

Student teachers' discourse about digital technologies and transitions between formal and informal learning contexts

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Abstract This research is a contribution to issues of digital technology use at the interface of formal and informal learning contexts. The research was conducted in the discourse tradition and investigates Finnish teacher training students' 'manners of speaking' as resources for, and obstacles to, making pedagogical changes in response to the potential of digital technology. Findings revealed that the resources and obstacles associated with transitions between formal and informal learning contexts are concerned with students' engagement in: (i) linking formal and informal activities, (ii) avoiding uncertainty, and (iii) participating in shared work practices. This research argues that risk taking is an opportunity in making the associated pedagogical changes. Risk taking can be developed in teacher education by critically evaluating how to support students in their use of digital technology at personal, group and cultural levels.

Keywords Initial teacher education · Digital technology · Discourse analysis · Informal and formal learning contexts

1 Introduction

Recent debate in the educational use of digital technology calls for research on the interrelationships of learning in informal and formal contexts (Wong and Looi 2011;

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Koutromanos and Avraamidou 2014; Sharples 2015). Despite increasing ‘informal’ use of technology, teachers are generally resistant to making pedagogical changes (e.g. Cuban et al. 2001; Greenhow and Robelia 2009; Häkkinen and Hämäläinen 2012; Ertmer and Ottenbreit-Leftwich 2013; Laru and Järvelä 2015). Previous research indicates that whereas the issue of pedagogical change at the intersection between social contexts and individual actors has been raised, teachers face the challenge of applying informal use of digital technology effectively in formal education. The use of digital technology requires designing new practices in teaching and learning. This is related to teachers’ intentions to make changes in their roles and develop current understandings of what good teaching and learning are. In particular, there are high expectations that young teachers newly entering the profession will be at the forefront of changes (Hammond et al. 2011; Mylläri et al. 2011; Valtonen et al. 2011b), and develop new professional working cultures (Darling-Hammond 2006; Dede 2010; Valtonen et al. 2011a).

This research aimed to contribute to these matters through investigations in a ‘dialogical space’ comprising individual student’s written reflections, the ‘texts’ they produced while studying pedagogical perspectives of educational use of digital technology in an initial teacher education setting. The research was conducted in a Finnish university. In Finland teacher education is organized in eight universities. There are different teacher education programmes for primary school class teachers and subject teachers and these reflect the structure of the Finnish school system (Malinen et al. 2012). The research reported here was part of a project on how prospective primary school class teachers learn to use digital technology in formal education. The work was conducted in 2008 and thus also provides an important ‘baseline’ within the entire programme of research on digital technology within the practice school. The baseline is that the research captures student positions on aspects of the use of digital technology as it existed prior to the widespread introduction of tablet personal computers such as iPads.

Social context in Finnish teacher education has a strong research orientation. All courses in teacher education programmes have research dimensions and students are expected to take an analytical approach in developing their understanding during training and to continue with this approach in their working lives (Niemi and Jakku-Sihvonen 2006; Krokfors et al. 2011). The notion that an objective of teacher education is to train students to take an open-minded approach to the work, drawing conclusions based on observations and experiences, and developing teaching and learning practices in a systematic way, was a foundational consideration for basing this research in students’ dialogue. Nevertheless, it would be misleading to think that all Finnish student teachers are open-minded and eager to develop teaching and learning practices in a systematic way. Therefore, this research attempts to investigate how student teachers’ learning occurs by making explicit their dialogue while studying pedagogical perspectives of the educational use of digital technology at the beginning of their university studies.

Methodologically, this research applies an approach where ‘discourses’ are seen as entities of spoken or written language. Discourses are generally understood as predefined entities which reflect relatively stable and enduring social practices (Parker 2002; Fairclough 2003; Gee 2005). Different discourses can be understood in their contextual usages governed by rules and customary ways defining ‘the self’ and expressing one’s thoughts. Thus, in discourses, personal and shared reflections are bonded together. The research reported here is positioned to address how student

teachers themselves construct order from the discourses in a particular learning context and how pedagogical changes occur at the interface between individual actors and social context. In order to put the students in a central position in the research, instead of predefining discourses, ‘manners of speaking’ are used. Manners of speaking refer to the entities constructed uniquely through students’ texts (see Potter and Wetherell 1987).

Building on previous research, this paper seeks to link informal and formal use of digital technologies in initial teacher education students’ learning through the following research questions:

- 1) what are the main shared ‘manners of speaking’ arising out of the students’ texts in which they reflect on their studying of educational use of digital technology?
- 2) how are manners of speaking resources for, and obstacles to, making changes in the culture of teaching and learning?
- 3) how do manners of speaking afford and constrain students in positioning themselves to make pedagogical changes?

The aim is to consider, through a discourse approach, some practicalities of overcoming obstacles that impede prospective teachers in acting as agents of change.

