Research Article

Teacher Roles in the Blended Classroom-Swedish Lower Secondary School Teachers' Boundary Management between Physical and Virtual Learning Spaces

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Article Info	Abstract
	The purpose of the study is to explore how Swedish lower secondary school teachers manage blended learning environments, established through using a specific learning management system (LMS) application. In the study, four teachers were followed during a four-month (n)ethnographic fieldwork. Based on analyses of data from video-recordings and observations in physical and virtual classrooms, the study examines teachers' practices of integrating and segmenting the two classroom domains. In order to unpack the realms of these practices, the study employs affordance and boundary theories. Through the analysis of participants' boundary practices and their use of communicative affordances in and across space and time, four teacher roles, enacted and emerging through teaching practices, are presented. The paper concludes with a discussion of how participants' engagement with virtual and physical learning environment compels teachers to reflect upon their preferred teacher role in the new multidimensional classrooms.

Introduction

In the classroom the teacher has written on the whiteboard:" Remember to bring tablet, pen, eraser". The teacher points to the whiteboard, with the pointer, on the task for the day's class. Showbie is projected on the whiteboard. Today's task consists of doing a sketch about one of the Nordic languages, and presenting it as a play for the rest of the class. The pupils are divided into groups of 4-5 each, and told to use Digilär (an online service for electronic schoolbooks) as well as the Nordic Council's webpage to learn more about Nordic languages. They are also recommended to use the public service broadcasting companies'

webpages to find and watch a video of the relevant Nordic language. (Field notes, School A, Teacher 1, Swedish, Year 8, W. 2)

The above vignette from field notes illustrates a glimpse of an 8th-grade Swedish lesson in a lower secondary educational setting in Sweden. The topic of the class, Nordic languages, is one of the key foci of the curriculum for lower secondary school Swedish. In the vignette, the teacher uses several tools and modalities for engaging with the learning task. The pupils and the teacher move in and out of the virtual and physical spaces of the classrooms during the class through their use of iPads, visiting a number of internet sites and using programs, in particular a learning management system called Showbie. In their instructional and learning activities, the teacher and the pupils also employ tools in the physical space, such as a pointer, whiteboard, pen, paper, texts and oral interaction.

In educational literature, the integration of ICT and various digital tools in education is sometimes referred to as blended, or hybrid, learning. Blended learning, in short, is a pedagogical approach that combines face-to-face instruction with computer-mediated instruction (Graham, 2006; Ferdig, Cavanaugh, & Freidhoff, 2012). Much of the power in blended learning comes from the modification or manipulation of time, space, and place to improve teaching and learning. Asynchronous and synchronous learning events have different properties that may be exploited for different pedagogical purposes (Sotillo, 2000). While much of previous research on blended learning has focused on ICTs in education in spatial terms, the present study joins a recent vein of research investigating "learning onlife", where the diminishing difference between being online and offline is emphasised (see e.g. Norberg, 2017). Related to such research, the notion of chaining has emerged as an empirically grounded concept in the analysis of human meaning-making in and across time and space, across modalities and communicative resources. In Nordic as well as North American literature, local chaining highlights the interlinking patterns of language use at a micro-interactional level (see e.g., Bagga-Gupta, 2002; Hansen, 2005; Messina Dahlberg, & Bagga-Gupta, 2013; Tapio, 2013). What is more important for our purposes, the concepts of event or activity chaining as well as simultaneous/synchronised chaining have previously been fruitful in the analysis of communicative patterns running over longer periods of time and across spaces, such as lessons, school days or even weeks (Bagga-Gupta, 2004; Gynne & Bagga-Gupta, 2013). As an analytical lens, chaining allows for "the (re)examination and (re)interpretation of human beings' participation in various kinds of communicative

activities" (Gynne & Bagga-Gupta, 2013, p. 492). Such research highlights the interplay and interconnectedness of oral, written, and other modalities in human communication, teaching and learning, beyond focusing merely on the boundaries of time and space where these activities occur.

Conducting research about blended learning environments requires not only close attention to the role of agents, tools, and the layout of the environments, but also to how such elements come into play, interact, and interfere with one another during learning events. Teachers' practices are of particular interest in this regard since it is commonly their role to administrate and manage the blending of the virtual and the physical learning spaces.

The purpose of the article is to explore how teachers manage blended learning environments in connection with the teacher role. More specifically, we inquire how teachers integrate and segment different elements in the physical and virtual spaces of the classroom. The analytical interest lies in describing and opening up the teachers' practices from a perspective that highlights the sequential and chained nature of communication and multimodality tied to teaching practices across physical and virtual learning spaces. The study involves teachers' use of both the physical space, where pupils and teachers interact in conventional face-to-face modes, and the virtual space, where participants engage in asynchronous interactions. Our study is guided by the following three research questions:

- What affordances are employed by teachers in physical and virtual spaces in order to support pupils' learning?
- Which communicative practices are used by teachers to segment and integrate physical and virtual learning spaces?
- What kinds of teacher roles are enacted through practices in and across physical and virtual learning spaces?

The study was conducted using an ethnographic approach, following four teachers in two different schools for approximately five weeks each (altogether 4 months). Video-recorded classroom observations as well as observations in the teachers' (and pupils') virtual classrooms were conducted. All the teachers in the study use Showbie (henceforth SB) as a digital tool for the virtual classroom. This software is a commercial product which can be used on all kinds of digital devices – through a website or through an app. SB enables teachers to set up groups in which pupils (and potential others, such as co-teachers or parents) are invited. Once a member in the group, the group members can send and share

information and communicate with one another, much in a similar way as in a social media group. There are, however, different ways the teachers can administrate and manage these virtual classrooms and integrate them in physical learning environments.

The article is structured as follows. We begin by presenting the two theories that are guiding the analysis: affordance theory and boundary theory. Then we account for the method and data of the empirical study. The empirical analysis is thereafter presented by combining the identified affordances and communicative practices that the teachers engage with/in, which results in the identification of four distinct teacher roles that the teachers can enact in the blended classroom. In the final section we discuss the implications of the findings and suggest future directions for research on teacher and pupil practices across different learning spaces.

Theoretical Outline

Our understanding of teachers' management of the physical and virtual aspects of the blended learning environment is guided by two theories – affordance theory and boundary theory – which we account for in this section. Affordance theory is used to answer the first research question: what affordances do the teachers draw on in virtual and physical classrooms? Boundary theory is used in answer to the second research question: which communicative practices do the teachers engage in order to integrate and segment physical and virtual learning spaces? Taken together, the two theories will help to answer the third question concerning the kinds of teacher roles that emerge in and through these integrating and segmenting practices.

