

LOCAL LEARNING IN DISTRIBUTED TEACHER EDUCATION

Abstract

This article describes the distribution of online video education and student learning in the local context. The case study shows that three-part online video cooperation between the participants can be a bridge between practice in the local primary schools and the distributed teaching. These students also experienced that paid teaching work can build knowledge on the borders between teacher education and practice in local schools. In this pilot project, local learning complements distributed education. This case study was developed from the framework of cultural historical activity theory.

Keywords: distributed teacher education, local learning, on-line video teaching, activity theory.

Introduction

There is an ongoing discussion on how teacher education can adapt new technology (F. Mørk Røknes, R.J. Krumsvik, 2014, pp. 250-280) to develop teaching and students learning (P. Wastiau, 2013, pp. 4-6). The aim of this study is to develop an understanding of how distributed cooperation of the partners in distributed teacher education can build bridges between the distributed video teaching and the students local learning and practice. This case study describes a pilot project in teacher education, which develops and distributes teaching by online video. The students are mainly off campus in local study groups and are linked to a local primary school for hands-on training. The pilot project emphasizes cooperation between the students, the educators from the University College (UC educators) and the practice teachers from

the local primary schools. These three groups cooperate via videoconference through teaching sessions and sessions where the students plan and evaluate their practice periods. The three-part cooperation is organized both asynchronously through learning management systems (LMS) and synchronously via video systems. This study, however, focuses on the use of the synchronous cooperation component.

A central contradiction in teacher education is the relationship between the learning process on campus and the guided teaching of the students in practice schools (D.T. Solbrekke, E. Munthe, P. Haug, 2010, pp. 187-189). Many students experience learning in education and in practice as two different worlds (V. Nilsen, 2010; F. Korthagen, T. Wubbels, 2001, pp. 32-50). Students have problems with seeing coherence and continuity in education. There are specific requirements that apply in school life that the teachers programme fails to meet (T. Dahl, T. Buland, H. Finne, V. Havn, 2006). Turid Irgens Ertsås and Erik J. Irgens claim that the dichotomy between theory and practice should be overcome, especially because the practice of teaching includes theoretical perspectives as a basis for action (2012, pp. 195-215). The term *practice shock* is used to describe this tension (T. Løkensgård Hoel, 2005, pp. 96-108; Nokut, 2006; S. Østrem, 2011, pp. 229-239). Many new teachers experience their first job as a shock, and they disappear from school as a working arena (C.R. Haugen, T.A. Hestbek, 2012). Experience from practice is not easily transferable from one context to another (E. Wenger, 1998; R. Säljö, 2000). To mitigate this shock, it is necessary to strengthen training in the field of practice, but practical knowledge alone is not enough to meet the needs of schools and learning. Pedagogy and practice should give students tools to understand and act, and encourage reflection and critique of existing practices (C.R. Haugen, T.A. Hestbek, 2012; P.I. Jensen, 2007, pp. 57-74). To understand the hybrid character of teacher education, taking part in several distinct practices, it is not enough to study participation within one community. We need to know how students act in their own community as well as across boundaries. Learning is a matter of acting on and talking about the object within and between communities (C.F. Jahreie, S. Ludviksen, 2007, pp. 299-318). This research gives answers to the question: How do student teachers build knowledge of teaching in and between the distributed teacher education and their practice in primary school?

The theoretical framework of this study is the cultural historical activity theory (CHAT). Within this framework, the study emphasizes processes of tools and learning, and interaction and boundary-crossing. The study shows how students, practice teachers and UC educators virtually meet and develop

learning and teaching in and between the distributed teaching and the practice field. This study also develops the meaning of the term *local learning*.

A pilot project in teacher education

In Norway, there have been different ways to participate in teacher education. From the 1980s to the beginning of the 2000s, there was a form of teacher training called decentralized teacher training (Dalu), which was organized mainly in rural districts in the northern part of the country (H. Hegerholm, 2001, pp. 97-111; R.H. Skjelmo, 2012, pp. 32-42). This teacher education was established to give working teachers without formal certification a chance to join organized teacher training based on plenary sessions (G. Grepperud, 2005, pp. 15-21), and from the 2000s, also through the use of digital tools. This kind of teacher education was able to link work and practice of the student teachers to the flexible teaching which gave a solid basis for further work as a teacher (H. Hegerholm, 2006, pp. 44-53; G. Holm, 2006, pp. 44-53; R.H. Skjelmo, 2012, pp. 32-42). The experiences of the DALU studies are used as one of the cornerstones of Nesna University College's (HiNe) new pilot project in teacher education.

