

Chapter 9

Teachers' Beliefs About Professional Development: Supporting Emerging Networked Practices in Higher Education



Jimmy Jaldemark, Marcia Håkansson Lindqvist, and Peter Mozelius

Abstract During recent decades society has gone through major changes related to social and technological developments. These changes have impacted higher education. This has led to emerging networked practices that professionals and the organisations they work within need to respond to. In answer to this challenge within higher education, several efforts in professional development have arisen. This chapter discusses teachers' beliefs about such professional development interventions. Particularly, it focuses on how networked practices in higher education are supported and fostered by professional development projects. The study was based at a Swedish university and included the dissemination of teacher beliefs from three different departments that participated in two professional development projects. The data materials were collected by using semi-structured interviews from a sample of 19 teachers. The results revealed that professional development trajectories concern beliefs on both individual and collective levels. Within these levels, teachers related their professional development beliefs to both social and technological networks.

Introduction

During recent decades, higher education has gone through major changes. However, these changes are not isolated to higher education institutions. They are related to larger changes in the surrounding society and are changes that higher education needs to respond to. Among others, the development within the field of information and communication technology, in terms of a shift from desktop-based solutions to more mobile and networked solutions, has had significant impact on societal development. This impact has included participation in higher education, working life or

J. Jaldemark (✉)

Department of Education, Mid Sweden University, Sundsvall, Sweden

e-mail: jimmy.jaldemark@miun.se

M. H. Lindqvist · P. Mozelius

Mid Sweden University, Sundsvall, Sweden

© Springer Nature Switzerland AG 2019

A. Littlejohn et al. (eds.), *Networked Professional Learning*, Research in Networked Learning, https://doi.org/10.1007/978-3-030-18030-0_9

professional development and private life. Although practices building on networked technologies nowadays include the implementation of Internet-based technologies such as wireless portable devices and various applications that support communication by bridging time and locations, the introduction of such networked technologies follows the footsteps of earlier developments. Networked technologies, such as telephones, radio and television, have all had an impact on learning, societal development and how people live their lives including private life, working life and participating in education. Some scholars emphasise these changes as the emergence of a networked society (Castells, Fernández-Ardèvol, Linchuan Qui, & Sey, 2007; Goggin, 2012). In short, the emergence of the networked society has had an impact both on the organisation of higher education and its relationship to the surrounding society (see Chap. 5, Nørgård, Mor, & Bengtsen, and Chap. 6, Pedersen, Caviglia, Gislev, & Hjortskov Larsen, this volume).

In the process of change, higher education has also been appointed a key role as a change agent, including contributing to societal development and globalisation through applied science and an increase in the recruitment of students. Moreover, the rise in enrolment has included lowering the student/teacher ratio, widening participation to embrace groups of students who earlier had low enrolment in higher education and increasing the number of international students (Jones, 2015; Nicholls, 2014). By assigning more tasks and students to institutions of higher education, governments seek to solve societal problems such as being competitive on a global market that relies on networked technologies, rectifying high unemployment and supplying society with professional development built on academic standards. From this perspective, it could be argued that networked technological developments also are an incentive for social change. To be able to fulfil these hopes, networked technologies need to be implemented within higher educational settings. However, despite fast technological development in society, the implementation in higher education is a challenge that can be described as work-in-progress. This work involves a scholarship of teaching that builds on and utilises participation in social and technological networks as a resource for nurturing ideas and enhancing learning. In other words, working as a professional in higher education means including the emergence of the idea of a networked participatory scholarship (Veletsianos & Kimmons, 2012).

Building on the emerging networked society and its impact on practices within higher education, this chapter builds on the implementation of networked technologies in terms of trials and professional development projects. Such projects have been a common feature to support professional development of higher education teachers and nurture the emergence of networked practices. Results of professional development projects for teachers have been identified by higher education institutions as critical for successful implementation of networked technologies. Therefore, studies of this kind are important to yield insight into how such practices could be developed. Finally, this study builds on a potential relationship identified between beliefs and practices (Buehl & Beck, 2015) and on the impact of teachers' beliefs on their actual use of networked technologies in educational settings (Haixia, Koehler, & Wang, 2018). In order to strengthen

future networked professional development, it is important to explore and discuss teachers' beliefs, since professional development needs to be linked to teachers' beliefs and experiences (Tondeur, Van Braak, Ertmer, & Ottenbreit-Leftwich, 2017). To achieve this aim, the following research question was explored:

What beliefs do teachers in higher education have about professional development that embraces social and technological networks as tools for learning educational technologies?

Thus, this chapter analyses teachers' beliefs of how professional development interventions support the emergence of networked learning practices in higher education.