Affordance theory

Affordance theory stems from a scholarly tradition in which an ecological approach to human perception is taken. This tradition emphasises that people do not focus on the intrinsic properties of an object, but that they rather perceive what is of value to them in a particular situation when aiming to fulfil particular purposes (Gibson, 1979). Thus, affordances can be defined i) as the possibilities and constraints for action that agents selectively perceive in any situation and ii) as dependent on the abilities, beliefs, past experiences and most importantly for this paper, on the goals of the agents participating in any situation (Norman, 1988). Moreover, according to the ecological approach, affordances

are affected by the use of tools. When agents use tools, they take performatory actions that would be unavailable to them without the tools (Linderoth, 2012: 51).

In virtual learning spaces, this may mean that the ways in which users employ virtual tools are both in concert with and far beyond the features originally intended by the designers. Affordances are thus emergent, and new possibilities are created through design and human creativity (Barton & Lee, 2013, p. 28). In present day educational settings, ICT is often a particularly important tool or a component because of the features it can bring about to the learning and application of subjects in the school curriculum. Kennewell (2001: 106) lists examples such as speed, capacity and range of access to information, ease of amendment of work carried out and immediate feedback to the learner. As we will demonstrate, teachers' and learners' interactions with tools take place in physical and virtual classrooms that are full of objects and technologies, whose affordances provide possibilities for drawing upon several communicative resources in teaching and learning practices.

The concept of affordances has been used in the study of literacy, multimodality and digital communication by many scholars. Among them, Kress (2003) has written extensively on what he calls "the new media age" from a perspective that highlights a digital and multimodal turn in human communication. Of Kress' (2003) analyses of the effects of new media, two aspects are particularly important for our study. First, learning management systems (as a form of new media) make it easy to use a multiplicity of modes – and multimodality is made easy and "natural" by these technologies. Second, the learning management systems change, through their affordances, the potentials for representational and communicational actions by their users through interactivity, which in turn is based on both interpersonality and hypertextuality. Through these potentials, technology-rich classrooms have often been regarded as pupil-centred. However, the role of the teacher as the manager of these potentials needs further attention (Engeness & Edwards, 2017).

The concept of affordances goes hand in hand with the concept of design (Kress, 2010). The emergence of design as a metaphor for contemporary knowledge production, creativity and communication has to do with a number of reasons, such as flexibility of social environments, the multiplicity of resources available in meaning-making and an assumption of increased individual agency (Kress & Bezemer, 2009). These social and representational changes are evident in digital media and learning management systems as the former distinctions of production and consumption, writing and reading, the designer and the user,

online and offline are blurred. Multimodal design has the potential to shape the social and representational environments of learners – and as we will argue, it plays an essential role in both teachers' and pupils' practices of teaching and learning across offline-online settings. Furthermore, in our study, orchestration is a notion that is employed in order to describe the process of how teachers – according to their interests – select and assemble affordances of SB, which are then given a shape through the process of design (Kress, 2010, p. 162).

In previous research, affordances of mobile applications in classrooms have been examined by e.g. Looi et al. (2009) and Roschelle and Pea (2002). Conclusions from their studies indicate that affordances of mobile applications in classrooms have to do with providing multiple entry points and learning paths, supporting multimodality and improvisation in situ, augmenting physical space and conducting the class. In another recent study, based on detailed analyses of teacher-pupil interactions in technology-rich classrooms, Engeness and Edwards (2017) found that much of the teacher's work in the classroom has to do with guiding learners' attention towards the potential of the mediational resources (which can be understood as affordances), organising and structuring their knowledge - in order to fulfil particular learning goals.

In this article, affordance theory is used to examine one aspect in particular: which possible functions of the learning management system Showbie, in connection with the possible functions of the physical classroom, do the participating teachers make use of?

Boundary theory

The boundary theory focuses on people's mental and practical strategies for integrating and segmenting different systems of meaning – different expectations and roles – such as between family life and work life, self and others, and public and private (Ashforth, Kreiner, & Fugate, 2000; Lamont & Molnar, 2002; Nippert-Eng, 1996; Riesch, 2010; Persson & Thunman, 2017a). The boundary theory adopts a social constructionist perspective, where the individual is treated as an active agent in the co-construction of boundaries in social interactions and practices (Zerubavel, 1991).

In this paper, we focus on a specific aspect of boundary work: the process, or the 'doing' of boundary work, through which the individual organises potentially realm-specific issues and dimensions of the self (Nippert-Eng, 1996, p. 7). According to the boundary theory, boundaries can be created along a continuum from 'thin' (weak) to 'thick' (strong).

Thin/weak boundaries are 'flexible', 'permeable' (open to influence) and 'integrating', whereas thick/strong boundaries are 'inflexible', 'impermeable' (closed to influence) and 'segmenting' (Ashforth et al., 2000; Nippert-Eng, 1996). 'Integrators' prefer to blur the boundaries between the realms of home and work, or private and professional. They think and act in much the same way, regardless of which space they act within, no matter what social responsibilities are at hand. Thus they do not make any sharp distinction between private and professional roles. 'Segmentors', on the other hand, prefer to keep the two realms as separate as possible. The mental boundary between the realms is well defined, strongly upholding the characteristics of each sphere. Segmentors alternate between different roles or ways of being depending on the realm-specific demands at hand. Both integrators and segmentors should be understood as archetypes, not found in their pure states in real life (Nippert-Eng, 1996, pp. 5-6). Boundary work is a mental activity, but must be enacted through a collection of practical activities, for instance keeping two different key rings, one for each realm (segmenting), or having one set of keys for work and one for home (integrating) (Nippert-Eng, 1996, p. 7). To apply these ideas to the setting of this study, an equivalent may be having two different teaching and communication strategies, one for the virtual, and another one for the physical space.

Previous research has highlighted actors' different roles in ICT-supported learning environments. In a study drawing on affordance theory, Kennewell (2001) presents a framework consisting of three interactional perspectives; teacher-student, designer-student and designer-teacher, that influence learning. The framework offered is applicable to analysing the effects of ICT in combination of other factors in education. Nacu et al. (2016), on the other hand, analyse adult educators' actions to support online learning in formal classroom settings and arrive at a definition of online learning support roles (OLSR) ranging from instructor to encourager and learning broker and socio-cultural friend. However, teachers' handling of virtual and physical dimensions of the classroom has not previously been explored from a specific 'boundary work' perspective, which is what this paper aim to do.

