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Published in:
Design for Learning

Publication date:
2010

Document Version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Davidsen, J., & Georgsen, M. (2010). ICT as a tool for collaboration in the classroom: Challenges and lessons learned. *Design for Learning*, *3*(1-2), 54-69.
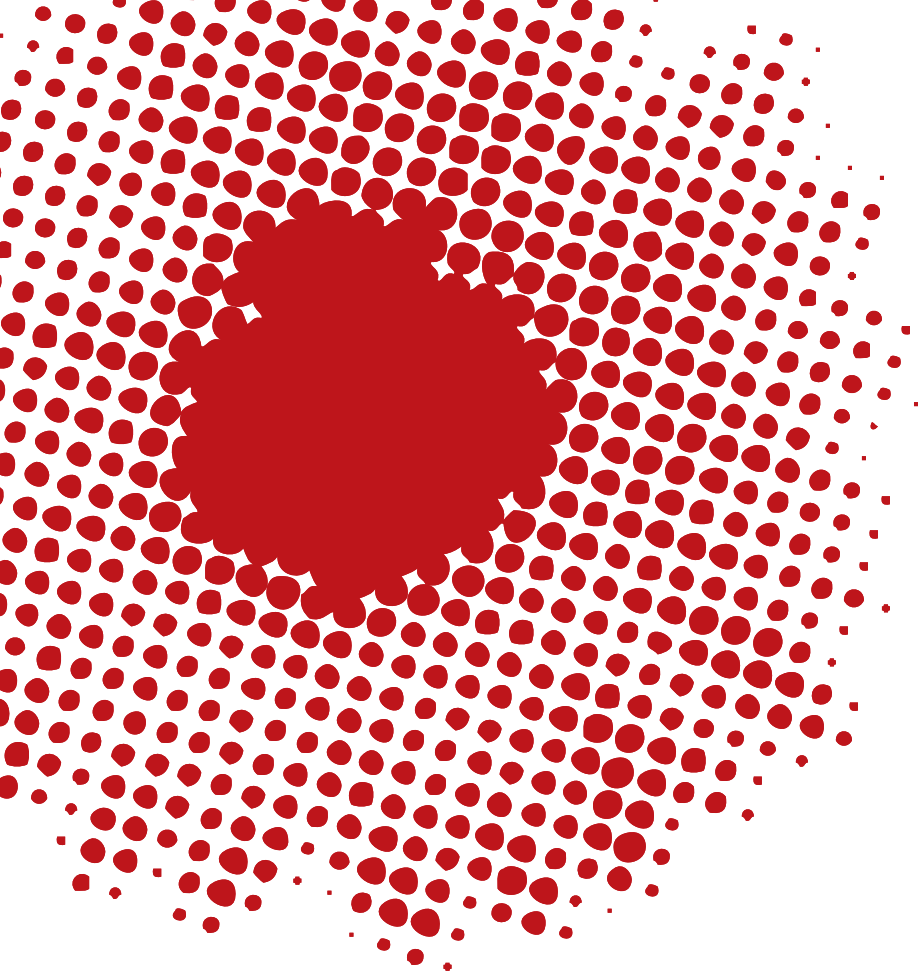http://www.designsforlearning.nu/10/no1_2/DFL_0102_10_davidsen_georgsen.pdf

DESIGNS FOR LEARNING

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ICT as a tool for collaboration in the classroom – challenges and lessons learned

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This paper presents data and results from a study on collaboration and self-directed learning in two second year-classes in a Danish school. Learners at ages eight and nine use interactive screens as a learning tool, and more than 150 hours of video data have been collected from the classrooms over a period of ten months. Through detailed inspection of video data, patterns of interaction and ways of collaborating are analysed. Analyses show that the participation patterns of the young learners are crucial to their learning outcome, and also that the role and actions of the teacher are decisive factors in the successful employment of this specific learning design. This paper presents examples of detailed analyses of parts of the data material. Among other things, findings include that collaboration between learners have gender issues, and that addressing topics such as collaborative and communicative skills require careful pre-teaching planning and classroom-observations by the teachers in charge.