2 Research context

Formal learning is typically characterized as a highly structured activity within the school curriculum involving different types of teaching and learning activities and forms of assessment (Eshach 2007). In contrast, informal learning consists of “all forms of intentional or tacit learning in which we engage either individually or collectively without direct reliance on a teacher or externally organized curriculum” (Livingstone 2008, p. 204). Thus formal learning is associated with institutional settings (e.g. schools or universities) and informal learning with activities which take place out of school, for example in the home or through hobbies.

These ‘physical context’ definitions are only partially satisfactory because, for example, teacher-planned field trips and teacher-led outdoor learning activities could be characterized as “formal learning in informal settings” (Wong and Looi 2011, p. 237) and schools can also be sites for non-formal activities, for example learning in after hours programmes such as in chess clubs and workshops (Schugurensky & Mayers Schugurensky and Myers 2003). Another way of looking at the distinction is through ‘aims and frames’: formal learning is based on the notion of direct reliance on a teacher or an externally organized curriculum; informal learning refers to learning that takes place without institutional control and occurs out of school contexts in a physical sense. In other words, formal learning happens in courses, classrooms, and schools, resulting in learners receiving grades, degrees, diplomas, and certificates, whereas informal learning happens throughout people’s lives in highly personalized ways based on their particular needs and interests (see Dabbagh and Kitsantas 2012).

Despite these definitional difficulties, out of school use of digital technology is seen as promising for developing practices in formal settings because of the entry it affords into an open and entertaining way of life (Murphy and Beggs 2003; Greenhow and Robelia 2009). Mobile educational games, for example, have been explored as a way of

engaging with the intersection of formal and informal learning settings (Sharples 2015). Koutromanos and Avraamidou (2014) argue that mobile games hold great potential for enhancing students' motivation, interest, interaction, and engagement; however, the informal-formal interactional aspects remain largely unexplored.

Another approach to connecting formal and informal settings through use of digital technology is to cross locations such as the classroom and the home and apply knowledge formed in one setting to the other (Sharples 2015). 'Mobility' here refers not only to mobile devices but also to the notion of ubiquitous learning. Learners are continually on the move from one space to another and from topic to topic and thus learning environments and learning opportunities expand by bridging individual and collaborative activities as well as face-to-face and social media activities (Laru and Järvelä 2015). However, the seamless interplay between and across different contexts, technologies and people remains challenging pedagogically (Wong et al. 2015).

Recent critics of the informal use of digital technology in education claim that age of participants as a criterion for classification of technology use in informal setting adopts too narrow an understanding of learning, placing too much emphasis on generalized learning behaviours (Helsper and Eynon 2010; Wang et al. 2012). Bennet and Maton (Bennett and Maton 2010) suggest that the lives of young people involve multiple, complex and overlapping social spaces, and thus urge teachers to recognize that young people engage in a wide range of different contexts, many of which entail learning in more or less formalized ways. Typically, use of informal technology is seen to inadequately prepare young people for advanced technology use in education (Warschauer and Matuchviak 2010; Fry and Seely 2011). This is endorsed by Beckman et al. (2014) who found that young students' use of technology outside of school is dominated by communication and interest driven activities. Despite a range of applications, their digital technology use is habitual; very similar activities are performed each day.

The relationship between formal and informal learning contexts is complex and overlapping (Schugurensky & Mayers Schugurensky and Myers 2003). Is it not just a question of transferrable skills and digital tools, it takes in also the intersection of different types of working cultures (Wong and Looi 2011). This is in line with Veletsianos (2013) who claims that the presentation of a 'self' that stands apart from academic matters, in other words, the use of social media in formal learning is a small act of defiance against institutional norms. Informal practices, like personalized contextual learning activities and presentations of a 'self' offer a bridge between formal and informal learning contexts. Learners can proactively observe, record, make sense of and reflect upon their daily encounters in informal settings and apply these experiences to formal learning settings (Wong et al. 2015, p. 134). Potentially, this implies huge changes for formal education which would be difficult to implement, especially matters pertaining to the sources and control of information for learning (Säljö 2010).

3 Methods

Research data were collected from the learning diaries of first-year primary class teacher students ($N = 70$) following a course on "Pedagogical perspectives of educational use of ICTs" (3 ECTS). The course was compulsory for all the students and consisted of lectures (five hours), working in groups (10 h), a written examination and

written reflections by the students on their learning. The course was assessed on a pass–fail basis without grades. The students produced learning diaries as they studied the theory and practice of the pedagogy of educational use of digital technology in the course. The majority of students were born in 1984–1989 and they all have primary school histories in Finland which increases the homogeneity of the sample.