Networked Learning and Professional Development in Higher Education

The introduction of networked technologies in higher education has enabled the development of a range of educational settings. These settings are founded upon the relationship between networked technologies on the one hand and the interplay between people and online resources on the other. This relationship is the foundation of the idea of networked learning, which is commonly defined as 'learning in which information and communication technology is used to promote connections between one learner and other learners, between learners and tutors, or between a learning community and its learning resources' (Goodyear, Banks, Hodgson, & McConnell, 2004, p. 1). To be able to teach in these sorts of educational settings, specific types of experience and knowledge are needed. Teachers working in higher education can develop this expertise and knowledge in different ways, for example, through courses or self-study (Töytäri et al., 2016), through participating in development projects (Crompton & Traxler, 2018) or by working with more experienced colleagues (Bennett, Agostinho, & Lockyer, 2015). Thus, knowledge and expertise in networked learning can be developed in several ways and requires higher education institutions to invest in different forms of professional development for teachers.

Professional development for higher education teachers is a complex phenomenon that can be viewed at the individual and the collective level (Nicholls, 2014). Professional development embraces change at both levels. At the individual level, higher education teachers need to develop abilities, behaviours, knowledge and skills to deal with a range of issues they face within their profession. At the collective level, professional development in higher education is a phenomenon related to the practices associated with teaching. At this level, professional development contributes to the ability of higher education institutions in being up-to-date in their educational processes and technological products, improving their competitiveness. Thus, professional development is important for higher education professionals as well as the organisations, particularly in a networked society that emphasises knowledge as critical asset at the heart of higher education.

Professional development is a phenomenon that relates to both informal and formal attributes of learning. In professional development, informal and formal attributes 'are inextricably interrelated' (Malcolm, Hodkinson, & Colley, 2003, p. 313). Formal attributes, sometimes described as 'training', are related to event-driven professional development activities. Examples include participation in courses, seminars and workshops. Formal attributes of professional development could also include assignments (Noe, Wilk, Mullen, & Wanek, 2014). Informal attributes of professional development embrace a wide range of activities. A common feature of these activities is that they occur during participation in ongoing, job-related tasks and in everyday work-based settings (Fuller & Unwin, 2011). A characteristic of informal attributes is engaging in (work-related) tasks where learning is a secondary purpose, rather than the primary goal. As work tasks are performed, learning emerges as an important by-product that can be related to individual and organisational professional development and change. Thus, it could be argued that professional development commonly takes place in everyday work-based settings, including the work of higher education teachers.

In summary, in the contemporary workplace, professional development can support learning and can be enhanced by networked technologies. This comprises how such networked technologies support professional development in terms of both formal and informal attributes of networked learning. Therefore, the relationship between formal and informal attributes of learning and networked technology enhancement is a feature that needs to be taken into consideration while designing professional development interventions. Professional development supported by social and technological networks could include collaboration as well as individual development. Long-term change of practice could be sustained where professional development activities include opportunities for teachers to apply and reflect on knowledge in practice in collaboration with their peers (Holmes & Sime, 2014).

Teachers' Beliefs

How teachers conceptualise teaching and learning with technology appears to have significant and interrelated impact upon their students' experience of learning (Kirkwood & Price, 2013). Hew and Brush (2007) report that professional development may be used to access many of the internal and external barriers to teachers' beliefs and that these may be related to experiences when implementing technology in their teaching. This includes professional development which goes beyond the sort of 'one-size-fits-all' technology training that is fundamental to teachers' technology use. If the integration of networked technologies in teaching practice is to be successful, it is important that teachers' fundamental beliefs about teaching and learning are taken into consideration during their professional development (Kirkwood & Price, 2013).

Drayton, Falk, Stroud, Hobbs, and Hammerman (2010) suggest that teachers need both professional development and time to discuss content, students' work,

pedagogy and technology. Moreover, the use of technology and the shift from technology to pedagogy takes time (Ertmer & Ottenbreit-Leftwich, 2013). It appears important to focus on teachers believing in their own abilities and the possibility to work in a culture that embraces a form of professional development which intertwines technological, pedagogical and subject-related didactic competences (Ertmer & Ottenbreit-Leftwich, 2010; Mishra & Koehler, 2006; Voogt, Knezek, Cox, Knezek, & Brummelhuis, 2013). Here, professional development should seek to support teachers' beliefs through supporting conceptual change, in order to have an impact on teachers' conceptions of and approaches to teaching with technologies (Englund, Olofsson, & Price, 2016). Towndrow and Wan (2012) emphasise the importance of teachers' collaboration through seeking and sharing. Moreover, Vrasidas (2015) argues that for professional development to work it should be collaborative in form and situated in teachers' everyday work-based settings and inbound practice. Thus, teachers' beliefs related to the use of networked technologies in teaching appear to support the notion that: 'technology itself is not the agent of change: it is the teacher' (Kirkwood & Price, 2013, p. 336). Building on this insight, the next section discusses the context of and the professional development projects reported in this study.

