the school organisation and in the teacher group, some school leaders described how they needed to find ways to own the object together:

> A leadership that succeeds in reaching out with the message. We [the upper secondary remote school] need to own this message together – that this is actually important for this part of the country and that we are doing a good job, because this is our chance. I think that works quite well to drive the development. (SL)

To develop sustainable learning and development, an important aspect also seemed to be for the learning object to be rooted in and to align with larger organisational and political goals as well as having visions anchored in the overall school culture, which was expressed as (see also the citation above):

> Digitalisation, for example, should be a process taking place over a longer period of time … not only in terms of rather specific and concrete goals because the technology is changing, but also in larger, general goals … it is also something that should be rooted in the entire school organisation. (ET)

> It is of importance to work with the implementation as a process [digital competences, digital technologies, and remote teaching] over a number of years. (SL)

Tools: Designing the "Physical Setting" and Securing Sufficient Resources to Sustain Learning and Development

What tools and resources need to be in place to support subjects in reaching the learning objects of the networked learning activity? When using a shared object, there is a need for some tools to be developed and added to the activity in order for learning and collaboration to proceed.

When implementing networked learning, a central aspect was the selection of relevant digital tools for teachers to use, learn, and collaborate with. Of importance here was to first identify the specific technological and pedagogical needs of the teachers and then to help the teachers to limit the number of digital tools to be used and collaboratively elaborated on:

> We have [over the years] noticed that we cannot burden our teachers with too many technological solutions – they have enough work teaching students. (ET)

> In the school organisation, we had to ask ourselves 'what do we really need?' We couldn't provide support for ten different [digital] systems. (ET)

According to the analysis, limiting the number of digital tools to, for example, the LMS Moodle® and Adobe Connect® facilitated a common ground, making it easier for the teachers to collaborate, learn, discuss, and share ideas. However, adding such tools to the activity created new challenges. The lack of teachers' *basic* digital competences seemed, for example, to cause problems in terms of starting to learn, use, and collaborate:

> It is very important that everyone [the teachers] is gaining basic knowledge in the [digital] programmes. …What I know about a programme sets the limits of what I can do – what is beyond my knowledge and competence does not exist. How can I have a desire to learn and use something that I don't even know exists? (ET)

> There were and still are many teachers feeling that 'I don't understand what I should do with these technologies'. This slows down the process and makes it more difficult to learn. (SL)

This also represents the need for a certain basic digital competence as a prerequisite for teachers to be able to start to elaborate on technologies, to develop their digital competences, and, more specifically, to formulate what they want to do and what they want to learn:

> We [the upper secondary remote school] are trying to help teachers to express their learning needs so that we understand what they want to do: […] 'now I have a computer, I want to do this, how do I do it?' – you need to risk expressing your needs. (ET)

Due to such challenges, basic introductions to digital tools such as the LMS Moodle® and Adobe Connect® were conducted with the aim of "connecting tools and people". Teacher blogs, online learning spaces, and physical learning cafés were also developed and introduced to the teachers so that they would have places to meet, discuss, and share ideas. The school management also initiated and booked formal meetings for teachers to fill with informal content. In these meetings, teachers had the possibilities to, in a more informal setting, share ideas of "best practice" and discuss needs as well as technological and pedagogical challenges related to remote teaching and learning.

Rules: A Balance Between Steering and Hearing

What rules are needed in order to shape and regulate the activity? According to the analysis, some rules or directions were of central importance for providing structure to the networked learning. One such example was the standardisation of digital tools used by the teachers. This standardisation was explained by the school management as a way of steering teachers towards developing a shared language or linguistic to be used in the teachers' teams, that is to make sure that everyone, through communication and collaboration, is talking about the same functions and procedures. The learning was also regulated by the fact that support and introduction courses were

given exclusively on some specific digital tools that were collaboratively decided on beforehand in the network:

> Before, we had many different [digital] systems. So I think that this one contributes with good conditions for development. (SL)

> From the very beginning we [the school management] saw a need to standardise our digital tools. The collegial learning becomes much easier than having teachers using different [digital and non-standardized] systems. … Standardising the development of introduction courses that fit everyone is also a way of helping new teachers to enter the teaching practice more smoothly than the more routinised teachers did a couple of years ago. (ET)

Another aspect related to rules is how the school management used the learning object as a rule to encourage TPD to proceed and to sustain itself. Professional learning and educational change was, for example, communicated by the management as a shared goal in the school organisation, but also as a strong recommendation of something for school staff to strive for:

> It is important that everyone knows why this [remote teaching and TPD] is essential for the school and what is expected from me as an employee … this process is not optional but is an expected development that I am required to be part of. (SL)

Another example of steering the activity was the school management's decision to schedule for both teachers' informal learning and for formal meetings that teachers could fill with informal content. Time and possibilities in the schedule for informal and formal activities seem to have been used intermittently as a way to provide fuel to the learning network during times of low activity. This indicates the importance of regulating the learning network whenever necessary and to be sensitive to teachers' needs. Furthermore, for rules to be aimed at regulating network structures rather than the teachers' learning processes.