This case study reviews HiNe's pilot project and the practice activity of the intern students in primary schools. The education takes place in a district where the population is diffuse, and there is a shortage of teachers. Video tools facilitate for participating near the student's home. The project includes groups of two to six students, located in their home towns, within six geographical locations in the north of Norway. A majority of the students in the pilot project were working as substitute teachers. The programme has extended agreements with the practice schools, and in addition to the ordinary internship, the supervising teacher supports the student groups throughout the academic year.

The project started with one class of 26 students in 2012/2013 and continued with a new class of 23 students in 2013/2014. The teacher education programme lasts four years, for teaching grades 1-7. The programme contains three campus weeks, six videoconferencing weeks and three weeks of internship throughout the semester. The various participants cooperate through use of online video conferencing tools. The videoconference system has large screens and microphones designed for dialogue and discussions. Desktop video (Adobe Connects) is used for discussions between the plenary sessions by students, groups and teachers. The videoconferencing offers plenary teaching from the UC educators, and it also represents a place where students can

discuss and share experiences. The UC educator and the practice teacher arranged, via desktop video, twelve work challenges throughout the year for both the students' internship and didactics. The students received support from the practice teacher at the local primary school, giving them advice and discussing didactics. The students and the UC educators share the results via video. There is cooperation between teachers, practice teachers and students to create an area where they can discuss subjects, practices and challenges in education.

The students intern in local primary schools for three weeks each semester guided by a practice teacher. In addition, these practice teachers intermittently participate in the online teaching of the UC educator before the internship. The UC educator, the practice teacher and the students meet online via desktop video related to internship to plan and evaluate the students' practice.

These kinds of virtual, online interactions whereby the teaching, planning and evaluation take place over video systems, are a three-part cooperation. The three-part cooperation make tensions and conflicts visible, but is also a bridge to different teaching and learning processes. This situation changes the rules of teaching and learning processes.

Theoretical framework

To examine the development of the pilot project, there was a need for a theoretical framework that emphasized the video tools and the relationship between teaching and practice in different communities. Cultural historical activity theory (CHAT) is a socio-cultural theory, which correspond with this purpose. According to Victor Kaptelinin and Bonnie Nardi the concept of activity is bridging the gap between the subjective and the objective (2006, p. 31). CHAT has roots in Lew S. Vygotsky's theories of learning (1978) where people use tools to develop and interact with objects. Yrjö Engeström (1987) expanded this foundation into a model where the use of tools was based on the interaction in communities. The rules, the division of labour and the use of tools in communities make an activity, which develops both social and individual knowledge. All parts in such an activity system interact, but the activity is realised through individual actions. Third generation activity theory deals with at least two integrated activity systems as its minimal unit of analyses (Y. Engeström, 2001, pp. 133-156). Subjects in at least two activity systems use tools in communities based on rules and division of labour to

affect the objects where parts of the objects are shared (Y. Engeström, 2001, pp. 133-156). The objects and their shared parts are developing and changing in the process. Learning in such a framework can be seen as participation and interaction in communities where the division of labour, rules and tools are fundamental to the knowledge building processes. Y. Engeström (1987) describes such learning processes as expansive learning. Gordon Wells sees learning as a dialectic process where information and building of knowledge contradict and complement each other. Information is second hand and can be distributed and shared and is an important part of the knowledge building process (1999, p. 84). The knowledge building process is formulated as follows: "Knowing starts with personal experience which amplified by information, is transformed through knowledge building into understanding" (G. Wells, 1999, p. 91). G. Wells continues by describing the relationship between information and knowledge: "the level of information has little or no impact on students' understanding until they actively engage in collaborative knowledge building" (G. Wells, 1999, p. 91). This raises a central question how information and knowledge interact and cross borders (G. Wells, 1999; T. Tuomi-Grøhn, Y. Engeström, M. Young, 2003, pp. 233-255; P. Lambert, 2003, pp. 233-255) and, in this pilot project, between the practice of learning on campus and the practice of teaching in the practice schools. The question of boundary crossing is raised within the framework of CHAT in different ways. Y. Engeström et al. claim that "boundary crossing is a broad and little-studied category of cognitive process" (1995, p. 321). Since 1995, the concepts of boundary crossing have developed and increased in educational science. Sanne F. Akkermann and Arthur Bakker have conducted an extensive literature study of borders and boundary crossing and claim that this concept has now become an explicit part of the CHAT framework on expansive learning (2011, p. 133). S.F. Akkerman and A. Bakker claim that "at the same time, sameness and continuity reside in the fact that both sites are concerned with pedagogy and with the learning process of the student teacher" (2011, p. 133), and argue that "the account of single groups and individuals crossing boundaries show how they not only act as a bridge between worlds, but also simultaneously represent the very division of related worlds" (2011, p. 140). According to Pirjo Lambert "boundary-crossers need places where it is possible to cross borders [and] we have challenges to develop new *boundary-crossing places* where students can act as boundary crossers and mediators between educational institutions and workplaces" (2003, p. 252). In this study, CHAT is the foundation of the theoretical concept that focuses on tools, learning, interaction, boundary-crossing and the shared objects of activities.