INTRODUCTION

The use of information and communication technologies (ICT) in schools has been a high priority issue for changing Danish governments over the past 20 years. However, a recent report documents that much is still to be achieved within this area and that in many instances ICT is used without being sufficiently integrated into the teacher's pedagogical practice (Danmarks Evalverings institut, 2009). In order to develop the use of ICT further, there is a need for ways of developing teachers' qualifications within the area of pedagogic ICT-use, and a need for practice-related and use-oriented qualifications development, the report concludes. In a recent paper focusing on three Scandinavian countries, it is claimed that "teachers play a crucial role in redeveloping schools into modern, technology-enhanced institutions" (Ottestad, 2010).

To understand the interplay between ICT and teaching and learning practices, the study presented here focus on the actions and interactions in two classrooms, as teachers engage themselves in the process of taking interactive touch-screens into use in two second year-classes over a period of ten months. At the school in question, Western State School[1] (WSS), local development projects are integrated into the daily life of the school and the work of the participating teachers, thus making sure project activities are firmly rooted in the culture of the school, and furthermore that tools, materials, ways of teaching

and learning fit into the organisational culture and other structures.

Over the last few years, investments in interactive whiteboards (IWB) have increased in the educational sector in Denmark, and some even view IWBs as a learning revolution with its possibilities for multimodal presentations. However, research into the expected transformative powers of IWBs shows that the learning revolution presupposes a change in pedagogic and practical use of IWBs in classrooms (Gillen, Staarman, Littleton, Mercer & Twiner, 2007). Furthermore, change in pedagogic practices needs to be driven by educational rather than technological purposes (Mercer, Hennessy & Warwick, 2010). The evaluation of use of ICT in Danish schools (Danmarks Evalueringsinstitut, 2009) concludes that teachers need further education in order to benefit from the features of the IWB. Similarly, Littleton claims that "as technologies change and develop, teachers need support, time and space to explore the associated implications for their pedagogy and practice" (Littleton, 2010). Comparing our research to studies done by Mercer, Twiner, Littleton and others, similarities and differences emerge. The most profound difference is that Mercer et al. study how the use of one IWB in each classroom can support a pedagogical transformation of the classroom activities into a more dynamic and dialogic direction. The work reported on in this paper aims at putting the technology into the hands of the learners, in addition to the teacher, and furthermore the research approach is inspired by dialogue design (Nielsen, Dirckinck-Holmfeld & Danielsen, 2003) and is oriented towards studying the interaction between all participants in the actions, teacher-learner as well as learner-learner. More specifically, you could say that our focus is on exploring the possibilities of a specific digital set-up serving as a framework for the teaching and learning activities.

At WSS, eight computers with 22 inches interactive touch-screens have been provided as tools for the children's learning, supplemented with one interactive whiteboard to be used by both teacher and learners. In this design for learning[2], learners are expected to collaborate and communicate when solving the tasks they are given, and the teacher is referred to a less central position than what is usually seen with such young learners. A number of issues can be observed in the data material; however, in this study three interrelated themes are at the forefront:

1. Letting students guide each other in the learning process;
2. The notion of intersubjectivity and the teacher's role in cultivating it;
3. The role of the teacher and also of the learners in the learning partnerships.

Setting the scene

The project "Move and Learn" at WSS has an overall focus on ways of supporting collaboration, interaction and experimental forms of learning through the use of interactive screens in the classroom. In other words, focus is on

how children can learn together in pairs with the touch-screens as a mediating artefact, rather than on how the teacher can use the IWB as a multimodal resource for orchestrating classroom dialogue (Twiner, Coffin, Littleton & Whitelock, 2010). At WSS, flexible arenas for learning have been designed, and project Move and Learn specifically targets ways of combining movement and learning within the boundaries of the classroom. The project aims to support and develop multiple ways of learning, with use of both auditory, visual, tactile and kinesthetic approaches and forms. Most importantly, perhaps, is the development of collaborative skills and student centred teaching methods through use of the interactive screens.