Emerging Networked Practices in Swedish Higher Education

Even though the Internet was developed during the 1960s, its impact on the society and higher education was limited until the 1990s. Even in the early 1990s, networked technologies' impact on Swedish higher education was limited (Jaldemark, 2008). Back then only 7% (approximately 15,000 students) of enrolled students participated in some of the 600–700 courses and 40 programmes that applied networked technologies to teaching. These educational settings used three approaches. The first approach involved applying non-digital, networked technologies, such as teleconferencing, to teaching. The second approach built on the notion of open learning and independent learning. This approach deemphasised networked learning by building on one-to-one telephone tutoring. The third approach was founded upon a decentralised model of education, such as self-study of learners located in a network of different physical locations (such as local study centres and university campuses) where students and teachers could meet. This third example was the most commonly applied approach (Gustafsson, 1993). Since these early days, educational settings in higher education have expanded in several ways, including the emergence and inclusion of Internet-based networked technologies. Today, networked approaches in Sweden routinely embrace blended learning practices, located both off and on-campus and enhanced by different asynchronous and synchronous technologies. For the academic year 2016/2017, there were approximately 215,000 enrolments in educational settings enhanced by networked technologies in approximately 500 programmes and nearly 7000 courses offered in the Swedish system. Teacher education is the most common of these programmes (Gröjer, Berlin Kolm, & Lundh, 2017).

Two Professional Development Projects

The data reported in this study were based on professional development projects run at the Mid Sweden University (MSU). MSU has two campuses located approximately 190 km from each other. The university has approximately 1000 employees and enrolls 13,500 students into 80 programmes and 350 courses. Due to separate campuses and the related geographical issues, the university has for decades built its teaching strategy on enhancement by networked technologies. Networked learning is encouraged and various projects have been introduced to keep up-to-date with recent developments in the field. In this strategy, the university has focused on different professional development projects that in a later stage could be disseminated among its employees. Preliminary results from the two professional development projects discussed in this chapter have been reported in other publications (Håkansson Lindqvist, Jaldemark, & Mozelius, 2018; Mozelius, Jaldemark, & Håkansson Lindqvist, 2018).

One example is the MUML project (Mid Sweden University and Mobile Learning), a predecessor to the two projects reported in this study. The MUML project supported the professional development of higher education teachers by focusing on the implementation of mobile networked technologies (Jaldemark & Lindberg, 2014). Teachers teaching in seven different courses performed trials and participated in workshops and seminars to foster the practice of teaching with everyday networked technological solutions. The project encouraged teachers to engage in 'Bring-Your-Own-Device' (BYOD) activity as well as allowing them to use enterprise systems. Through cumulative and iterative processes, teachers were encouraged to share ideas and learn from each other's practice as they experimented with technology in their teaching. The results of this project were disseminated throughout the university to allow teachers across the organisations to learn about new forms of networked technological practice that had been introduced. The two projects reported in this chapter built on the results of the MUML project.

The first project, the Campus-Distance (CD) project, was run for 3 years with 35 teachers who participated on a voluntary basis. These teachers worked within two different departments, including the department where the MUML project was run. The project aimed at supporting professional development and networked learning practices within six higher education programmes. Five of these programmes focused on teacher education, and the sixth programme was based on the subject of behavioural science. The teachers who taught within this behavioural science programme were also active within the teacher education programmes. One aim of the CD project was to support the development of expertise in blended and mobile learning practices. Professional development within this project emerged through an iterative design comprising the following five features (Fig. 9.1): participating in a competence development course, planning trials, conducting trials, evaluating teaching and participating in a pedagogical seminar. The second round of competence development was also voluntary, took place in a less formalised format and included fulfilling different teachers' needs. For example, this could be participation

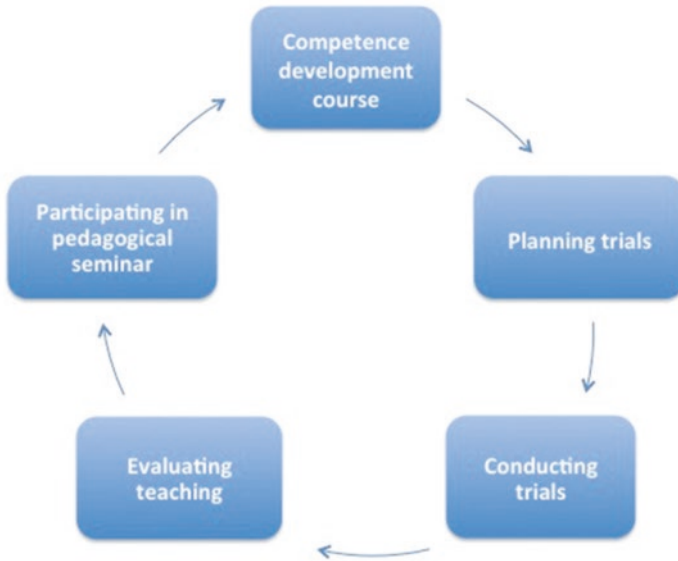


Fig. 9.1 Model of professional development in the first project

in seminars and workshops arranged by university, or conferences and symposia arranged by other institutions. Lessons learned from these sessions were used in a later stage to inform the next round of trials.