This theoretical concept gives priority to investigation on development and tensions in and between tools and communities of the students' knowledge building in the pilot project and practice.

A case study of learning in distributed teacher education

Two researchers who were familiar with the pilot project conducted this study. One of the researchers has organized the pilot project. The other researcher has developed digital tools for the project. The research question of this study is as follows: How do student teachers build knowledge of teaching in and between the distributed teacher education and their practice in primary school? We ask also two subordinate research questions: How does synchronous video education support teacher education? and – how does the three-part cooperation support students learning? We assume that the answers to these questions will give meaning to the term *local learning*. To answer the research question, we developed a qualitative study in accordance with guidelines from case studies (J.W. Creswell, 2007; R.K. Yin, 2009; R.E. Stake, 2010). Robert Yin argues: “In general, case studies are the preferred method when (a) ‘how’ and ‘why’ questions are being posed, (b) the investigations have little control over events, and (c) the focus is on a contemporary phenomenon within a real-life context”. (2009, p. 2) A research design for a case study will usually include five components: (1) a study question, (2) its proposition, (3) its unit(s) of analysis, (4) the logic linking the data to the propositions and (5) the criteria for interpreting the findings (R. Yin, 2009, p. 27). One of the basic differences among different types of case studies is whether it has one or more cases, and whether it has one or more sources to investigate. The design for this case study is an “embedded single case design” (R. Yin, 2009, p. 39), i.e., one case many sources.

The sources of data in this study included:

- two observations of three-part cooperation;
- seven interviews with students according to practice and the remote learning situation;
- two surveys containing data from the students' experiences of practice and video education.

The first qualitative survey (S1) consisted of 24 students and 6 practice teachers in 2013, and the second qualitative survey (S2) – of 20 students in 2014. All personal information related to the respondents and informants is classified. Observations of the three-part cooperation included both the

teaching of the UC educators and the virtual meeting for practice planning and evaluation.

We interviewed individually three chosen students who represented different ages, genders, locations and living situations, and did two focus interviews with groups of two students. The interviews were semi-structured and lasted from half an hour to one hour. The students interviewed were i.a. Anne and Inger who both have families and live on two neighbouring islands in North Norway. Ferry connections between the two islands are poor, which make cooperation problematic. Inger works part-time in the local school and she studies. Anne works as a substitute teacher in different classes and periods in the local school and she also studies. Tor has just finished upper secondary school. He lives in a town with his girlfriend and does not want to move to another place to start studying. Grete and Solveig participated in a focus interview. They live in small towns in the region together with their families. They work as part-time teachers in a primary school in their neighbourhood. Marte and Liv have worked part-time as substitute teachers in some periods last year. Marte lives in a small town with her family and Liv lives in a village in the country. They participated together in a focus interview.

A third source of data was two qualitative surveys. The first survey (S1) was taken when the students and practice teachers were asked to evaluate the learning and teaching processes in the spring of 2013. Twenty-four students from the 2012/2013 class and six of their practice teachers answered 15 qualitative questions. The second survey (S2) was conducted in the second grade in the spring of 2014. Twenty-two students answered 20 qualitative questions related to four central topics to evaluate the learning and teaching process in the study.

The first survey (S1) focused on the teaching and learning in the pilot project and the interaction with the practice field. It summed up technical and pedagogical problems in the distribution of teaching. The results were published and discussed during an evaluation meeting in May 2013 with the UC educators, the students and the practice teachers. The evaluation meeting emphasized developing of three-part cooperation to strengthen teaching, learning and interaction in and between the pilot project and the practice field. There was a focus on the practice situation and the teaching work of the student teachers. The results of the evaluation meeting together with the theoretical framework of CHAT were developed into categories and guidelines for the collection and analysis of the data. Basic components of CHAT as tools, rules and the division of labour in and between activities in learning processes,

support the focus of the evaluation meeting. The categories developed for the study include the following:

- use of digital tools;
- division of labour in three-part cooperation; and
- rules of practice – paid teaching work.