The learning diaries, each typically 6 to 12 pages and individually written, were composed of reflections by the students as they described and analyzed their learning and perceptions of themselves as prospective teachers following discussions and other learning activities in small group sessions. Although the students were encouraged to reflect freely about their experiences and perceptions, learning diaries were structured around four topics. Each topic had associated open-ended questions or tasks. The research data for this study were taken from learning diary material associated with the topics ‘aims’ and ‘future visions’. This generated a rich and multifaceted picture of the students learning experiences and associated personal and contextual aspects. The topic ‘aim’ was introduced in the beginning of the course to motivate students to set their learning goals and posed the questions: “what do you think is most important in the educational use of digital technology”, “what are the aspects with which you feel competent?” and “what are the aspects that you should especially learn?” The topic ‘future visions’ was introduced at the end of the course where students specified their forthcoming learning goals and made plans about how they would achieve those goals. In this topic students were asked to describe their previous school experiences and analyze their present knowledge and skills. Students were guided to consider the application of the digital technologies they were already familiar with. In this way they were implicitly encouraged to explore the boundaries between their own informal learning with digital technologies and the incorporation of digital technology experiences in formal settings.

One of the authors of this research was one of the teachers who designed the course. She has extensive experience in teacher training and she was the instructor of the small group work and also the main person responsible for the data analysis.

3.1 Data analysis

Following from the broad understanding of language which Scollon and Levine (2004, p. 2) encapsulate in multiple modes of communication, discourse analysis texts may be seen as spoken language in a dialogical sense. Whether language is in the spoken form or as text, it is always inevitably constructed in multiple modes of communication. Thus written texts in the students’ learning diaries may be regarded as ‘talk’, not only for the writer but also to the expected audience: written texts are audience-oriented and thus dialogic (Bakhtin 2004).

In order to construct manners of speaking a concrete tool is needed to analyze and pool together students’ texts. The analytical tool used in this research is ‘rhetorical strategies’. Rhetorical strategies refer to strategies people use to organize and present their ideas in order to legitimate them and actively present them to others (Perelman 1979). However, according to discourse analysis, texts reflect hidden norms which situate texts in their sociocultural and historical contexts (Fairclough 2003; Gee 2005). In other words, people are not free agents but are subject to social structures in the ways they use language (e.g. Parker 2002). Furthermore, the use of rhetorical strategies is a process rather than a single event because people take versatile subject positions,

consciously or not, while talking. Subject positions vary according to the context in which they emerge (Wetherell 2003). Therefore rhetorical strategies link individually written texts as entities, ‘manners of speaking’, disclosing the ways of talking about pedagogical perspectives of the educational use of digital technology that are legitimated among students.

In this research, students’ individual perceptions and experiences are analyzed. The sociocultural context is academic but not formal. Students’ texts reflect their individual opinions and experiences, not their academic knowledge concerning e.g. learning theories. Furthermore analyzing and interpreting rhetorical strategies reveals how the students, consciously or subconsciously, intend to make pedagogical changes. Therefore in this research the common elements within individually written texts are identified and from these general characterizations are derived.

The analysis was undertaken at three levels. The content from different students learning diaries were grouped together to form common categories so as to examine the most important issues from a variety of perspectives. First, after reading and re-reading the whole research data (i.e. the research diaries of all the students), shared rhetorical strategies were identified. Rhetorical strategies emerged from the readings of the texts by focusing on excerpts in which students problematized the need for using digital technology in teaching and learning practices.

Second, key rhetorical strategies were identified. These are strategies which students use in different parts of their learning diaries. The analysis focused on analyzing differences, commonalities and ambiguities in the rhetorical strategies. Five key strategies were identified and named as: 1) frequency of use, 2) extreme expressions, 3) turning points, 4) detailed examples, and 5) prohibitions.

Third, manners of speaking were established. The students’ texts were grouped together according to the each key rhetorical strategy by comparing the meaning of key rhetorical strategies in general (i.e. the main meaning of the rhetorical strategy), and in detail (i.e. concrete examples of the main meaning). Four manners of speaking were established which were named as follows: 1) initial talk, 2) routine talk, 3) innovative talk, and 4) generational talk.

4 Findings

Research question 1 asked: what are the main shared ‘manners of speaking’ arising out of the students’ texts in which they reflect on their studying of educational use of digital technology? This study indicates that students use five main rhetorical strategies which are key strategies in the construction of four manners of speaking. Whereas the manners of speaking categories are discrete, they all are connected to transcending boundaries between formal and informal use of digital technology, and thus provide an insight into how students understand pedagogical changes by making interrelationships between informal and formal learning.

Each manner of speaking has associated with it one or two key rhetorical strategies as follows: 1) frequency of use is the key strategy in initial talk, 2) extreme expressions in routine talk, 3) detailed examples in innovative talk, and 4) detailed examples *and* prohibitions in generational talk. In addition to the key strategies, students do utilize other strategies, like active and passive expressions, changes in subject positions and

lists. However, the meanings of those strategies are understood contextually in each of the manners of speaking, i.e. strategies might have different meanings in initial talk and generational talk.