Community: Enabling Different Voices

Who is included in the community in which the activity is taking place? The community represents the group of individuals sharing the same object of change and development. A central aspect when initiating networked learning is to consider the community in which the TPD is taking place. One important task for the school management was to include different voices in terms of different professions with different competences that could help drive TPD of digital competence:

> We [the school management] are trying to find as many forces as possible that are moving forward in the same direction. Not making them into formal employments, but trying to find those who can influence the development in a positive direction in both smaller and larger aspects. … If it appears to rely on three or four enthusiasts, it won't be sustainable in a long-term perspective. It is dependent on having as many as possible who know as much as possible and who also understand why we are doing this and what we want to achieve. (SL)

This indicates the importance of providing a structure for networked learning by locating and adding the 'right' actors and competences that are able to contribute. Furthermore, building a community includes introducing teachers and their competences to each other. This seems to have been done through formal meetings (learning cafés, introduction lectures, etc.) where teachers had the opportunity to meet with colleagues and to discuss and elaborate on shared problems in their teaching practices.

Division of Labour: Creating Conditions in the Teacher Team

What tasks need to be done, and who is doing what in the community? According to CHAT, to make a collective networked learning activity flourish, the division of labour between participants might need to be elaborated on or even re-designed in order to facilitate learning and development. There were several challenges related to division of labour over the years. To make learning flourish, the school management has, for example, supported teachers in formulating, adding, and distributing new roles in the network. For example, there have been changes to the division of labour when it comes to certain learning tasks and processes needed for TPD of digital competence. One example is the role of educational technologists, who, besides being responsible for the technological support structure, also aimed to help teachers to develop their technological and pedagogical competences. Another role was played by remote facilitators and educational technologists who supported teachers in determining and formulating shared and emerging learning needs, and who arranged meetings to discuss them as well as supported teachers in both their everyday teaching practices and in their professional development of digital competence:

> The remote facilitators are very skilled in helping with the technology when it struggles. It is very important having them here. (SL)

> By means of introduction and the role of remote facilitators, the teachers have felt safe in their teaching situation relatively quickly. (SL)

> There are also possibilities to book meetings with educational technologists. It is, for example, possible to discuss and elaborate on issues like 'How can we solve this problem? How can we use this tool?'. (ET)

Creating Conditions for Facilitated and Sustained TPD of Digital Competence

The learning network at the studied school had been intermittent for several years and seemed to have included periods of both high and low activity. The school management described how teachers' self-organised collegial learning seldom

appears to be enough for driving the learning and development needed in a longitudinal perspective. Thus, to create conditions for facilitated and sustained TPD of digital competence, the school management had to be sensitive to both when and how the teacher group was in need of external support. In our analysis, it is indicated how the school management needs to work with both short-term and long-term support in order to give fuel to teachers' learning and collaboration. One such example is how the school management elaborated on and negotiated what type of roles and competences that could be added to the learning network – in both a short-term and long-term perspective (see Fig. 10.2). While some roles, such as IT support and educational technologists, seem to be added on a more permanent basis, guest speakers, researchers, etc., are temporarily added to inspire the learning network. Another example is the arrangement of formal meetings for teachers to fill with informal content. This as an opportunity for teachers to (once again) connect and find ways to collaboratively learn and discuss technological and pedagogical issues during times of low activity. Also, rules vary and are put on and off during different periods of time. Long-time rules include, for example, developmental demands (all teachers are required to develop certain digital competences), while short-term rules include introduction courses to new digital tools, additional time for TPD, and so forth.

Other aspects for creating sustainability were the school management's support in transforming the networked learning object as learning needs change. After a number of years of working with TPD and networked learning, it seemed as if the developmental focus was primarily on technological competences in terms of learning the LMS Moodle®, for example, how to upload course materials, and how to use Adobe Connect®. A central challenge noticed by the school management seemed here to be supporting teachers moving towards development of more *pedagogical* digital competences with the possibility of reflecting more deeply on remote teaching and new remote educational designs. Examples of such a result emerging from teachers' pedagogical reflections on remote teaching were new ways of arranging group work and discussions in the remote classroom and new ways to steer questions among students. Another result from the teachers' pedagogical reflections and elaborations was the solution of having all students online, meaning that the teacher could concentrate on one design (online) instead of two (online and traditional classroom). However, as indicated in the analysis, such a transformation of the learning object still seemed to be a challenge:

> We started to identify a need for additional [digital] competences. An inventory that wasn't really there from the beginning. (ET)

This is also an example of trying to sustain learning and development by transforming the object into new and important learning needs.