For years, teachers at WSS have taken part in formal training, but also in informal peer-to-peer learning, and school management has been attentive towards the needs for flexibility and extra resources needed in experimental work. An important guiding principle for WSS is to let further teacher education and development take place within the school itself. Through project work, personal and professional qualifications of the teachers are further developed.

To create more flexible teaching and learning spaces, classrooms have been fitted with individual work spaces for each pupil, facing against the walls of the room. This allows for a fairly sheltered work space for each child, and leaves the centre of the room available for a wide range of activities (se figure 1 below).
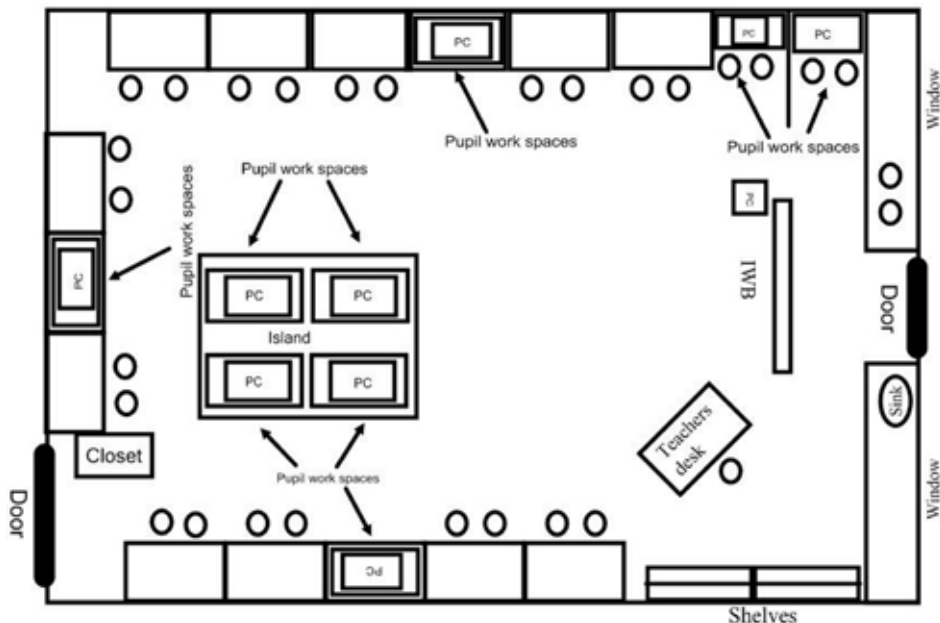

Figure 1. Classroom layout with work spaces along the walls and in the centre of the room

At one end of the room the teacher has a work space, situated next to an IWB. The eight computers with touch-screens have been placed along the walls and in a group at the centre of the room. When the pupils work with the touch-screens they move to new seats, both in order to get to where the screens are, and in order to team up with their partner for the exercises. This technology has been introduced into all subject matters, although the actual frequency and extent of use varies from teacher to teacher and also over time for the individual teacher. Usually teachers will design their own materials for the computer based exercises, but in some instances also use the interactive screens as "regular" computers and e.g. play educational games from internet resources. In the process of taking the screens into everyday use, several pedagogical and qualifications-related themes have emerged for both teachers and learners. The teachers decided to always let learners work in pairs to strengthen collaboration and dialogue between them. The general philosophy is to enable and support learners to work and learn in different ways. Most importantly though, the collaborative skills of the learners would be strengthened, and dialogue between learning partners was expected to add to both the experience and outcome of the learning.

The focus of this study

As part of an overall interest in how the potentials of ICT in learning and teaching are realised, in this study we specifically look into ways of using technology in a design for learning which supports collaboration between young learners. Based on a sociocultural understanding of learning (Dysthe, 2003; Rogoff & Wertsch, 1984; Säljö 2003; Vygotsky, 1978, 1986), the idea of letting students guide each other in the learning process is explored here. This is inspired by Vygotsky's well-known concept *zone of proximal development* (Vygotsky, 1978), where the learning of one person is guided by a more capable peer, thus taking the learner's activity in new directions. However, in Vygotsky's understanding it is unlikely that this more capable peer would be a child, let alone a child at the same age as the learner in question. It remains to be explored how and to what extent young children can serve as more capable peers to each other, and what communicative and collaborative skills this re-quires. Furthermore, the concept of intersubjectivity as presented by (Rogoff & Wertsch, 1984) is of great interest in this study. Three definitions of intersubjectivity are offered by Matusov (2001):

1. Intersubjectivity as having something in common;
2. Intersubjectivity as coordination of participants' contributions;
3. Intersubjectivity as human agency.