In this paper, we treat SB as a separate (virtual) realm that extends the physical realm of the classroom. The two realms, or spaces, are interlinked in different ways depending on the practices of the individual teachers. Similar to the findings in previous research presented above, that individuals have different preferences regarding the boundary work

between home and work, we will examine how teachers perform boundary work to integrate and segment certain aspects of the virtual and physical spaces of the classroom. Our point of departure is that the relationship between the two realms, 'physical' and 'virtual', is regarded as a boundary regulatory process by which the teacher manages blended learning in their class. In these processes, either building chains between the spaces or separating them is at the core of the teachers' practices. Furthermore, we will examine how the teachers' 'doing' of boundary work results in different social practices connected to the adoption of integrated or segmented teacher roles. These roles and practices are explored in the findings section.

Method

Altogether, four teachers and 130 pupils participated in the project during 2016-2017. The participants came from two lower secondary schools in two different municipalities in Sweden. The schools were chosen based on their interest in participating in the project and their use of educational apps, through a regional selection as well, which was tied to the regional funding source. Figure 1 presents the schools, teachers and their subjects and classes.
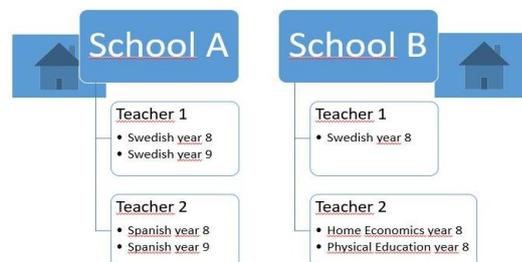
Figure 1. The schools, teachers and participating classes in the study.

The empirical data were collected during 4 months of (n)ethnographic fieldwork, in which both researchers participated. Fieldwork was conducted both in physical settings (the school classrooms) and virtual settings (SB was used in both schools). Each of the physical classrooms was visited during four days during a period of five weeks in both schools (School A: Nov-Dec 2016, School B: Jan-Feb 2017). We have, through visual observation, recorded how the teachers use the virtual classroom (using different devices) during class (Hammersley & Atkinson, 1983). We have also, nethnographically (Kozinets, 2010), observed how the teachers use the virtual classroom for communication with pupils. Observations in SB were conducted during and after the fieldwork in physical settings. The researchers were

given a "teacher" role in the app, which allowed us to access all communication between teachers and pupils taking place through this learning management system.

The empirical data consist of the following data: video and audio recordings of classroom interactions, field notes from both researchers from classroom observations, photographs of classroom settings, screen grabs from SB, and interview recordings and notes. Altogether, the data sum up to 22 hours of video and 24 hours of audio recordings, 147 pages of hand-written field notes, 38 photos and 181 screen grabs. Two hours of interview recordings and interview notes accounted for secondary data.

The data presented and analysed in this study are selected fractions of the above-mentioned primary data. In a true ethnographic sense, an exploratory analysis procedure (LeCompte & Schensul, 2013) was initiated during the ongoing fieldwork in order to identify, clarify and modify initial impressions and descriptions. This entailed an ongoing dialogue between the researchers, where the data created based on initial questions and model were examined, initial comparisons across observations and data were made and the study design was revisited and revised in order to refocus our analytical endeavours vis-à-vis new data. Yet another exploratory analytical step during the fieldwork phase was to test our pre-analytical ideas at an interactive webinar and gather feedback from participants, both research colleagues and teachers, in order to deepen the analysis.

By the end of the fieldwork, a systematic mapping of data created followed this exploratory phase. Due to the magnitude of and detail in the data, data from two weeks were selected as a point of departure for analysis from each classroom. The video and audio recordings and transcriptions of both classroom interaction and virtual data were then coded and put together with field note data and screen grabs from the same time frame.

The coding and analysis of the data follows a theory-led thematic procedure (Braun & Clarke, 2006; Hayes, 1997), driven by the theoretical focus on the affordance and boundary work perspectives. Questions that were considered during the initial coding were (Saldana, 2009, p. 18): what affordances are used by the teachers in physical and virtual spaces?; and, which communicative practices are used by teachers to segment and integrate physical and virtual learning spaces? Following this, the codes were collated into potential themes. A check was performed to ensure that the themes worked in relation to the coded extracts as well as the entire data set. In dialogue concerning the theoretical perspectives, clear definitions and names were generated for each theme (Braun & Clarke, 2006).

Regarding the first question about employed affordances, two main themes were identified: *informational* and *interactional affordances*. While the first theme involves the sharing and collecting of information and documentation, the second theme is more responsive in its nature and involves two-way communication between teacher and pupil.

Regarding the second question about communicative practices, two main themes were identified: *segmenting* and *integrating strategies*. While the first theme involves ways to separate the physical and the virtual spaces, the second theme involves ways to intertwine these spaces.

Having coded the affordances and the boundary practices according to these four themes, the themes were then reviewed together. By comparing what the teachers are doing in the physical and virtual learning spaces with how they allocate different actions to different spaces, we managed to identify four archetypical roles that the teachers can adopt in the blended classroom.

Finally, a selection of extracted examples was made, illustrating the logics and the actions connected to them. A final analysis of the selected extracts, relating back to the analysis of the research questions and literature, completed the thematic analysis (Braun & Clarke, 2006).

Findings

Following the structure of the three research questions, we begin the findings section by describing which affordances of the classroom the teachers make use of. Then we present the boundary practices they adopt to manage the virtual and physical classrooms. Finally, we introduce four archetypical boundary roles that the teachers can enact when managing the two spaces of the blended classroom.

The teachers' engagement with the affordances of the blended classroom

In educational settings, teachers are usually the main agents in creating spaces for learner activities. In these settings, pupils are expected to carry out learning tasks with particular outcomes (e.g. produce a physical or a virtual piece of writing, an oral presentation, or even prepare a meal, as we will see below), which optimally also demonstrates that learning has occurred. To achieve these goals, pupils use their existing abilities together with the supporting features of the setting, and in many senses, the role of the teacher is to orchestrate the attributes of these supporting features, which we here define as affordances (see also Evans et al., 2017). In our observations of the physical and

virtual classrooms, we have detected a number of affordances utilised by the teachers in order to provide for communication, meaning-making, and learning in class. Based on the empirical observations, we have coded the affordances into two broad themes: *informational* and *interactional*. While the first theme involves the sharing and collecting of information and documentation, the second theme is more responsive in its nature and involves two-way communication between teacher and pupil.