In the project, institutionally owned, enterprise equipment was used alongside a BYOD approach. Throughout the project, teachers worked towards enhancing their own networked learning practice, using both asynchronous and synchronous technologies. For example, they learned how to apply different networked tools, external websites, screencast technologies, social media, video conferences to their teaching and explored how they might improve their use of the learning management system.

The second professional development project originally included five teachers and was later expanded to 15 participants from the computer science programme in informatics at Mid Sweden University. The initial name of the project was ConCurrent Design (CCD), but later the name changed to Structured Multidisciplinary Project (SMP). The computer science department had been continuously discussing teaching technology and pedagogy outside the project and had organised visits to other universities to exchange experiences. Under both names, the project had the aim of developing expertise in how to apply networked technologies within blended learning settings. Later, the initial focus on asynchronous applications shifted to blended synchronous learning, and how to support student collaboration and group work. One of the objectives of the project was to develop a distributed CCD version (DCCD) for geographical independence and collaboration in virtual meeting rooms. The basic premise of DCCD was to use the Internet

and rich media technologies to combine expertise in a virtual space instead of a physical venue. Discussions and problem-solving were carried out in the virtual room following an adapted CCD process.

The last part of the second project focused on DCCD and how to maintain the CCD process quality in a distributed educational setting. Identified benefits of a DCCD process were increased possibilities for distance work, access to expertises that are difficult to move geographically and reduced transports. An important part of CCD is concurrency and how the various parts of the process could be handled in parallel, but presence was also of importance. Transferring the control and quality of a CCD process to a DCCD educational setting requires networked technologies that enable personal presence and the possibility to share documents. One project activity was to test various video conferencing systems with the possibility of using break-out rooms to divide a larger group into subgroups. This was carried out as online sessions between teachers from the three universities. Lessons learned were later compared with best practice and challenges in practice at other universities that use blended synchronous learning on a regular basis.

Method

Data was gathered through semi-structured interviews (Kvale & Brinkmann, 2015) with 19 higher education teachers from the two projects. From the first project 12 of 35 teachers, seven women and five men, were interviewed. From the second project, a total of seven of 15 teachers, three women and four men, were interviewed. The interview participants represented a variation in demographics, including academic degree, disciplines and experience of networked learning. These participants represented the three academic departments and seven different programmes involved in the two projects. During the interviews, the teachers and the interviewer discussed themes that were agreed in an earlier study of the MUML project (Jaldemark & Randevåg, 2016). In the interviews, an interview guide was used. Among others, the guide included the following topics: teachers' beliefs on social and technological networks and its relation to professional development; their views regarding the professional development which they had seen in their programmes and at the department; and their beliefs on the need for continued professional development.

The data collected in the interviews were analysed using an inductive, data-driven process according to the thematic analysis model described by Braun and Clarke (2006). The model includes six recommended steps: (1) Get familiar with the data, (2) Generate preliminary codes, (3) Identify patterns and themes, (4) Review patterns and themes, (5) Create and name categories and (6) Present the analysis. In this study, strict ethical guidelines were followed, as recommended by the Swedish Research Council (2017).

Results

This section outlines the results of the interviews with the teachers. An overarching theme of the interview responses was that teachers' perceived professional development at two distinct levels: *professional development at the individual level* and *professional development at the collective level*. These levels included several categories, as presented below.

Professional Development at the Individual Level

When analysing teachers' beliefs concerning professional development in regard to learning networked tools on an individual level, several categories were identified. These categories involved *just-in-time learning*, *trying to catch up with technology*, *technological responsibility*, *information overload*, *maintaining an optimistic stance* and *individual learning as a base for professional development at the collective level*.

Just-in-Time Learning

At the individual level, professional development was discussed in the form of taking on new skills *just in time*. One teacher described this as just-in-time, individual learning to use a networked tool at the point of need: 'Well, it is a type of trial and error. I don't learn first and then test it and use it a bit, I just get into a situation where I have to use Skype'. Another teacher expressed this as taking on networked technology at the right time: 'There are so many versions. I don't know which to choose, should I learn this one or will there be a better version in a few months?' This teacher chose to learn just in time when the technological knowledge was needed.

Trying to Catch Up with Technology

Other issues related to keeping up with technology were associated with individuals updating their knowledge of technological innovations. For one teacher, professional development involved continually trying to catch up and with advances in new networked tools. This left him/her with a feeling of insecurity:

But clearly, I can feel that the technological development is going faster than what I can keep up with and learn to use it, so there is the feeling that I am always behind. This is my experience. If you think of all of the things you can use, there are always more functions than I use. So, even if I feel that I am developing, it is far from enough.

This teacher realised the need to continually learn about new technologies to be able to apply these in his/her teaching while at the same time acknowledging the huge number of technological functions that were available, but that were not used. Another teacher hoped in the future to see ‘less complex systems that can interact with each other’.