The data analysis shows that the key rhetorical strategy in *initial talk* is ‘frequency of use’. Concrete examples of this strategy in students’ texts are expressions, for example: “in primary school I wrote once a short story with a word processor”, “today technology is being used more than earlier”, and “ICT is an occasionally used option in normal teaching”. These are qualitative expressions of frequency of use rather than exact numbers. The general meaning of this key rhetorical strategy in initial talk is that the students learning is connected to transcending boundaries between formal and informal learning, however, the students tend to ‘regulate’ how often digital technology is used in formal education. Accordingly, in initial talk, frequency of use as a key strategy differentiates informal learning from formal learning in the sense that in formal education digital technology use can be ‘measured’ and therefore seen as a discrete part of school life.

The key rhetorical strategy in *routine talk* is ‘extreme expressions’. Concrete examples of this strategy in students’ texts are expressions, for example, “the teacher must obtain the maximum benefit of ICT”, “the most important is to create a perfect learning environment for children”, and “my current skills are limited to very basic computer skills”. The general meaning of the key rhetorical strategy in routine talk is that students notice opportunities for transfer between informal and formal learning, but that they expect the changes in formal education to be made in conventional ways. In other words, they stress that the teacher must anticipate what will happen in the lesson and plan for it.

The data analysis shows that the key rhetorical strategy in *innovative talk* is ‘turning points’. Concrete examples of this strategy in students’ texts are the expressions “I thought before”, “I would have to still develop”, “in the future”, and “I would strive to”. The general meaning of the key rhetorical strategy is that in innovative talk students position themselves as actively focusing on issues outside formal education and as individuals they are ready to make changes in the teaching and learning culture.

The key rhetorical strategies in *generational talk* are ‘detailed examples’ and ‘prohibitions’. Concrete examples of these strategies in students’ texts are expressions, for example, “older generations do not necessarily know”, “our generation has learned”, “in my school time internet was not used”, and “we can maybe use ICT better than”. The general meaning of the key rhetorical strategy is that pedagogical changes happen slowly because they are seen to take place generation by generation. Students position themselves as taking responsibility in transcending boundaries between formal and informal learning through taking seriously informal practices in formal education.

Each of the four manners of speaking are discussed below in the contexts of research question 2: how manners of speaking are resources for, and obstacles to, making changes in the culture of teaching and learning; and research question 3: how manners of speaking afford and constrain students in positioning themselves to make pedagogical changes.

The quotations from students’ learning diaries given below have been translated from Finnish with minor adjustments to English to remove ambiguities. They have not been edited heavily for grammar.

4.1 Linking formal and informal learning activities

The findings suggest that there is much variation in how student teachers commit to developing teaching and learning activities. However, the common element for the main shared manners of speaking is to link formal and informal learning activities. This is actualized in student texts through renegotiating the meaning of ‘physical context’ in which learning takes place.

Initial talk as a context for making changes is weak, even negative. Students assume that use of educational technology is high and inevitable in schools today and they are not satisfied with this situation. Therefore engagement with digital technology in formal education is shaped by negative connotations implying a wish that digital environments should not be used too often in teaching and learning activities. The following example illustrates one student’s wish to resist the inevitability of digital technology in children’s learning:

After all I hope that ICT shouldn't be included in everything, since it is absolutely important for a pupil also to learn to work with people without any kind of machinery.

The data indicates that transcending the boundaries between the formal and informal use of technology is challenging for two reasons. Firstly, educational use of digital technology is seen to be quantifiable and hence a separate part of learning. Secondly, technology will distort children’s communication skills. Therefore, direct links between the educational use of technology and learning outcomes are typically not made and not discussed (see OECD 2015). This argument is strong, but, dichotomous: it is difficult to argue that skills of communication with other people are not important. However, the claim itself is a manifestation of the rule that learning in technology enhanced environments takes place too often in school contexts and furthermore does not include face-to-face interaction between people. Students’ texts highlight the power of technology to distort something they regard as important in communication between people and therefore there is resistance to analyzing pedagogical changes in detail.

An imbalance between students’ commitment and the changes they make in ‘physical context’ is also seen in routine talk. The students value digital technology environments which traditionally promote individual learning in formal settings and consequently they ignore social changes in teaching and learning practices. However, compared to initial talk social changes are accepted as taking place in informal settings. Therefore, reconciliation of formal and informal technology use is seen as problematic. Students contradictory views are manifest in seeing informal digital technology use to be part of children’s life whilst regarding it as a waste of time in the formal environment. As one student illustrates:

Children have grown up in digital world and therefore at school there is no need to waste time to learn to use digital environments.

Generally speaking, in routine talk informal digital technology use is not judged pedagogically. This position is justified by emphasizing that technology may be transferred from outside the school context into school life without making changes

in school practices. According to the data, web-based environments, except search engines, are not seen as routine environments in formal learning. Therefore teachers' main role is supporting and supplementing traditional activities without re-considering the meanings of social changes in informal settings as a basis to create new innovations in formal settings.