Discussion and Conclusions

Running a school in a remote area requires the school management to think creatively and to have a willingness to continuously try new ways of TPD (Pettersson, 2018). TPD activities organised by the school management have in this regard been intermittent for a number of years, and many lessons have been learnt. With a certain focus on how TPD of digital competence through networked learning can be organised, facilitated, and sustained, as seen from a school management perspective, we will now shed light on some of these lessons.

As the context and boundaries of learning networks are constantly changing and transforming, it can be hard for school management, to find reusable ideas when organising and facilitating learning networks (Goodyear et al., 2016; Ryberg et al., 2016). However, in this chapter, CHAT served as an analytical tool to unravel the complexity in how learning networks can be organised, facilitated, and sustained as different sociocultural elements shape and regulate the ability to reach the object, in this case, TPD of digital competence. One example that was highlighted in this study was the development of the physical and material setting in terms of selecting specific digital tools for teachers to use, and another example was bringing together and connecting teachers with digital tools and software to help the networked learning develop and proceed (see Conole, 2007). Similar to Goodyear et al. (2016), our analysis also showed how using the same pre-selected tools help teachers to share experiences and also imposes a common ground for learning. Other examples of externally facilitating the network included helping teachers to select roles and competences for the community (educational technologists and remote facilitators), elaborating on the division of labour, and introducing teachers to regulating rules and the object of enhanced digital competence (see also Vrieling et al., 2010, 2016 for self-organised and externally directed learning networks). It appears that helping teachers to discover actors, boundaries, and tools that are important for their learning and collaboration is important in times of low activity. Put differently, this supports teachers knowing what and with whom they can connect when the object is transformed into new learning needs (cf. Chap. 11 by van Amersfoort, Korenhof, Nijland, De Laat & Vermeulen, this volume). However, in a remote teaching context, one role that could further be elaborated on in the community is the role of the remote facilitator. Because remote teaching is a relatively new phenomenon in Swedish schools, the methods and structures for using and taking advantage of remote facilitators have not been developed yet. The remote facilitator, being involved in a variety of remote classroom situations, and facing wide a range of teaching and learning designs, might be used more thoroughly for picking up and spreading ideas and solutions within the school community.

Aspects of importance when organising for networked learning, as indicated in this study, also seem to be related to the networked learning object. For example, the learning object needs to be aligned with greater organisational and political goals, and learning visions need to be anchored in the overall school culture (Pettersson, 2018). In this

study, the object of enhanced digital competence by the teachers seemed to be strengthened by being anchored in broader political and organisational visions of digitalisation and educational change. Informal learning objects emerging within these bigger political objects and strategies was easier for school management to support. However, a challenge for management is to be facilitating teachers to transform the object to include both technological and pedagogical competence, needed when developing new educational teaching and learning designs (Lindberg & Olofsson, 2010; Niemi et al., 2013; Olofsson & Lindberg, 2012). In this study, it is apparent that technological competences will not be enough for students to sufficiently learn and develop in a remote teaching context. Teachers also need to reflect on their pedagogical choices when designing for remote teaching and learning. However, such TPD takes time (Pettersson, 2017), and poses a major challenge for the school management in terms of sustainable professional development in the remote educational context.

To conclude, this chapter asked the questions of how structural and organisational conditions are constructed as a possibility for facilitating teachers' professional development of digital competence and how they shape the possibilities for sustained professional development of teachers' digital competence. Our analysis showed that school management can support and facilitate, but also hinder teachers' learning through efforts to develop and maintain the school organisation. The school management described how teachers' self-organised collegial learning seldom appeared to be enough for driving the learning and development that was needed. Therefore, when organising for TPD of digital competence it is important that school management is sensitive to when and how the learning network is in need of encouragement and external fuel. In other words, for the school management to find a balance between when the network can be self-organised and when it is in need of being externally directed with support from the school management. The analysis also shows how school management together with educational technologists needs to support teachers in elaborating and negotiating on what type of rules, roles, and divisions need to be added to the activity in order for the networked learning to take place and to proceed in both a short-term and long-term perspective. While some roles (educational technologists and IT support) need to be added from a long-term perspective, others ('guest actors' such as researchers) can inspire and give fuel to the learning network on a short-term basis. Therefore, in this study, sustainability could be seen as being a fine balance of moving back and forth between being self-organised and being externally directed both in a short-term and long-term perspective. This does not mean that teachers are hindered from finding their own strategies to collaboratively learn and develop, but rather that the structure and use of the networked learning is facilitated and supported by the school organisation during times of low activity. Moreover, that the school management is supportive in creating a culture of change that can be sustained beyond single TPD actions and activities at the school. Focus for future research could therefore be how school management create conditions for cultures of change. Moreover, how different school management create balance between networks being self-organised and externally directed within the school organisation.

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