These categories were used to sort and reduce the amount of data gathered from the observations and the students' statements. The categories were the criteria for interpreting the findings and linked the observations and statements to the research question.

Analysis and findings

This case analysis addresses the students' experiences as expressed in interviews and surveys, as well as the observations of three-part meetings.

Use of digital tools in the pilot project

The use of video-tools in the distribution of education changes the teaching and learning process, and a different teaching process is emerging in the interaction between teachers and students. Observations and students comments describe the online teaching lessons and the students' interactions within and between the study groups in the plenary sessions. This can be summed up by the following sequence:

- Participants establish connection – UC educator opens the session;
- Lecture of UC educator – 20-40 minutes;
- Sequence of plenary questions, answers and comments;
- UC educator delivers working task;
- Off-line student work in local study groups;
- Report in plenary session from group work – organized by UC educator;
- Sequence of plenary questions and discussions;
- UC educator delivers working tasks for further off-line work in local study groups; and
- UC educator closes the session.

The students describe the video teaching sessions in their virtual class as distribution of information with focus on lectures, responses and instructions. According to the students, the focus of the local study group is to discuss, interpret, understand and solve problems linked to the subject content and teaching in practice.

There were critical voices concerning the teachers' function in the distributed plenary sessions. Grete said in the interview: "The lectures are too long, but they have become shorter" (all translations are ours). One of the students wrote in survey S2:

Usually, the teachers organize discussions and we can ask questions, but there are still problems with the lectures. Some talk too much and some can be difficult to understand. We want the teachers to introduce changes into the system of short lecture – questions and answers – discussions – another short lecture and so on. As it is now, there is not enough time to discuss properly.

There are both technical and pedagogical challenges. The most frequently reported problem was the establishing of video connections during the video sessions. Inger describes another technical problem: "It was only at Christmas that we got a fibre connection to the island. Before that, I felt that I could not contribute equally". Inger continues her comments as follows: "Now I can be part of discussions together with the others and ask the teacher questions. This is a great improvement". Based on students' statements, a critique of teaching and learning situations can be summed up as follows:

- Lectures function well as long as there are no technical problems;
- The teachers should be more technically competent ;
- There must be an available system of support;
- There should be more focus on discussion and dialog which involve *all* the students;
- The teacher must be the conductor and organizer of the dialog and discussions.

The distributed teaching sessions, which the student critics focus on, develop and change over time. There is an on-going process where students ask for longer and closer dialogue with the teachers and the teachers involve new technical tools. Students' and teachers' experiences with digital tools can be used in their teaching and learning processes, as well as their ability to resolve different technical problems. The use of podcasts is an example where the UC educators received support and learned to use this kind of technology. Anne describes this learning situation in the interview:

The basis of the education is the online video teaching with lectures and discussions, but I also like the podcasts. Sometimes, the teacher at Nesna records a lecture and distributes the podcast through Moodle. This functions very well. We can pick it up and play it when the place and time are

right. It doesn't replace the discussions and talks we have online, but I can be better prepared to the online video sessions.

The students want asynchronous support in the learning process between the plenary sessions. They say they use new digital tools in learning and teaching situations and want to increase the use of different digital tools. Solveig says in the focus interview:

When I started, I was a bit afraid of this kind of technology. Now I have learned to use different tools. We use Facebook in addition to Moodle. We have our own Facebook site. In practice, we use smartphones to take pictures and videos of interesting situations.

Grete adds:

Sometimes, we put these things together as multimodal texts with sound and effects. Then we can show it to the pupils in the class, but some of us also put this into Moodle to illustrate special situations.

These statements indicate how the use of digital tools in educational situations drives and increases the use of technology. It also indicates that asynchronous and synchronous tools support different learning situations, purposes and didactics.

Three-part cooperation – division of labour

The three-part cooperation is meant to connect the internship to the teachings of the UC educators. When the UC educators join practice teacher and the students on desktop video between the plenary sessions, didactic subjects and internship are planned and discussed, and all parts are supposed to contribute to the discussions. In this situation, the UC educators can develop better insights into the students' problems and progress in their internship teaching. When the practice teacher joins the plenary sessions, it is possible to develop insight in subject content for all parts. The students expressed that virtual three-part cooperation supports the interaction function. Marte says in the focus interview: "This mix lifts the whole learning situation". One of the researchers points to the three-part cooperation in spring 2013 where the UC educator gave a lesson on Norwegian language via the videoconference system. This lecture was close to the internship period and the practice teacher was attending. The notes from the observation state:

After the lecture, the practice teacher signals that she has something to say: “This is not good enough. How can the students implement this in their teaching? We must find words and tasks that give meaning in primary school”. The UC educator says: “I agree. We must do some further work to adapt this to the students’ teaching”. The students agree.