In the physical classrooms, we observed how the teachers use informational affordances by providing visual clues such as writing on the whiteboard or a projection of an image from the internet, oral prompts such as directives and instructions, or illustrations of information sources or demonstrations where a multimodal co-play of several elements (bodily actions, oral instructions, use of physical tools). In the virtual space, information is understood as practices related to the sharing of information or collecting documentation to and from the pupils using the affordances of the learning management system. In most cases, the information refers to teachers' handing out assignments and materials linked to these assignments – such as textbook examples, teachers' notes on the whiteboard, or links to useful webpages (see e.g. Vignette 1 in Section 1). In language classes, information was about sharing audio and video files so the pupils can listen to the language they are learning. In classes where the foci of learning were of a practical nature – such as practising meal planning and cooking skills in Home Economics or designing a game in Physical Education – information had to do with posting instruction sheets online. In all, the teachers' interactions with perceived affordances of the physical and virtual classrooms in informational purposes were in concert with goals that had to do with providing resources and information to pupils (cf. Kennewell, 2001).

Interactional affordances in physical classrooms are often connected to oral activities, with the teachers and pupils posing questions, requesting for and discussing possible explanations and providing feedback either one-to-one, in small or large groups. In similar ways, interaction in the virtual space consists of discussions about school assignments, or individual/group feedbacks on assignments or grades. Figure 2 illustrates an example of teacher-pupil interactions through a screen grab and a transcript from the virtual classroom in a Spanish class. Here, a few steps of process writing can be observed. The pupil has written a text in Spanish (which is her way of "handing in an assignment"), describing her morning routines. This text was posted on SB during the Spanish lesson at

school. During the same afternoon, the teacher responds to the pupil's post by giving feedback on the text below[1] (i.e. re-writing it correctly) and prompting her to continue writing about her school and school day. The dialogue concerning the pupil's writing does not take place in the physical classroom, but in the virtual space at SB.
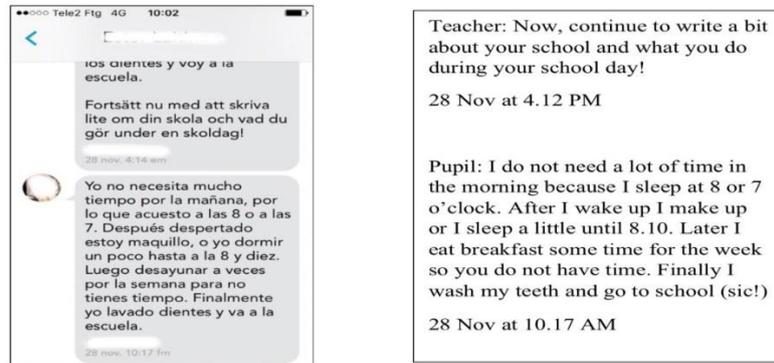
Figure 2. Pupil-teacher interaction in SB with a translation from Swedish/Spanish to English. (SB screen grab, School A, Teacher 2, Spanish, Year 8, W. 2).

Furthermore, we noted that oral and visual prompts in the physical classroom often related to actions in the virtual classroom, which in turn emphasises the multimodal and interlinked nature of interaction in blended classrooms. An example of such an oral prompt from the teacher is provided below from a Spanish lesson, year 9:

> *"I have uploaded some things for you at Showbie. First the listening exercises that I want you to do when you get there. After that there is a key to them so that you can check yourselves. I want you to finish that task by Thursday. I want you to look at this video. Write answers as comments on SB."* (Classroom recording, School A, Teacher 2, Spanish, Year 9, W. 2)

While all teachers participating in the study used the virtual classroom extensively for sharing information and collecting documentation, their use of the affordances of the virtual classroom for interaction varied from a high degree to almost none during the observations.

The teachers' boundary work in the blended classroom

People perform boundary work by using different kinds of practices – social, material and virtual (Kreiner et al., 2009; Persson & Thunman, 2017b) – in relation to other people in order to manage boundaries to one's liking. Guided by boundary theory, we have observed how teachers use material and virtual objects in the desired integrating and

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[1] The feed in Showbie runs from bottom to top, with the latest message/post being at the top.

segmenting ways of working. We found that the observations in classroom show low or high contrast between action in physical and virtual spaces. Teachers may use the virtual space as a necessary work tool for information/documentation and interaction (integration), as well as an optional work tool used only for particular learning purposes (segmentation). Below we present examples of practices that the teachers adopt in order to construct a blended classroom. Differences in integrating and segmenting ways to manage the physical and virtual classroom should not be understood as binary, but rather along an integrating-segmenting spectrum.

The most segmenting way of employing SB is when a teacher uses it purely for informative purposes, e.g. informing them: 'today's task is..', but no conversation really takes place in the virtual learning system. Instead, all interaction between teachers and pupils is allocated to the physical classroom. SB is in such case used as an information board, a place where the pupils can read what to do, but the actual interaction takes place face-to-face. We observed, however, several instances of pupils solving tasks and handing in schoolwork in the virtual classroom, using SB, without any comments by the teacher.

On the other side of the integrating-segmenting spectrum, teachers may also use SB as a tool for interaction in a more engaging way, such as by participating in dialogues with pupils on SB as well as offline. Such communication may take place between the teacher and a group of pupils, or with individual pupils. For instance, a performance by some pupils, including song and oral presentation and related to the theme "Languages in Nordic countries", which took place in the physical classroom, was responded to by the teacher with brief oral feedback both in the classroom and as extended feedback at SB:
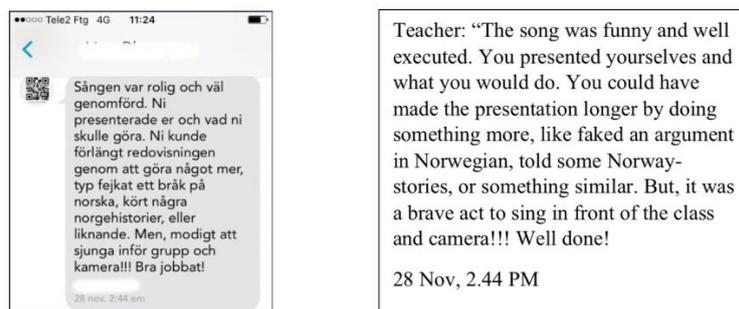
Figure 3. Teacher feedback on SB with a translation to English. (SB screen grab, School A, Teacher 1, Swedish, Year 8, Week 2)

The virtual space is also used to give pupils individual comments when encouraging and supporting them in their writing process, such as in the following example from the teacher to a pupil:

> *"Good summary. But, it's a bit difficult to read. How can you simplify for the reader?*
> *The more you write about the persons and their experiences, the more opinions you can*
> *express. Select the details that concern you."* (SB response, School A, Teacher 1,
> Swedish, Year 8, W. 4)

Although all the teachers in the study use SB, and other digital tools, willingly, they do not integrate the two spaces in every learning situation. The teachers also adopted various segmenting practices, which consisted of various ways to assign different tasks, or purposes, to the physical or the virtual classroom. By doing so, the teacher motivated the use of digital tools only for certain tasks at school, or accessing selective digital data, such as in the teacher example below:

> *The class starts by the teacher projecting slides on SB, going through his presentation*
> *of today's task. When he is done, he shuts down the iPad and writes on the whiteboard,*
> *and says 'open page 89 in the textbook!' He then starts the iPad again and plays an*
> *audio file containing a listening exercise in Spanish. When this part is finished, the*
> *teacher projects the textbook on the whiteboard with help of the camera in the iPad, and*
> *together with the pupils goes through the answers to the questions in the textbook.*
> *Then he plays the next audio file, and so forth. After a few rounds, he tells the pupils to*
> *continue on their own in the textbook. The pupils start to work and the teacher helps*
> *when needed.* (Field notes, School A, Teacher 2, Spanish, Year 8, W. 4)

In this learning situation, the teacher uses the virtual classroom to inform the pupils of what to do and to play audio files for the pupils. However, the affordances of the virtual arena are available only for the teacher to employ and are used in a limited manner; the design for learning does not prompt the pupils to engage with SB or any other digital tools – they only use the textbook. The teacher's way of blending in this classroom builds on a segmented or de-chained order, which means that he assigns different tools to different purposes.

Different teachers may adopt different boundary practices which can be of a more blending (integrating) or separating (segmenting) character between the physical and

virtual dimensions of the classroom. In the next and final part of our analysis, we will take a closer look at different teacher roles in connection with the blended classroom.

The teachers' boundary roles in the blended classroom

Having accounted for the 'what' (the affordances) and the 'how' (the practices) above, we now turn to our final research question: What kind of teacher roles are enacted through the adoption of different practices in and across physical and virtual learning spaces? At the heart of the analysis is the teachers' 'doing' of boundary work when using SB to link or separate the physical and virtual spaces of the classroom. Taking the segmentation–integration continuum as a point of departure, we have identified four archetypical teacher roles related to different practices the teachers engage in while constructing, dismantling and maintaining borders between the physical and the virtual. Figure 4 illustrates the teacher boundary roles in the management of blended classrooms, and each role will be presented in more detail in the following subsections.

		Affordances	
		Informational practices	*Interactional practices*
Boundary work	*Segmented practices* High contrast between online and offline	The informing teacher SB as an optional tool for sharing information	The sequential teacher SB as a tool for certain tasks
	Integrating practices Low contrast between online and offline	The seamless teacher SB as a necessary tool for sharing information	The responsive teacher SB as a tool for ongoing dialogue

Figure 4. Teachers' boundary roles enacted in the management of the blended classroom using SB.

Segmented Practices/Information: The informing teacher

The first role to be presented is the *informing teacher*. In this role, the teachers' actions, which involve the sharing and collecting of information, stems from the physical classroom and uses SB as a complementary, or optional, space for information. For example, in school B, one teacher was followed during both PE and Home Economics classes. In the latter subject, we observed a series of lessons that were inspired by a reality TV show, "MasterChef", where amateur chefs compete in cooking against one another. In accordance with the TV show, the pupils were to practise meal planning and execution in pairs. Planning was to take place in advance of the "MasterChef" lessons, with the directions provided orally and visually by the teacher during the first lesson as a background. The only form of information provided by the teacher on SB is an instruction

sheet, uploaded at the beginning of the 4-week period, when the theme "MasterChef" was initiated. During week 2 of our observation, the division between the virtual and the physical is emphasised by the teacher referring to SB at the beginning of the lesson, indicating that the virtual and the physical are to be separated:
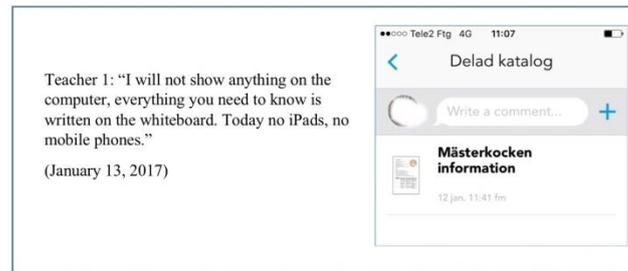
Figure 5. Oral instruction and the information sheet uploaded on SB/MasterChef task. (Classroom recording and SB screen grab, School B, Teacher 1, Home Economics, Year 8, W. 2)

This statement reinforces the fact that instructional activities as well as learning events occurring in the physical classroom are primary to the activities in the virtual space. The virtual space available for learning is a secondary space. On the other hand, the teacher's explicit mentioning of not using tools and affordances in the virtual this time also highlights the fact that in many other practices, virtual tools such as iPad and the SB app were a natural part of the design for learning. This was the case in another practice adopted by the same teacher when, in relation to another Home Economics task, she required the pupils to report on their execution of "Dream room for 5000 SEK" in a collage of images and a fictitious budget on SB by giving them an oral directive in the classroom and repeating the same directive in the virtual space.

> *"Download both PDFs in the same portfolio [on SB]: one as a document with your budget and the other as a photo of your room".* (Classroom recording, School B, Teacher 1, Home Economics, Year 8, W. 2)

However, the teacher does not provide response to the pupils' posts on SB, and neither is the discussion forum a function used in this task. The main function of SB is adhering to information and documentation, meaning that the app is used by the teacher mainly as a message board and by the pupils as a mailbox. Its affordances in terms of interaction are not employed. Thus, in our observation, the virtual and the physical are only loosely connected, or de-chained. Further empirical support for our analysis of these teaching practices as segmented and informing, but not completely ignoring, the virtual is

provided through contrasting the practices above with practices adopted by a teacher in a neighbouring class. When the pupils meet after the Home Economics class, a discussion occurs concerning the fact that in the class we observed that the task was done by using iPads, while the other class conducted exactly the same task "manually" by using pen and paper.