By contrast, rules in innovative talk are different from those in initial and routine talks. Innovative talk as a discursive context encourages students to make pedagogical changes. They consider especially physical environments which are typically associated with informal learning. Students commit to making changes emphasizing that children can at school use the skills and knowledge they have gained outside of school. Thus, in innovative talk to transcend the boundaries between formal and informal technology use is an opportunity to make changes in the teaching and learning culture. The following extract provides an example of this:

I believe that ICT is still based on computers, but instead I'd like to aim to benefit other diverse possibilities. For example to make a video in one of our projects and then together with pupils to edit and cut it until it is finished, so they can participate in every stage of the project.

The findings of this research point to seeing learning as a process that is one critical element in achieving a balance between formal and informal learning. For students this is a new way of analyzing how learning takes place. Students are used to considering learning as straightforward with clear movements from one step to another, but they do not associate this with educational use of digital technology. In innovative talk increasing the range of digital learning resources invokes students to analyze not only which informal digital environments are suitable for school learning but also how these environments can positively change teaching and learning practices, like enabling the teacher to see learning as a process rather than a product.

In generational talk students are eager to commit to developing new teaching and learning activities; however, compared to other 'manners of speaking', complexity of learning is not evaluated through the perspective of an individual teacher's attitudes and knowledge. Complexity of learning is rather seen as a requirement to teach high order thinking skills. The students point out that the role of the school is to teach children to participate in society, like how to communicate safely on the internet and how to critically analyze media content. This is illustrated in the research data as the embedding of high level thinking skills in everyday working practices. Delivering artefacts on the internet is one example. The following extract is how one student put it:

With the help of ICT, knowledge can be shared with others. For example pupil's work can be published in the internet. Wikipedia is another good example for sharing information; pupils can establish an article and publish there. It can help pupils to understand e.g. the self revising nature of science.

This example opens new social dimensions for school activities and underlines the reciprocal nature of learning. In expanding the 'physical context' of the school, the student refers to knowledge building with others. Thus, generational talk indicates the students' awareness that the educational use of digital technology is not just widening

data resources but takes account of how knowledge is created and distributed in formal and informal settings.

4.2 Accepting and avoiding uncertainty

Recently, teachers have been required to position themselves as “change agents” and develop broad understandings of learning environments (Häkkinen and Hämäläinen 2012; Ertmer and Ottenbreit-Leftwich 2013). Increased pressure to implement novel teaching and learning activities is also seen in this research. However, this research only partly supports the notion that student teachers are active agents of change. Especially in initial and routine talks, students maintain passive roles in seeking reciprocal, innovative interrelationships between informal and formal technology uses. Therefore, we argue that students’ positions toward learning are highly connected with avoiding uncertainty. In contrast, forms of involvement in innovative talk include accepting uncertainty. Students actively commit to making changes and also mistakes in order to be successful. Furthermore, in generational talk, uncertainty is partly accepted: informal digital technology usage is accepted, however, students acknowledge that their personal technological skills might be an impediment to working between the boundaries of informal and formal technology uses.

More precisely, in initial talk students make connections between formal and informal technology uses through considering their individual positions as teachers. The data suggest that instead of deepening pedagogical understanding, students’ texts emphasise competition between the teacher’s personal role and digital tools. The students are worried about being replaced by technology and this obscures considerations of the importance of the teacher’s role in the regular use of digital technology. However, despite a personal tendency to resist technology, students have observed positive outcomes if digital technology is used occasionally in teaching and learning practices. In this respect, learning to use digital technology in formal education poses a conflict between collective and self-interests. Student described this:

You can also find pupils being more enthusiastic and motivated when along with traditional teaching educational software are used, e.g. a story in a cd player or when videos are watched. Therefore it is extremely important, that ICT is used a right way and in certain amounts. Teaching cannot rely just on technology; the most important support for pupils is their own personal teacher, whom no machinery can replace.

The students do not see themselves as “change agents”; rather they stress that teachers make decisions on a personal basis about whether or not to use digital technology in teaching and learning. The data show that students are mainly secure with implementing teaching according to their own intentions and interests which are closely connected to practices without digital technology. However, simultaneously they find positive aspects in using digital technology in education, e.g. the novel possibilities in the previous extract. With regard to novel possibilities, the analysis shows that willingness to increase digital technology usage per se is weakly argued if it is not positively connected to any other aspects of learning. In contrast, if digital

technology is used only occasionally it does not diminish the teacher's personal responsibilities and thus it does not undermine the notion of the importance of the teacher. In initial talk students noticed that the role of the teacher changes from deliverer of information to 'supervisor' when digital technology is used in teaching and learning. Despite an awareness of these changes, they express their desire to maintain traditional teacher-led school practices.