The differences in these definitions are among other things a question of the quality of the collaboration and dialogue between learning partners, which subsequently has implications for the learning outcome. An important ques-

tion in teaching concerns the ways in which a teacher can cultivate intersubjectivity between students, and ultimately teach students to do so themselves. A third issue of great importance in the process of changing teaching style is the question of the role of the teacher. In this case, for the teacher to take on the role as a peripheral guiding resource is a radical turn from a traditional teacher-centred way of instruction.

As mentioned above, our research aims at exploring the *learning potential in collaborative work*, the challenges related to establishing *learning dialogues between young learners, and their use of external resources* in the process of learning. In the following, this will be the focus of analysis as we go through a small part of the data material. In addition to looking for use of external resources, we will also analyse communicative aspects of the collaborative work. Partly because the use of learning resources often takes non-explicit forms, and becomes observable only when the students enter into dialogue; and partly because through analysis of the communication patterns, the roles of the learners and ways of participating in the shared work become clearer. Inspired by Matusov's definition of intersubjectivity as coordination of contributions (Matusov, 2001), we offer a closer look at the learning partnerships between the learners. In relation to this, we also look at how the teacher may make a difference – how can intersubjectivity be cultivated by the teacher without falling into the trap of teacher-centred classroom management? In this paper we have selected an example extract from the data material to illustrate how these issues are seen in the interactions between the learners. The analysis of this extract serves as illustration of the analytic approach taken in the study. In this paper it also serves as an introduction to a discussion of the pedagogic implications of what we see in the data (see analysis and discussion sections below).

RESEARCH DESIGN

The overall research design is inspired by both ethnography (Blomberg, Giacomi, Mosher & Swenton-Wall, 1993), dialogue design (Nielsen et al., 2003), action research (Coghlan, 2005), and ethnomethodology (Clark, 1996; Psathas, 1979). In other words, we engage in practice studies and focus on both phenomenons of interest and on their context as well as the environment of the users. A pivotal point in the research design is to meet the participants as *local experts* and to establish a joint learning partnership with them (Tiller, 2000). The concept of *mutual learning* as described by (Nielsen et al., 2003) serves as a guiding principle for the way we interact with the social practice. As Blomberg et al. write, this type of research "involves an iterative, improvisational approach to understanding, wherein partial and tentative formulations are revised as new observations challenge the old, and where adjustments in research strategy are made as more is learned about the particular situation at hand" (Blomberg et al., 1993). Thereby the analytical foci in this study evolve and get adjusted as situations are observed and analysed by the researchers and the practitioners. This research design is emphasised with its *going-back-*

and-forth-process between the world of the researcher and the world of the social practice. Compared to Design Based Research (Barab & Squire, 2004), this is a slightly different approach, as our interactions and interventions with the field of practice are not driven by theory or curriculum. We are interested in studying how teachers teach and learners learn within the framework of this design, rather than evaluating the outcomes or the performance of the teachers based on some theoretical assumptions.

Mercer et al. (2010) report on a design for learning where IWBs and a dialogue based approach to teaching (Alexander, 2008) has been deployed in English schools. The authors find that IWBs can support children's collaborative learning, "when used within the context of a 'dialogic' pedagogy and appropriate collaborative tasks". In project Move and Learn we identify some of the same characteristics, especially a need for teachers to explore and develop pedagogies for a digital collaborative learning environment. Mercer et al. study the IWB as a communication and teaching tool in whole-class environments, while we study how touch-screens can facilitate dialogue, learning and collaboration in a symmetrical partnership. For the purpose of studying the actual interaction in the classrooms as well as conducting a broader case study related to capacity building and integration of ICT into pedagogical practices, a multitude of techniques were used in the data collection process:

- On site-observations
- Interviews and informal conversations
- Photography
- Online reflections from participating teachers (blogging)
- Logging events in the lives of the two classes
- Video observations
- Separate video feedback-sessions with teachers and ICT-advisor

For the purpose of this part of this study, only video observations and video data will be discussed. The video recordings capture communication, interaction and collaboration between learners, and through analyses provide valuable insights into classroom management; the interactional patterns of the participants; and how the work and behaviour of the learners is influenced by the teacher and other learners. Observation through video must be seen as something else than a reconstruction of events. It is a form of *direct observation* and should be seen in contrast to observational methods that rely on some sort of story telling in their way of capturing and representing data (Jordan & Henderson, 1995, p. 51).

In the process of grounding and validating our understanding of the actions taking place in the classrooms we tested our analytical themes with the teachers during feedback sessions. At first, our interpretations of the recorded situations were based on a *quick and dirty analysis* of the video material. In preparation for the video sessions, we made thorough interaction analy-

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ses of selected sequences and subsequently presented the video extracts for the teachers together with transcripts of the interaction. The sessions helped bridge the gap between our understanding of the social practice and that of the far more knowledgeable teachers. Furthermore, this activity gave the teachers deeper insight into the actual communication, interaction and collaboration of the learners. Thus the feedback sessions made it possible both to validate our interpretations and to add new perspectives to the understanding of the teachers, all inspired by the theoretical framework in the analytical approach and made possible by the video data.

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THEORETICAL CONCEPTS ON LANGUAGE,
ACTION AND PARTICIPATION

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Developing collaborative skills is an important pedagogic aim of the project at WSS. In order to focus on this aspect in the analyses below, we briefly introduce a conceptual framework for the concept of collaboration. The framework draws on research within computer supported collaborative work (CSCW) which is concerned with the study of both the "ongoing dynamic articulation of activities and the cooperative management of the mechanisms of interaction themselves" (Schmidt & Bannon, 1992). The concept of collaboration as a multi layered activity poses a challenge to any analysis of collaborative work, and therefore some a priori understanding is helpful. CSCW-researchers Neale, Carroll & Rosson (2004) suggest a taxonomy to illustrate the differences in demand of the work for information sharing or communication. Bearing in mind that a professional work context is different from a learning context for young learners, we still find it fruitful to look at the hierarchy of interactional patterns described by Neale et. al.:

- Light-weight interactions
- Information sharing
- Coordination
- Collaboration
- Cooperation

Cooperation is seen to be the most demanding form of work coupling, although a strong demarcation line can be drawn between levels 1 and 2, and the remaining levels. According to the authors "Cooperation is the highest level of work coupling, and it demands the *greatest amount and highest quality of communication.* People at this level of work coupling have shared goals, common plans, shared tasks, and significant consultation with others about how to proceed with the work." (Neale, Caroll, & Rosson, 2004). When it comes to participation in communication, American psychologist Clark suggests three categories or types of participation, described as the roles of *participants, side-participants,* and *non-participants* respectively (Clark, 1996). An important issue is the fact that people get ratified as participants as the joint activity gets

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initiated and carried out; roles are not always assigned to people prior to the activity and may very well change during the joint activity. The roles emerge only as the nature of the joint activity becomes clear. Combined with the forms of coupling work described above, it seems likely that learners would position themselves as participants in order to contribute fully to the collaborative effort. However, as illustrated in the analysis below, this is far from always the case.

In addition to the roles participants can have, Clark identifies four *levels of action* in language use (ibid, p.17):

1. High level, e.g. negotiate deals, gossip, get to know each other;
2. Lower level, e.g. categorize things, refer to people, locate objects for each other;
3. Still lower level, e.g. produce utterances for each other to identify; and
4. Lowest level, e.g. produce sounds, gestures, writing for each other to attend, see, hear.

As the example presented below shows, a large part of the interaction between the children takes place at the lowest level of action, i.e. in a physical and often non-verbal manner (see lines 15-22 for an example). It is our claim that learning to collaborate involves learning to verbalise your intentions and also to listen to and adjust your actions in reflection on the opinions of other learners, and last, but not least, to disagree in a respectful manner. This strongly relates to the concept of cultivating intersubjectivity between learners - e.g. high level language use and cooperation/collaboration between learners can result in a higher degree of intersubjectivity. These concepts mutually influence each other in the theoretical understanding of the interactional patterns seen in the data.