Segmented Practices/Interaction: The sequential teacher

The second role presented here is that of the *sequential teacher*. In this role, the teachers' action adhering to pedagogical practices is steered towards both the physical and the virtual classroom in a highly sequential manner. Affordances from both spaces were drawn on, but never parallel with each other. An example from our field notes highlights such a procedure:

[In the physical classroom], the teacher gives general instructions orally to the whole class. He talks and explains the issue at hand for the pupils by giving individual comments and stopping by each group of 3-4 pupils to discuss their ideas. He seems well connected in the class and takes time to talk to each group. At the end of the 50-minute lesson, pupils engage in whole class discussion by providing answers to the questions in the book.

Instructions at SB, uploaded online prior to the lesson, are general for all pupils. They are shown shortly either at the beginning or at the end of class. Activities are divided into online and offline activities; the whole class works either manually with pens and books or electronically; the two spaces are not simultaneously made relevant. An exception to the rule is when an image of a textbook page is projected to the whiteboard from SB. (Field notes, School 1, Teacher 2, Spanish, Year 8, W. 4)

The above example illustrates segmented practices, where the physical classroom is the base of teaching and learning onto which a virtual app is attached. The contrast between online and offline is highlighted by the fact that classroom activities are not orchestrated in such a way that the pupils would be expected to engage in both virtual and physical spaces simultaneously. Interaction, when it takes place, occurs from the teacher's side in providing feedback on homework beyond the actual lesson, to which pupils respond in the virtual space.

Yet another aspect emphasising the sequential nature of relating teaching practices to the physical and virtual spaces needs to be addressed. In the above example as well as

other instances of segmented practices, our observations confirmed practices in which activities were divided between the two spaces. While the physical classroom was the obvious centre of actions, SB was referred to as a space reserved for homework. Moreover, the two spaces were allocated in different chronological spaces, SB being referred to either at the beginning/end of class, never in the core of a lesson, or beyond the scheduled learning activities during the school day. From an analytical perspective highlighting chaining and boundary work, one can thus note a loosely chained string of activities across time and space where the boundaries between the physical and virtual are more marked than blurred.

Integrating practices/Information: The seamless teacher

The first of the two integrated teacher roles is called the *seamless teacher*, characterised by low contrast between physical and virtual spaces with regard to how school-related information and documentation is handled. A seamless teacher uses SB as a necessary work tool, as a workbench for sharing texts, videos, links, and other things, to the pupils in order for them to solve the tasks in class and at home. Much of the work in class is conducted with the help of SB, on the pupils' iPads. Vignette 1 in the introduction illustrates an example of the seamless teachers' way of managing classroom activities. As illustrated by the vignette, the physical tools and affordances of the classroom – whiteboard, pointer, projection of SB, oral prompts, papers and pencils – are utilised in concert with virtual affordances: tablets and mobiles connected to and accessing SB, electronic schoolbooks and links to webpages. The sequence of learning actions continues in the following extract from our field notes:

> *Finally, the teacher informs, the pupils are to do a mind map and develop their thoughts on what is typical for the specific Nordic language assigned to the group. (…) All pupils work with digital tools, such as mobile phones and tablets, but many of them use pen and paper for drawing the mind map, which they take a photo of when done and publish it on Showbie. During the lesson, the teacher walks around between the groups and discusses with the pupils. After a while, he suspects that the pupils have some difficulties to find texts and videos on their own, so he goes on to publishing some useful links on Showbie for the pupils to use.* (Field notes, School A, Teacher 1, Swedish, Year 8, W. 2)

High integration between physical and virtual spaces of the classroom means that the virtual is always present in the physical, ready to be used or referred to at any time and vice versa. Through engagement in chained strings of activities where time and spaces are interconnected, the seamless teacher moves between the physical and virtual spaces seemingly unhindered. The design for learning is here inherently multimodal and interlinked, and the outcomes of such learning reflect both the teachers' and pupils' engagement with digital as well as traditional tools and literacies.

To return to the design theoretical perspective (Kress, 2010; Selander & Kress, 2010) concerning learning, the practices through which a seamless teacher role emerges are based on a design for learning in which the modes and media for learning are integrated in such way that SB is a necessity, not an optional tool. Furthermore, the teaching practices are built around the affordances of the tools available both online and offline, and the didactic implications seem to be in sync with the affordances.

Integrating practices/Interaction: The responsive teacher

The second integrated teacher role is called the *responsive teacher*, and is characterised by low contrast between physical and virtual spaces about how to manage interactions between teacher and pupils. By interaction we refer to two-way dialogue. As with the seamless teacher, the responsive teacher moves between physical and virtual spaces seemingly unhindered. In their responsive practices, the teachers use both physical and virtual spaces for interaction as intertwined components, which means that communicative actions and resources are chained across time and space. In the physical classroom, interaction occurs mostly orally, while the virtual classroom is mostly employed for written interaction. The communication may be conducted in either groups of pupils or between teacher and pupil, such as in the following example of dialogue from SB:

> "Teacher: Brilliant P (Pupil's name). In one lesson!!!! Good work. Make the text easier to read with paragraphs, choose one of the arguments and use the image below to really get out as much as you can. Write - read - find something to develop - write. Imagine every argument as something you can argue around even more. Widen the perspective - opinion - reasoning - based on your perspective - based on what it looks like at school – and based on what it looks like in the world - (is Trump a bully?) - suggestions for solutions - how will it look like in the future.
>
> Long feedback this time, but that's because I feel that .... you are getting there.... any day now. It's like you've managed to find the key to your writing. BOOM!
>
> Pupil: Something like this? I have done a little longer reasoning now too, but I will work on them later in class time :)
>
> Teacher: Great! Just some details. Compounds[1]. Read through your text and listen if it's a word or two you're reading. (…) It will be a D for Christmas, but it is a strong D. The C is within reach to the summer, and it is superb.
>
> Pupil: Okay, then I know!! Then damn it, I'll get a C to summer ;)"

Figure 6. Teacher-pupil dialogue on SB. (School A, Teacher 1, Swedish, Year 9, Week 4; Dec 14-15)

An extreme example of integrating practices where interaction lies at the centre of those practices was observed during another Swedish class. This was when the teacher engaged in dialogues with his pupils simultaneously both online and offline, while both moving in the physical classroom between the pupils' desks and chatting with them, and writing responses to their tasks on his laptop in the virtual space during the same class.

Discussion and Conclusions

As shown above, we have observed two main themes of affordances among the teachers' use of Showbie: informational and interactional. We have also shown how different boundary practices are adopted by the teachers in order to integrate and segment different physical and virtual affordances in the blended classroom. The analyses of the teachers' engagement with affordances and their boundary practices together result in the identification of four archetypical roles. Thus, through drawing upon the affordances of physical and virtual classrooms in integrating-segmenting ways, the informing, sequential, seamless and responsive teacher roles emerge. While the informing and sequential roles are characterised by segmenting boundary practices, the responsive and seamless roles are characterised by integrating boundary practices.