Instead, in routine talk students reflect their individual positions as teachers by considering teachers knowledge, not explicitly their desire to use or not to use digital technology in teaching and learning. However, the picture that emerged from the students' texts is not consistent with the common assumption that the lack of teachers' knowledge is a prime obstacle to integrating digital technology into teaching and learning activities. The empirical findings of this research suggest that although a lack of knowledge is problematic for students, it is not construed as the preeminent obstacle in transcending boundaries between formal and informal learning. Instead, the main obstacle in making pedagogical changes turned out be the notion of a good teacher; is it possible to be a good teacher without re-thinking the nature of digital technology and its use? As one student put it:

It's critical that teacher using ICT, has the best knowledge how to use it. In the worst case ICT only complicates but disturbs teaching.

Good teaching is fluent and therefore the teacher's role is to know the best practices before she/he considers applying technology in a pedagogical sense. In routine talk it is essential that teaching occurs fluently because students argue that digital technology can either promote or hinder children's learning. However, the teacher's role is not to critically re-think how learning takes place and attempt to increase her/his pedagogical knowledge. Thus, the best practices should promote the learning conceptions the teacher already values and thinks are good. For example, to construct multidisciplinary connections across different subjects, combining for example, natural sciences and art is not a basis to increase a sense of certainty in routine talk. Instead, students expect they have to have enormous experience of technology use and learn all the features of technology before they are allowed to use it in teaching and learning. However, nowadays no-one can have comprehensive skills and knowledge about all technology. Incompetence is difficult to accept because it causes uncertainty, so it is denied in routine talk.

In contrast, in innovative talk students focus on making changes by being open-minded, curious, brave, and ready to explore new teaching and learning methods. This requires that they openly acknowledge that they need to learn new things. Consequently, innovative talk is the students' strong resource for expressing a desire to make changes. Change and the development of school culture do not happen by following safe paths or applying activities students already know. In innovative talk, daring to trust is conjoined with feelings that teachers do not have to know everything in advance of how learning might take place in the digital era. To share uncertainty helps the students to do trial and error experiments while learning to use digital technology in teaching and learning. Thus, judgments about the teaching and learning culture are rooted in a wider perspective than the teacher's personal knowledge, skills

and choices. Co-operation and shared visions makes sense. Here is how one student described her/his learning:

Surely ICT must be used in the future as it is used now; to utilize computers, software, data projectors and learning environments like moodle so everyone should learn those very important skills. They are definitely needed during university studies and also in working life. I am very enthusiastic about ICT and I will get the required skills and knowledge, as well as a supportive network to help me to dare to create and implement my visions. One shouldn't be afraid of the new and of failure because everything can be learned. You just have to make some effort for it.

The data show that daring to trust operates at group and individual levels. Firstly, learning is understood in terms of acting on and influencing shared issues within a community. Students recognize that the possibility to negotiate and share ideas about teaching and learning practices is important in the field of the educational use of digital technology. Thus, collective support and justification are conditions for innovations. Secondly, and fundamentally, rules of the innovative talk allow students to identify themselves as “change agents” underlining the meaning of their personal development. Taken together, this research supports the notion that transcending the boundaries between formal and informal learning should be integrated with ongoing participation and everyday work practices outside formal education.

Compared to other ‘manners of speaking’, in generational talk students highlight their responsibilities to understand informal technology use in formal education but lack of positive experiences weakens their commitment practically. Students discuss that children’s interests should be considered in the longer term and that lifelong learning is a part of children’s personal growth. Students evaluate informal use of technology as predominant compared to formal situations and furthermore they see that school is an isolated community of practice. However, properly used, digital technology in teaching and learning will reduce differences between formal and informal practices. Students are committed to taking into account children’s informal technology habits which also affects how teaching is implemented in formal situations. As one student put it:

Using ICT itself isn't motivating for the pupils. Computers are nowadays common and part of the learning software is just very bad. Luckily, some decent software can also be found. I have also had some positive experiences.

Generational talk is one major resource to support structures for boundary crossing between formal and informal technology uses. The data analysis shows that if educational use of digital technology is implemented properly, school is no longer an isolated community of practice. Thus, pedagogical practices can help integrate schools into other activities in society. Proper usage refers to students understanding that people are necessarily surrounded by digital technology and children should learn at school to evaluate consciously their own relationships with it.

4.3 Participation in shared work practices

This research indicates that learning for students is more individual work than shared practice. In other words, student teachers' texts emphasized taking much responsibility but minimal risk. It appears that strong individual agency limits collaborative practices which in turn are resources for transcending boundaries between formal and informal learning. Co-operation with others is constructed only in innovative talk as a basis for bridging the gap between informal and formal use of technology. Absence of collaborative culture in initial and routine talk is a strong sociocultural norm which limits students to even using words like "together", "in co-operation" or "we" while reflecting on how children or they learn. In generational talk, students tend to realize the importance of co-operation, however, creating common knowledge is fragile. Sharing practices are likely to take place out of the students' control in general and therefore commonly shared goals remain remote. To sum up, student texts emphasize individual responsibilities and minimize collaborative practices in understanding the interplay of informal and formal uses of technology.