Technological Responsibility

There are a large number of challenges at an individual level that continued to be problematic, and could be associated with a paucity of support networks for help. As networked tools continued to develop and become more user-friendly, the individual technological responsibility for use of the tools increased. One teacher noted being tired of all of the technological troubles and the related responsibility: ‘It takes so much time and I have noted, that as the technology develops, there is more and more that we have to do ourselves. I feel a bit frustrated about this, because it happens a lot, and we put a lot of time into it’. In another interview, a teacher claimed that it was important to ‘let go and have the courage to explore things on your own’.

Information Overload

Even when support networks were in place, there could be difficulties in learning new networked tools. One teacher explained the need for individual support in learning a new tool, as well as the overwhelming amount of information necessary to take in all of the features of a tool:

I think that I am still more on the analogue side than on the digital side, that I am not as motivated although I think that it is fun. I want to have someone who sits next to me and tells me, that you can do this and that and this. I just know that when I was having everything installed with a person from Helpdesk, it took one and a half hours. We went through everything. When he left, I felt physically ill, I could not take in one more thing.

Several teachers highlighted the need for professional development and more ‘concrete hands-on courses’. A number of shorter courses on networked tools that could support learning were developed and provided by the university, but a teacher commented: ‘the discussions are on a rather abstract level, for our daily use we need more hands-on training’. Another teacher pointed out that ‘our IT Helpdesk seldom has any solutions’ and that ‘I learn about new tools by myself and together with the colleagues’.

Maintaining an Optimistic Stance

Many of the teachers held a positive view of new networked technologies, which one teacher expressed as 'It's the constant tinkering that leads further, and I see new tools as a part of my job, and a way to learn new things'. Viewing the use of networked tools and technologies in teaching as interesting challenges was most common among teachers working with the computer science programme. This was also the group that had the most optimistic expectations of future technological developments. One example of a visionary view of the use of technologies was a teacher who believed that it would soon be possible to collaborate online using 'a common and never ending real time whiteboard' as a new way to enhance and improve existing practices.

Several teachers expressed a belief articulated by one teacher as 'it's improving. It's getting better', that the situation today is easier to handle than it was a decade ago. Results indicated that the general quality of networked tools had improved and that communication features were more stable than they were 10 years ago. On the other hand, the speed of technological development created problems for teachers working on all programmes and increased the need for professional development.

Individual Learning as a Base for Professional Development at the Collective Level

Teachers also perceived professional development at an individual level as a foundation for potential collective professional development and collaborative learning. One teacher noted that professional development, seen as an item on his/her own individual list, also provided the opportunity to share experiences and learning within a collective network of colleagues: 'We have used these active learning [classrooms]... and this is on my list for development....and here I see that there are many possibilities for development both for me, but for learning and co-learning'. A condition for professional development as an individual, and in turn, for the collective can be viewed as an optimistic outlook:

Well, I think that I, to be able to show this, I must also develop my own technological skills and be able to demonstrate it well and give good examples. It is like everything else, if you are optimistic ... If you want to promote something, well then it creates many positive effects and this spreads.

Having good skills in working with networked tools was seen to be important. It was also important to be able to present them well, and use them in a positive light. This use provided opportunities and an optimism related to the tools which spread between colleagues.

Professional Development at the Collective Level

In the analysis of teachers' beliefs concerning professional development in relation to learning networked tools at the collective level, several categories were identified: *professional development within limited time constraints, new and accessible strategies for professional development, creating new spaces for networked learning through easily accessible learning networks, and scaling up informal and formal attributes of networked learning opportunities within and beyond the university.*

Professional Development Within Limited Time Constraints

During the interviews, teachers often articulated challenges around finding time for networked learning with colleagues. Emerging networked practices were described as well as the need to create more time for these networks: 'We have meetings where we sit and discuss and share and help each other and talk to each other about how we can improve, what we can develop... Here, one would like to have more of this time. But I still think that we do this, we try all the time'. Another teacher expressed this as a double challenge that could be related to both time and location: 'There are two parts to this, one is that somewhere there has to be a place to meet to make this exchange and the other is to have the time to do it'. A third teacher pointed out that 'it can be helpful just to test new tools together'.

New and Accessible Strategies for Professional Development

With limited time available for professional development, teachers needed to find new and accessible strategies for professional development. This involved finding ways to use the short periods of time during teachers' everyday work schedules for just-in-time and efficient professional development: 'A requirement for a staff member who needs professional development is to actually be able to do it, with a half an hour more or a half an hour less in their schedule. It is extremely difficult to create the time for this meeting'. Beyond time and space, flexibility and accessibility of systems appeared to be a critical condition for networked learning: 'We need to build another way to exchange experiences, but how can this be done and easily accessible and not a burden of additional systems to log into, additional systems to learn'.

Time also seemed to be an important aspect to promote collaboration in networked learning. At the collective level, groups of teachers communicated with each other to decide what resources they could produce by themselves and what resources they could find and disseminate. However, locating, evaluating, sharing and disseminating these resources for collective purposes within a network of colleagues took time:

We have discussed academic writing many times, in teachers' education. We could use films about writing references and so on. If we do our own films, and now we have ended up in that there are so many resources on the Internet and you can use them... Here, there are lots of discussions, which resources there are and what we need to do by ourselves, and new things. And it takes time to find them.