According to the advocates of boundary work theory, boundary work practices are performed according to personal preferences in order to organise one's work and everyday life (Nippert-Eng, 1996; Ashforth, Kreiner, & Fugate, 2000). Put differently, the "doing of" boundary work can be related to being either a 'segmentor' or an 'integrator', the latter of which can be connected to "boundary crossing", a process which involves "combining ingredients from different contexts to achieve hybrid situations" (Engeström et al., 1995, p.

319). While the boundary work theory we have employed here rests on both constructionist and cognitivist grounds, it can be seen as feasible for the analysis of social and communicative practices *in situ*. As pointed out by Akkerman and Bakker (2011), boundaries are not only barriers to learning but they are also spaces with potential for learning.

Identifying and discussing boundary practices has been deemed useful in attempting to understand the challenges and potentials for teaching and learning in blended classrooms. As seen in our analyses, boundaries are established and crossed by the actors through drawing on the different communicative affordances of virtual and physical spaces. On the basis of the present analyses, explanations for the teachers' chosen practices can be sought from different sources. One of them is indeed their personal preferences or teaching styles. As Kjällander (2011) points out, didactic design starts in the classroom with the teacher imagining the task. In order for this process to be successful, the teacher needs two kinds of knowledge: 1) of the resources available to perform the task, and 2) of the pupils and their capacities. Furthermore, the teacher needs to incorporate this knowledge to his/her own capacities and preferences. Our findings suggest that personal preferences concerning boundary management between physical educational settings and virtual learning spaces can be seen as guiding the adoption of certain practices that will help the teachers to construct and form their own preferred way of working and teaching.

Another relevant aspect for a teacher's movement on the segmenting-integrating continuum is the subject matter being taught. Integrating teaching and learning practices across physical and virtual spaces may be more challenging in practically oriented subjects, such as Home Economics or Physical Education. Such subjects may require that certain actions are performed in the physical space in order to fulfil curriculum goals, such as a physical exercise, or cooking an actual meal. However, practical subjects are often also intertwined with theoretical goals, such as learning about nutrition, economy, anatomy and health, - as well as goals concerning communication and digitalisation and that are emphasised to a high degree in the present Swedish curriculum, LGR 11 (Swedish National Agency for Education, 2011). Thus, even though certain aspects of a subject matter would need to be performed in the physical dimension of the classroom, the teacher may draw upon both informational and interactional affordances using the virtual space in his/her teaching practices. Following the line of thought of boundary work theory, subject matter

might thus affect the way the teachers intertwine the physical and the virtual dimensions of the classroom.

Having said that, teachers' practices do not only depend on personality, preferences and subject matter, but also on their knowledge about different ways of working, i.e. on informed choices about the available possibilities of working in the physical and virtual dimensions of the classroom. Previous research (Kreiner et al., 2009) has emphasised the importance of identifying specific boundary work practices in order to contribute with tools for individual workers to perform boundary work in an informed way, by finding a fuller array of options in specific practices available to individuals. Introducing new technology in work life often requires new ways of working, and new sets of competencies for the teacher, such as changed technical, cognitive, or social demands (Hagström & Hanson, 2003; Engeness & Edwards, 2017). Integrating virtual affordances of the classroom, with the aid of digital media, involves demands for technical and pedagogical skills to create a positive learning environment for pupils. With this study, we put the spotlight on such boundary work practices in relation to the blended classroom, and we would like to emphasise the importance for the teachers to reflect upon and position their preferred teacher role in new multidimensional classrooms.

By identifying boundary work practices in blended classrooms, we can also deepen our understanding of 'chaining', or chained learning. In previous literature, activity-chaining has highlighted the use of several linguistic resources as linked and distributed temporally over the course of a larger temporal phase – for instance an entire lesson (Bagga-Gupta, 2014; Messina Dahlberg & Bagga-Gupta, 2013). It has also focused on the linking of technological and discursive tools, such as digital or physical texts and programmes, whiteboard, paper and pencils across time and space much in a similar manner that has been the case in the present study. In our contribution to the body of studies on blended learning, we would like to emphasise that it is not a matter of working either with or without the support of virtual tools, but rather that there are distinctly different ways of constructing blended learning spaces and different ways of being and acting as a teacher in such spaces. By looking at specific practices, used to integrate or separate certain affordances, we can open up yet another element of the analytical concept of chaining by studying how teachers may draw upon different affordances in and across space and time in role-specific ways.

Acknowledgments

References

Akkerman, S. & Bakker, A. (2011). Learning at the boundary: An introduction. *International Journal of Educational Research*, *50*(1), 1-5.

Ashforth, B. E., Kreiner, G. E. & Fugate, M. (2000). All in a day's work: boundaries and micro role transitions. *Academy of Management Review*, 25(3), 472–491.

Bagga-Gupta, S. (2002). Explorations in bilingual instructional interaction: A sociocultural perspective on literacy. *Journal of the European Association on Learning and Instruction*, *5*(2), 557-587.

Bagga-Gupta, S. (2004). Visually oriented language use. Discursive and technological resources in Swedish Deaf pedagogical arenas. In M. V. Herreweghe & M. Vermeerbergen (Eds.), *Sociolinguistics in European Deaf Communities. Vol 10. The Sociolinguistics in Deaf Communities Series*, (pp.171-207). Washington DC: Gallaudet University.

Bagga-Gupta, S. (2014). Languaging: Ways-of-being-with-words across Disciplinary boundaries and empirical sites. In Paulasto, H., Riionheimo, H., Meriläinen, L. & Kok, M. (Eds.), *Language contacts at the crossroads of disciplines*. (pp.89-130). Newcastle-upon-Tyne: Cambridge Scholars Publishing.

Barton, D. & Lee, C. (2013). *Language online. Investigating digital texts and practices*. London: Routledge.

Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.

Engeness, I. & Edwards, A. (2017). The complexity of learning: exploring the interplay of different mediational means in group learning with digital tools. *Scandinavian Journal of Educational Research*, *61*(6), 650-667.

Engeström, Y., Engeström, R. & Kärkkäinen, M. (1995). Polycontextuality and boundary crossing in expert cognition: Learning and problem solving in complex work activities. *Learning and Instruction*, 5, 319–336.