The students' texts in initial talk and in routine talk indicate teachers' individual work as the basis of their professionalism. In initial talk this means that work at the boundaries between informal and formal technology use is typically left to someone else. The next example illustrates how increasing informal use of technology may be the basis for understanding educational use of digital technology but that the student's active participation in this change is unclear.

Possibilities in the field of technology in the future will be unlimited, due to technology's extreme development. As well as more and more younger pupils start to use ICT in their everyday life and also in their learning. I think that ICT is used in schools continuously more and more. I hope that in the future I would become inspired to orientate myself in usage with different technologies, especially if I get training.

In initial talk, the passing of responsibility for making changes to someone else is widely accepted. This is evident in use of passive expressions combined with frequency of use strategies. Passive expressions are where it is implied that educational use of digital technology is out of the students' control and their commitment to making changes remains unclear. For this reason coincidence rather than pedagogically meaningful actions describes better how children are taught at school; teachers may not be eager to participate in developing pedagogical practices while using digital technology in teaching and learning.

In routine talk teachers' individual work is also highly respected but in a different sense compared to initial talk. Students tend to identify themselves foremost as teachers whose main responsibility is to teach subject matter and thus they should anticipate how children learn in those subjects. Students made it clear that they would like to learn about the technology and apply effectively their technical know-how, but they do not share their responsibility with others. As one student put it,

In my opinion, the most important thing in schools is ICT's adaption. I mean that ICT can't be of intrinsic value in teaching and learning. There is no reason to use

ICT, if there is no actual need for it. ICT is an important field in schools and use of ICT should increase, but only if it's appropriate.

Although the attitude in making pedagogical changes is strong, the relationship between formal and informal learning is not substantial in routine talk. Students assume that digital technology potentially offers positive benefits, but they do recognise only their own roles in realising those benefits. They do not recognise that the teacher's learning can also take place in collaboration with others and therefore routine talk impedes students in overcoming the boundaries of privacy. Consequently the teacher's participation is perceived as knowing in advance exactly what and how children are learning when digital technology is used in education. Furthermore, it is perceived that the teacher knows for sure whether or not children are learning the 'correct' information.

In innovative talk the students see children and other people as active partners. Traditionally teachers' and children's participation have been seen differently in the design of teaching and learning activities in formal education; the teachers' role has been active and children's role passive. Applying informal use of technology as a means of expanding children's participation through planning of the teaching and learning activities is seen as an innovation. Co-operation with children is closely connected to everyday school work practices, and the students indicated that they are free to develop teaching and learning practices as they wish. In practice the students can, for example, choose digital tools for teaching and learning together with children. Making decisions together means that children's learning is not just learning facts but it is also about participation. Children's participation is important because they have experience about technology use outside the school. This change is seen positively in innovative talk.

In considering problems associated with making changes, the findings show that a major obstacle emerged from the notion of individual learning. Students' texts show that participation in shared work practices is weak and fragile. In innovative talk students tend to share responsibility for making changes; however, sharing is an opportunity not a necessity. Conditional expressions are clear signs of this, for example:

Teacher should altogether with other teachers and pupils find the suitable ways and facilities for using ICT.

Despite the voluntariness related to the implementation of cooperation, student teachers see that all teachers are in the same situation. Therefore, to maintain a positive attitude happens in co-operation with peers, colleagues and children, also in informal settings. Thinking through with others in the sense of seeing them as experts encourages students to trust in making changes.

According to generational talk, a sense of cohesion is constructed at generational levels. The students describe differences between generations: they see differences between in-service-teachers and themselves, and between younger people and themselves. Furthermore, student teachers tend to compare generations; their own generation is better in using digital technology in education and the younger generations are better

users of digital technology in informal settings. However, the generation effect can work positively or the other way, for example:

So I just think it is kind of a strength to me that for my age group information and communication technology is familiar, and its use in the school environment does not cause additional stress, rather, I could imagine my age reduces it, because I have learned to take advantage of, for example, many computer programs. However, if I compare my skills inside my generation I am surely behind others in many issues.

The findings of this research suggest that there is an imbalance between the students' perceptions of their position and the social demands imposed on them by virtue of being part of the so called 'net generation'. Some students hesitate about saying they belong to a 'technology savvy' generation. The research indicates that feelings of belonging to the generation are constructed individually and age is to some extent superficial in making judgments about participating in making pedagogical changes in teaching and learning.