Here, teachers appeared to see possibilities in the networked tools and resources available, but also the need for collaborative discussions which networked learning could provide.

Creating New Spaces for Networked Learning Through Easily Accessible Learning Networks

Another challenge was also evident according to another teacher. This challenge was related to a conflict of interest between individual professional development and networked learning through collaborative professional development: 'We must create possibilities to discuss collaboration in other ways. But is also problematic in relation to the resources that we have and the time we have for professional development, but there are individual needs'. Another teacher expressed a need for more opportunities for networked learning. This would involve time, but would also create a creative space for expanding informal networks to formal networks for collaborative learning. Here, informal networks appeared to provide some of the information needed, but the focus continued to remain on the individual level:

I miss the pedagogical conversations, if that is what you can call it. In my experience, a lot is ventilated between people who have the same interests, you get a little input, a few ideas, but there has never been the time or the room for discussing this more in detail. You can see and you hear that things are going on. There are many skilled colleagues who do lots in their courses, but you never really have the opportunity to learn about it because everyone is so focused on their own thing.

Another teacher also articulated emerging network learning processes. This teacher described the informal dissemination of information and learning processes which took place:

What we do right now, we do so much sharing in the corridors, we spread 'she has done this and she has done that' and 'they have tested this' and so on. But here, we could put together a number of examples for changes or for ideas, ideas for development, and together, look at them, collaboratively think of them and collaboratively see, how can we, ok, how can we use this in other situations?

Emerging networked learning processes were also described by a teacher who noted perceptible changes in practices:

It is spreading, we talk about Moodle in a different way. Both culturally, how we think, how we get the students to be active, how we can do this strategically, how we think about Moodle, how we work with Moodle and so on. It is slowly spreading, we are talking about this and I think I can see it or I see it. Not just think ... I can see it.

What most teachers agreed on was the strength of *the collegium*, a collegial network where all kind of issues could be discussed. The collegium could be a channel for sharing best practices and lessons learned. Teachers also mentioned that a network of colleagues brings them comfort during their daily work, and could be viewed as an important complement to the official support channels. The collegium was also depicted in an answer as ‘a flexible networked collaboration with sub-groups or sub-collegia’. Teachers also claimed that in the collegium there are no clear boundaries between new technology and new pedagogy and that these phenomena today are intertwined.

Scaling up Informal and Formal Attributes of Networked Learning Opportunities Within and Beyond the University

At the university level, there were opportunities for professional development; however, according to this teacher, these activities were not given a high priority: ‘There are many good possibilities to go to seminars...courses held by the university. This is good. But, people often have a hard time to find the time to do this, but they are offered now and again and more and more people go’. Another teacher expressed the need to expand networked learning beyond the university, creating opportunities for networked learning with other universities: ‘But looking at us as universities, we need to collaborate. We are sitting and thinking ourselves [...] there are not really any good collegial structures for developing this’. Finally, a teacher discussed creating new conditions for networked learning and professional development within the university as well as between universities. An example of a fruitful inter-university collaboration was when the department of computer and system science initiated a dialogue with another department of computer and system science. A concrete outcome of these discussions was the introduction of a theoretical framework that later was used in their work as teachers.

Discussion

Returning to the research question posed in this chapter regarding beliefs teachers in higher education have about applying social and technological networks as tools for professional development of higher education practices, there is evidence that emerging network practices can be seen on the individual level as well as the collective level.

While many of the teachers view individual professional development as a condition for collective professional development, networked learning is emphasised as a phenomenon including both informal and formal attributes. While some teachers see emerging network learning processes as slowly but surely developing over time (Bennett et al., 2015), other teachers see stronger effects such as the collegium. Therefore, teachers’ beliefs also appear to confirm the notion that professional

development takes time (Ertmer & Ottenbreit-Leftwich, 2013). In other words, the emerging professional development trajectories could also be discussed in terms of a networked participatory scholarship (Veletsianos & Kimmons, 2012).

Professional development which takes place on the individual level alone may make it difficult to keep up with changing technology. It is most likely that new solutions are needed to support individual and collective professional development (Hew & Brush, 2007). The results of the present study indicate that teachers' professional development today requires more than just the official training that is provided by the university. The constantly changing situation in networked technologies needs complementary resources both for technological and pedagogical novelties in which pedagogy and technology are intertwined (Ertmer & Ottenbreit-Leftwich, 2010; Mishra & Koehler, 2006; Voogt et al., 2013). Such intertwined resources could embrace practice-based professional development projects (Crompton & Traxler, 2018; Vrasidas, 2015) that involve seminars where ideas could thrive and be disseminated and discussed between teachers through sharing (Drayton et al., 2010; Towndrow & Wan, 2012).