According to Tor, such situations changed some of the UC educators’ teaching and improved the situation during the in-service practice: “After some criticism, some of the UC teachers have changed parts of their teaching. They give more examples, which can be used in our teaching in practice, and they prepare for discussions”. Three-part cooperation develops interaction and information among the participants. In the survey (S2), one student expresses: “We need to work with the subjects, but we will also teach these subjects to children. Practice gives meaning to what we talk about in the video sessions”. The three-part cooperation strengthens the interactions and work in and between the practice community and the community of distributed teacher education. Interaction and demands in the three-part cooperation can change both the teaching of the UC educator and plans for the internship.

Rules of practice-paid teaching work

The distribution of video teaching to local study groups opens the door for a new group of students. The majority of them are family people, and for these two classes 45 in 49 students are women. The survey (S2) shows that 15 in 22 students in the class of 2012/2013 work part-time as uncertified teachers in local schools, and those who do not, want to have such work. They want to have an income and to live at home during their studies. Inger says in the interview:

For me, this is a once-in-a-lifetime opportunity to join teacher education.
I really appreciate this. I can still have my teaching job 50% of the time.
I have an income and can be a part of my family while I study.

In the pilot project, this group of working students joined another group of students who had just finished high school. For personal reasons, they did not want to move away from their home to a campus to study. When the interviewer asked if Tor had some income from teaching, he answered:

I have some income, but not from teaching. I wish I did. I want to work as a teacher and I’m going to have an interview with one of the

neighbourhood schools. I hope I can get some part-time work in this school next year.

Students with experience of full-time teacher work criticize both the intern's situation and the content in the distributed teaching. Students report that their work as substitute teachers or part-time teachers means more to their teacher education than the internship. Grethe says in the interview: "I think I know the teaching situation in primary school better than the UC-educator. I think the cooperation of practice teacher and the UC-educator is necessary to lift the teacher education". Anne comments in the interview on the educational situation and the function of the practice teacher:

The practice teacher is my college. We work together daily. I want her to be more active when we attend the video lessons. She was not very informed about what is going to happen during the in-service period. The three-part evaluation made the situation better.

The student teachers tell in the survey about their growth as students and teachers. The researcher asked Anne: "How do you realize the education in practice?" Anne answered:

I get many good ideas when we have video sessions. I listen to the teachers and take part in the discussions. But it is not during the internship practice where I realise my ideas. It is so structured, planned and restricted from HiNe. I realise my ideas in the best way in my work as a teacher. And my teacher practice is not so important here.

When the researcher asked Anne how she sees herself in the future as a teacher, she answered: "I will continue my work as a teacher in this school, but I think the teacher education has made me a better teacher". One of the students says this view in the survey (S2):

In my work as a substitute teacher, I have the opportunity to test out and develop ideas in my teaching. This means a great deal to the pupils and me. Teaching gives me experiences, which I can use during studies. It is a short step from the discussions in the plenary sessions to my classroom. This is a better situation than the organized practise. Sometimes the organising of the internship gives me the feeling that I do unpaid work on demand.

In this study, students in paid teaching work question the rules and develop teaching experiences in a way that strengthened both the teaching in

the local school and the distributed learning situation. Paid teaching work can, therefore, be seen as a bridge between the distributed teaching and learning and the practice situation.

A model of teaching and learning in the pilot project

The analysis and central findings of this study can be illustrated according to the principles of CHAT as follows:

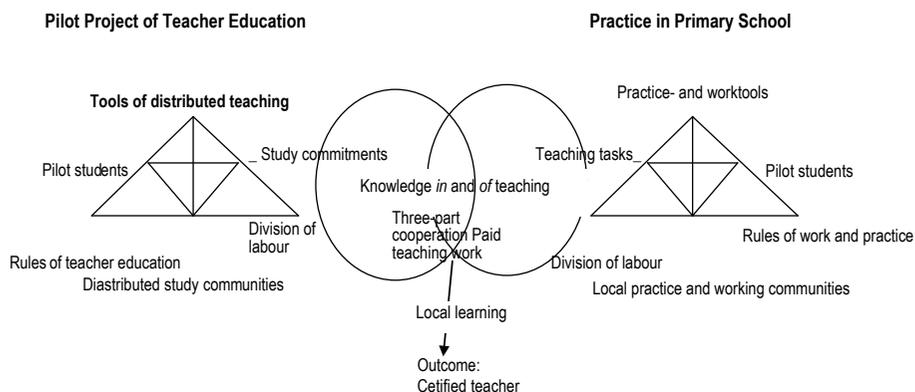


Figure 1. Pilot Study and practice as an activity system (Y. Engeström, 2001)

This model of the activity system shows how the activity of teaching in the pilot project interacts with the activity of practice in the primary schools. The model is also meant to help to give answers to the research questions, with focus on learning, interaction, tools and three-part cooperation. The students are the subjects of both activities. The examined tool is the video systems in the pilot project. The communities in the pilot project are both distributed and local. The distributed community is an overall virtual student class divided into study groups organised in local study centres. Students are acting to develop the object of the pilot project, i.e. to develop study commitments of teacher education. Students have a community in their local primary school, which include both work and practice. The object of the practice in primary school is to develop knowledge in teaching tasks.

This is a dynamic model where the outcome is a certified teacher. The outcome is a result of local learning processes of distributed teaching and local practice. The objects of both activities seek to develop the students' knowledge *in and of* teaching. This is the shared part of the objects. Three-part

cooperation and paid teaching work are components in the shared part for reaching these objectives. The UC educators interact with the students and their practice teachers through distributed three-part cooperation. Sometimes, confrontations in the three-part cooperation develop a transformation process, whereby the guidelines and division of labour from education are changed, interpreted and adapted for multiple situations. The three-part cooperation supports and develops the students' learning in both activities, and sometimes, is a bridge for crossing the borders between the activities. Most of the pilot students also described another important boundary crossing place for building knowledge *in* and *of* teaching – paid teaching work. Students in paid teaching work develop experience and confidence in teaching and question the rules of practice and education. Both the three-part cooperation and paid teaching work are described as situations that support learning in both activities, and can be understood as boundary-crossing places.

Discussion

The research questions of this study were: How do student teachers build knowledge of teaching in and between the distributed teacher education and their practice in primary school? – and, how do synchronous video education and the three-part cooperation support teacher training and students learning? In the introduction, we reviewed relevant literature, which discussed the contradiction between teaching and practice in teacher education. According to the students, the three-part cooperation has been reducing the gap between the UC-teaching and the practice situation, but there are still tensions and critical voices. The impact of flexible education and paid teaching work in teacher education are discussed in research on Dalu-education, but are underdeveloped in contemporary research. Students in paid teaching work, in the Dalu-study or in the pilot study, do not formulate the 'practice shock' as a problem. The distributed education is consistent with local needs for teacher education. The theoretical concept of this study is the foundation of a model where processes of learning, tools, interaction and boundary crossing can be examined. This theoretical concept also allows for inquiring processes of students' knowledge building, which shows the tensions and dynamic between the use of tools and division of labour in communities of teacher education. The main findings of this study tell about tensions and bridges in the knowledge building processes of the students.

This case study was limited to respondents in just two small classes in a pilot project. The observations and interviews were few. The virtual three-part cooperation was a pilot project construction, and the students' extensive involvement in paid teaching work was a rare situation in teacher education and should be studied further. These limitations make the generalisation of the findings problematic, and there was uncertainty in some of the findings. The results, however, are known and discussed in the pilot project. Further research should focus on learning situations where information and knowledge can cross borders between activities.

Conclusion

This case study examines a pilot project based on a theoretical concept which emphasizes learning, tools, interaction and boundary-crossing. This is a project where teaching is distributed as information and learning is anchored in the building of knowledge. Learning to teach is built as a shared object on the borders between the activities of academic teaching and practice in primary school. Division of labour and rules are changing due to tensions in such learning situations. A three-part cooperation between students UC educators and practice teachers narrow the gap between practice and theory. The study shows how distributed teacher education favour students with families living in remote areas. Some of these students have paid teaching work during the studies. These students develop confidence and experience in their study situation. Three-part cooperation and paid teaching work can be seen as boundary-crossing places between activities where participants develop teaching and learning. Local learning is anchored in the knowledge building processes of interaction, dialogue, interpretation and implementation in a local context. In this way, local learning both contradicts and complements distributed teaching.

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