5 Discussion and conclusion

We have examined the discursive resources and obstacles student teachers construct in their texts while reflecting on their own study in initial teacher education. The aim was to create a comprehensive picture of the manners of speaking which have arisen from the research data, and, based on the findings, indicate how rhetorical strategies reflect hidden norms and situate texts in their sociocultural and historical contexts. The findings of this research point to addressing the transition between formal and informal learning contexts by focusing on the following three aspects which emerged from the analysis of manners of speaking: (1) linking formal and informal learning activities, (2) avoiding uncertainty, and (3) participation in shared work practices. In the following sections, these three aspects are discussed in terms of how they can be addressed to find new ways of developing initial teacher education.

The findings of this study provided evidence that student teachers 'manners of speaking' afford and constrain students in positioning themselves to make pedagogical changes. Especially, initial and routine talks emphasize the obstacles rather than the resources for changing the balance between formal and informal learning. Initial talk opens resources for transcending the boundaries between formal and informal learning. Yet, generational talk is on the one hand a resource for, and on the other hand an obstacle to, making pedagogical changes. In sum, student teachers discursive contexts are complex and together they form a 'dialogical space' which suggests that sociocultural norms only partly encourage student teachers to be open-minded and eager to develop teaching and learning practices in a systematic way. Therefore, there is a need to develop teacher education in such a way that individual students can maintain their enthusiasm and commitment to making challenging changes in the beginning and during teacher training and later in their future professional work. This kind of development not only produces new knowledge but requires pedagogical shifts and risk taking in teacher education.

The long standing challenge seems to be how to train students to connect subject content knowledge and digital technology use in meaningful ways. This study suggests that student teachers' readiness for change, their attitudes towards the educational use of digital technology, and their knowledge and beliefs about learning and technology, are all critical in making pedagogical changes (Kontkanen et al. 2014, Valtonen et al. 2011a). Students texts in this research reveal that one major obstacle at the individual level is that it is difficult for them to evaluate what kind of technology use outside the school is relevant to school contexts. They recognize that it is important that children learn at school to cope in the future, however, informal ways of working are not naturally linked to formal education. This finding is in line with Wong's and Looi's (Wong and Looi 2011) conclusion that transcending the boundaries between informal and formal learning contexts still requires learning how to switch between multiple learning tasks and encompass multiple pedagogical or learning models in planning and implementing new teaching and learning activities.

This research reinforces the view that the potential learning gains from adopting some aspects of the open and entertaining ways of life offered by digital technologies are not yet understood in formal education (Veletsianos 2013; Koutromanos and Avraamidou 2014; Sharples 2015). Entertaining aspects of informal technology use are totally missing in students' texts. Therefore, in teacher education it is important to acknowledge that reconciling informal and formal modes of learning is challenging even for scholars. However, according to this research, accepting uncertainty as a natural characteristic of learning is extremely uncomfortable and established sociocultural practices limit possibilities to cross borders.

Our findings show that commitment to direct reliance on a teacher and placing emphasis on generalized learning behaviours is strong. For this reason, this research reinforces the assertions of Margaryan et al. (2011) that conventional, passive and linear uses of technology tend to be associated with formal education. Sharples (2015) notion that learning can occur anywhere and knowledge formed in one setting can be applied in another is very little evident in this research. In order to accept uncertainty and find novel ways of understanding learning, it is suggested that students systematically as a group discover new perspectives during their teacher training and attempt to apply these changes in practice. This can be achieved through practical interventions which take into consideration issues related to students' everyday life in a broad sense. However, it is clear that an understanding of rapidly changing digital technology habits in formal settings cannot be achieved by drawing on traditional cultures and individual means of implementing education. Instead, there is a need to develop innovative practices in teacher education collectively to build a shared understanding of the possibilities of new work practices (Hökkä and Eteläpelto 2014).

The key question in teacher education is how to find novel ways to implement learning practices by involving collaboration between students in boundary transcending between formal and informal contexts. Thus, this research is in line with previous findings which indicate that an effective collaborative learning culture is not easily adopted in teachers' learning practices (Darling-Hammond 2006; Kukkonen et al. 2011; Valtonen et al. 2011a; Hökkä and Eteläpelto 2014). Prospective students prefer an individual learning culture and clear instructions. This confirms the evidence of previous research that students are not advanced technology users (Warschauer and Matuchviak 2010; Fry and Seely 2011). However, in our case advanced technology

skills refer to the ability to creatively apply technological skills and experiences pedagogically. This research indicates that students' narrow understanding of the flexibility of technological possibilities is linked with their perceptions of their personal and professional positions. To blend professional ideas or to share professional information happens only occasionally. Sociocultural rules that underpin the individual as the active director in bridging formal and informal learning practices are extremely strong. It is argued that building understanding of the creation of new working practices in teacher education is something that should be shared between students and teacher educators. Reducing social boundaries at a cultural level means that students and teachers should dare to trust each other and to work together systematically in seeking novel pedagogical practices because even if digital technology is changing rapidly pedagogical issues seems to remain much the same.

Compliance with ethical standards

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