Creating conditions through networks for professional development to discuss, reflect and exchange experiences results in a collective human knowledge bank of best practices and challenges in practice. This appears to take place primarily in an informal way. However, more opportunities for networked learning are provided through formal systems and structures. This seems to take time and these networked learning opportunities compete with other teaching duties. The idea of teachers and subject matter experts as a collegium with sub-collegia looks promising for the sharing of ideas and best practice. The collegium could provide a bedrock for formal and informal attributes of higher education teacher training.

While teachers learn about new networked tools individually and collectively to support student learning, time is an important factor. Several teachers highlighted a low level of resources, and emphasised that lack of time was the most crucial. University teachers in Sweden have in general 20% of their working time for personal development, but this time is also used for research, updating subject matter expertise and course development. In this study, teachers focus on individual and collective aspects of networked tools to support students' learning. At the same time, it is difficult to see any thoughts in these teachers' beliefs about how these skills could be facilitated through online solutions for professional development, i.e. supporting their individual and collective professional development through the use of flexible networked tools. These possibilities for networked learning could be provided by the university, in order to provide the same networked learning opportunities for teachers and other university employees as for students.

The results suggest that contemporary teacher professional development interventions must extend beyond the formal training provided by the university. Formal attributes of professional development trajectories tend to be offered in a top-down way, where technology and pedagogy are discussed at a high level of abstraction. Thus, the authors recommend combining formal top-down models of professional development with self-organised, bottom-up structured networks that emphasise informal attributes of learning, therewith acknowledging the teachers' beliefs

(Englund et al., 2016; Kirkwood & Price, 2013; see Chap. 13, Spante, Johansson, & Jaldemark, this volume). The continuously changing context of networked technologies and the need for professional development that includes pedagogy and technology intertwined will likely increase. For Mid Sweden University, as for other universities, it will be important to reinforce the current professional development for teachers in higher education both individually and collectively.

Conclusion

The results of this study identified that the teachers involved in this study perceive social and technological networks as a means to cope with the urgent need for contemporary professional development in higher education. Furthermore, the results indicate that professional development comprises both individual and collective aspects. A key challenge identified in this study is for universities to create and support networks that are sufficiently dynamic to extend across and maintain both aspects, and at the same meet the social and technological needs of higher education. In these professional development endeavours, teachers' beliefs should be acknowledged. Finally, future research is needed to investigate how universities might systematically support dynamic networks that embrace informal and formal attributes of learning to enhance professional development among university teachers.

References

- Bennett, S., Agostinho, S., & Lockyer, L. (2015). Technology tools to support learning design: Implications derived from an investigation of university teachers' design practices. *Computers & Education, 81*, 211–220.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.
- Buehl, M. M., & Beck, J. S. (2015). The relationship between teachers' beliefs and teachers' practices. In *International handbook of research on teachers' beliefs* (pp. 66–84). New York: Routledge.
- Castells, M., Fernández-Ardèvol, M., Linchuan Qui, J., & Sey, A. (2007). *Mobile communication and society: A global perspective*. Cambridge, MA: The MIT Press.
- Crompton, H., & Traxler, J. (Eds.). (2018). *Mobile learning and higher education: Challenges in context*. New York: Routledge.
- Drayton, B., Falk, J. K., Stroud, R., Hobbs, K., & Hammerman, J. (2010). After installation: Ubiquitous computing and high school science in three experienced, high-technology schools. *The Journal of Technology, Learning and Assessment, 9*(3), 5–52.
- Englund, C., Olofsson, A. D., & Price, L. (2016). Teaching with technology in higher education: Understanding conceptual change and development in practice. *Higher Education Research & Development, 36*(1), 73–87.
- Erntner, P., & Ottenbreit-Leftwich, A. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education, 42*(3), 255–284.