Evans, S. K., Pearce, K. E, Vitak, J. & Treem, J. W. (2017). Explicating affordances: a conceptual framework for understanding affordances in communication research. *Journal of Computer-Mediated Communication*, 22, 35-52. Ferdig, R., Cavanaugh, C. & Freidhoff, J. (2012). *Lessons learned from blended programs: Experiences and recommendations from the field*. Vienna, VA: iNACOL.

Gibson, J. J. (1979). *The Ecological Approach to Visual Perception*. Boston: Mass: Houghton Mifflin.

Graham, C. R. (2006). *Blended learning systems: Definition, current trends, and future directions.* In C. J. Bonk & C. R. Graham (Eds.), The Handbook of Blended Learning: Global Perspectives, Local Designs (pp. 3–21), San Francisco, CA: Pfeiffer.

Gynne, A. & Bagga-Gupta, S. (2013). Young people's languaging and social positioning. Chaining in "bilingual" educational settings in Sweden. *Linguistics and Education*, 24(4), 479-496.

Hagström, T. & Hanson, M. (2003). *Kompetens för flexibelt arbete. Förnyelse på svenska arbetsplatser – balansakter och utvecklingsdynamik.* Ed. Linda Wilhelmson (pp.153-178), Stockholm: Arbetslivsinstitutet.

Hansen, A. L. (2005). *Kommunikative praksiser i visuelt orienterte klasserom: En studie av et tilrettelagt opplegg for døve lærerstudenter.* Trondheim: NTNU, Norges teknisk-naturvitenskapelige universitet, Dept. for Languages and Communication Studies. Doctoral dissertation.

Hammersley, M., & Atkinson, P. (1983). *Ethnography: Principles in Practice.* London: Tavistock.

Hayes, N. (1997). Theory-led thematic analysis: social identification in small companies. In Hayes, N. (Ed.) *Doing Qualitative Analysis in Psychology* (93-114), Hove: Psychology Press.

Kennewell, S. (2001). Using affordances and constraints to evaluate the use of information and communications technology in teaching and learning. *Journal of Information Technology for Teacher Education*, *10*(1-2), 101-116.

Kjällander, S. (2011). *Designs for Learning in an Extended Digital Environment. Case Studies of Social Interaction in the Social Science Classroom.* Stockholm University: Stockholm.

Kozinets, R. V. (2010). *Netnography.* London: Sage.

Kress, G. (2003). Literacy in the New Media Age. London: Routledge.

Kress, G. (2010). *Multimodality. A social semiotic approach to contemporary communication.* London: Routledge.

Kress, G. & Bezemer, J. (2009). Knowledge, creativity and communication in education: multimodal design. In C. Jewitt (Ed.) *Beyond Current Horizons*. Futurelab.

Kreiner, G. E., Hollensbe, E. C. & Sheep, M. I. (2009). Balancing Borders and Bridges: Negotiating the Work-Home Interface via Boundary Work Tactics. *Academy of Management Journal*, *52*(4), 704-730. https://doi.org/10.5465/amj.2009.43669916

Lamont, M. & Molnár, V. (2002). The study of boundaries in the social sciences. *Annual Review of Sociology*, *28*(1), 167–195. https://doi.org/10.1146/annurev.soc.28.110601.141107

LeCompte, D. & Schensul, J. J. (2013). *Analysis and interpretation of ethnographic data: a mixed methods approach*. Lanham: AltaMira Press.

Linderoth, J. (2012). Why gamers don't learn more. An ecological approach to games as learning environments. *Journal of Gaming and Virtual Worlds*, 4(1), 45-62. https://doi.org/10.1386/jgvw.4.1.45_1

Looi, C. K., Wong, L. H., So, H. J., Seow, P., Toh, Y., Chen, W. et al. *(2009)*. Anatomy of a mobilized lesson: learning my way. *Computers & Education, 53(*4), 1120–1132. https://doi.org/10.1016/j.compedu.2009.05.021

Messina Dahlberg, G. & Bagga-Gupta, S. (2013*).* Communication in the virtual classroom in higher education: Languaging beyond the boundaries of time and space. *Learning, Culture and Social Interaction, 2*(2), 127-142. https://doi.org/10.1016/j.lcsi.2013.04.003

Nacu, D. C., Martin, C. K., Pinkard, N. & Gray, T. (2016). Analyzing educators' online interactions: a framework of online learning support roles. *Learning, Media and Technology*, *41*(2), 283-305. https://doi.org/10.1080/17439884.2015.975722

Nippert-Eng, C. E. (1996). *Home and Work: Negotiating Boundaries through Everyday Life.* Chicago: University Chicago Press.

Norberg, A. (2017). *From blended learning to learning onlife: ICTs, time and access to higher education.* Umeå: Umeå University.

Norman, D. (1988). *The Psychology of Everyday Things.* New York: Basic books.

Persson, M. & Thunman, E. (2017a). Ethical dilemmas on social media: Swedish secondary teachers' boundary management on Facebook. *Teacher Development*, *22*(2), 175-190. DOI: 10.1080/13664530.2017.1371634

Persson, M. & Thunman, E. (2017b). Boundary practices and social media: the case of teachers' use of Facebook to communicate with pupils. *Human IT, 13*(3), 24-48.

Riesch, H. (2010). Theorizing Boundary Work as Representation and Identity. *Journal for the Theory of Social Behaviour*, *40* (4), 452–473. https://doi.org/10.1111/j.1468-5914.2010.00441.x

Roschelle, J. & Pea, R. (2002). A walk on the WILD side: How wireless handheld may change computer-supported collaborative learning. *International Journal of Cognition and Technology, 1* (1), 145-168. https://doi.org/10.1075/ijct.1.1.09ros

Saldana, J. (2009). *The coding manual for qualitative researchers*. Thousand Oaks, CA: Sage.

Selander, S. & Kress, G. (2010). *Design för lärande – ett multimodalt perspektiv.* Stockholm: Nordstedts Akademiska Förlag.

Sotillo, S. M. (2000). Discourse functions and syntactic complexity in synchronous and asynchronous communication. *Language Learning & Technology, 4*(1), 82–119.

Swedish National Agency for Education. LGR 11. *Curriculum for the compulsory school*, *preschool class and the recreation centre.* Stockholm: National Agency of Education. Retrieved from: https://www.skolverket.se/publikationer?id=2575

Tapio, E. (2013). *A nexus analysis of English in the everyday life of FinSL signers: a multimodal view on interaction*. Doctoral thesis. Jyväskylä: Jyväskylä University Printing House.

Zerubavel, E. (1991). *The fine line.* New York: Free Press.