- Ertmer, P., & Ottenbreit-Leftwich, A. (2013). Removing obstacles to the pedagogical changes required by Jonassen's vision of authentic technology-enabled learning. *Computers & Education, 64*, 175–182.
- Fuller, A., & Unwin, L. (2011). Workplace learning and the organization. In M. Malloch, L. Cairns, K. Evans, & B. N. O'Connor (Eds.), *The SAGE handbook of workplace learning* (pp. 46–59). London: SAGE.
- Goggin, G. (2012). *Cell phone culture: Mobile technology in everyday life* (2nd ed.). New York: Routledge.
- Goodyear, P., Banks, S., Hodgson, V., & McConnell, D. (2004). Research on networked learning: An overview. In P. Goodyear, S. Banks, V. Hodgson, & D. McConnell (Eds.), *Advances in research on networked learning* (pp. 1–9). Dordrecht, The Netherlands: Springer.
- Gröjer, A., Berlin Kolm, S., & Lundh, A. (2017). *Distansutbildning i svensk högskola: Redovisning av ett regeringsuppdrag (Distance education in Swedish higher education) (Rapport 2017:18)*. Stockholm, Sweden: Swedish Higher Education Authority.
- Gustafsson, G. (1993). Success and failures in distance education: The need for actors' perspectives in policy analysis. *Research in distance education: Present situation and forecasts* (Vol. 6, pp. 4–10). Umeå, Sweden: Distansrådet, Umeå University.
- Haixia, L., Koehler, M., & Wang, L. (2018). The impact of teachers' beliefs on their different uses of technology. In E. Langran & J. Borup (Eds.), *Proceedings of society for information technology & teacher education international conference* (pp. 1468–1477). Washington, DC: Association for the Advancement of Computing in Education (AACE).
- Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development, 55*(3), 223–252.
- Holmes, B., & Sime, J.-A. (2014). Online learning communities for teachers' continuous professional development: An action research study of eTwinning learning events. In V. Hodgson, M. de Laat, D. McConnell, & T. Ryberg (Eds.), *The design, experience and practice of networked learning* (pp. 185–205). London: Springer.
- Håkansson Lindqvist, M., Jaldemark, J., & Mozelius, P. (2018). Professional development as a collaborative endeavour of networked learning in higher educational settings: Dissemination of knowledge among teacher training professionals. In M. Bajić, N. Dohn, M. de Laat, P. Jandrić, & T. Ryberg (Eds.), *Proceedings of the 11th international conference on networked learning* (pp. 349–352). Zagreb, Croatia.
- Jaldemark, J. (2008). Changes within the practice of higher education: Participating in educational communication through distance settings. *International Journal of Web Based Communities, 4*(2), 173–187.
- Jaldemark, J., & Lindberg, O. (2014). Designing for mobile participation in blended higher educational settings. In S. Bayne, C. Jones, M. de Laat, T. Ryberg, & C. Sinclair (Eds.), *Proceedings of the 9th international conference on networked learning 2014* (pp. 364–367). Edinburgh, UK.
- Jaldemark, J., & Randevåg, L. (2016). Teachers defining mobile learning: Conceptualisations emerging in a development project. In S. Cranmer, N. B. Dohn, M. de Laat, T. Ryberg & J. A. Sime (Eds.), *Proceedings of the 10th international conference on networked learning* (pp. 341–344). Lancaster, UK.
- Jones, C. (2015). *Networked learning: An educational paradigm for the age of digital networks*. London: Springer.
- Kirkwood, A., & Price, L. (2013). Missing: Evidence of a scholarly approach to teaching and learning with technology in higher education. *Teaching in Higher Education, 18*(3), 327–337.
- Kvale, S., & Brinkmann, S. (2015). *InterViews: Learning the craft of qualitative research interviewing* (3rd ed.). Los Angeles, CA: Sage.
- Malcolm, J., Hodgkinson, P., & Colley, H. (2003). The interrelationships between informal and formal learning. *Journal of Workplace Learning, 15*(7/8), 313–318.
- Mishra, P., & Koehler, M. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*, 1017–1054.

- Mozelius, P., Jaldemark, J., & Håkansson Lindqvist, M. (2018). Teachers' beliefs about professional development and the use of collaborative online tools in higher educational settings. In M. Bajić, N. Dohn, M. de Laat, P. Jandrić, & T. Ryberg (Eds.), *Proceedings of the 11th international conference on networked learning* (pp. 361–364). Zagreb, Croatia.
- Nicholls, G. (2014). *Professional development in higher education: New dimensions and directions*. London: Routledge.
- Noe, R. A., Wilk, S. L., Mullen, E. J., & Wanek, J. E. (2014). Employee development: Issues in construct definition and investigation of antecedents. In J. K. Ford (Ed.), *Improving training effectiveness in work organisations* (pp. 153–192). New York: Psychology Press.
- Swedish Research Council. (2017). *Ethics*. Retrieved January 29, 2018, from <https://www.vr.se/inenglish/ethics>
- Tondeur, J., Van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence. *Educational Technology Research and Development*, 65(3), 555–575.
- Towndrow, P. A., & Wan, F. (2012). Professional learning during a one-to-one laptop innovation. *Journal of Technology and Teacher Education*, 20(3), 331–355.
- Töytäri, A., Piirainen, A., Tynjälä, P., Vanhanen-Nuutinen, L., Mäki, K., & Ilves, V. (2016). Higher education teachers' descriptions of their own learning: A large-scale study of Finnish Universities of Applied Sciences. *Higher Education Research & Development*, 35(6), 1284–1297.
- Veletsianos, G., & Kimmons, R. (2012). Networked participatory scholarship: Emergent technological pressures toward open and digital scholarship in online networks. *Computers & Education*, 58(2), 766–774.
- Voogt, J., Knezek, G., Cox, M., Knezek, D., & Brummelhuis, A. (2013). Under which conditions does ICT have a positive effect on teaching and learning? A call to action. *Journal of Computer Assisted Learning*, 29(1), 4–14.
- Vrasidas, C. (2015). The rhetoric of reform and teachers' use of ICT. *British Journal of Educational Technology*, 46(2), 370–380.