INTRODUCTION TO DATA ANALYSIS

As a general approach, we are interested in researching interaction as understood from the phenomenological perspective. Furthermore, two aspects of our understanding of language should be noted: 1. Language is *use of language*, which means that focus is on what people do with language, and 2. Language is seen as an integrated part of the total interaction of the participants. Interaction covers both verbal and non-verbal language use, gesture, bodily movements and use of artefacts.

In the following section, a detailed analysis of a one minute, 8 seconds-long sequence is presented, in which several themes are pursued. The overall theme of the analysis is the interactions of the learners, seen within the perspective of *intersubjectivity*. This issue gives rise to a number of sub-themes which appear in a more or less mingled whole. The sub-themes are: *the use of resources in the learning process, the modes of participation*; and finally *construction of*

participants' roles. Both the verbal (in bold text) and the bodily interaction (in plain) are covered in the transcripts. Due to limited space, we have included only one example of data-analysis in this paper.

<div align="center"><em style="color:red">"Work together now, children!"</div>

In the following extract from the video data, pupils Julie and Peter are working on an assignment in Danish. The teacher has introduced the task and the pupils are now working in pairs. Their task is to form sentences by drawing lines between the words on the screen (see figure 2 below). Learners have been told to collaborate on the task, but have been given no specific instructions how to do this. Julie and Peter have been working on the assignment for five minutes and up till now, only Julie has touched the screen to create sentences. Prior to the events in the extract below, Julie has completed the sentence "Otto wants to watch a movie", and is now about to move on to make a new sentence. Julie and Peter sit side by side on stools in front of the touch-screen, facing the screen.
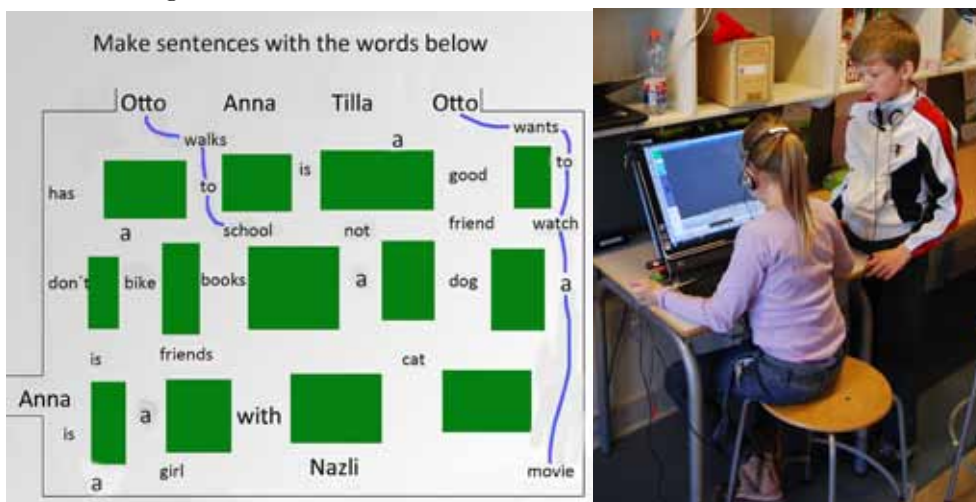

Figure 2-3. Work sheet with preprinted words to be connected into sentences. Pupils working in the classroom (to the right).

1. **Julie:** (moves her right index finger over the screen, drawing a line between
2. words): **Otto wants to see a movie okay**
3. **Julie:** (her right index finger touching the screen): **Tilla is a**
4. **Peter:** (points to the screen with his left index finger)
5. **Julie:** (pushes Peter's hand away with a fast motion of her right hand)
6. **Peter:** (hand on table): **.. cat** (turns his face towards Julie)
7. **Julie:** (scrolling with her right index finger in front of Peter, face towards screen):
8. Laughs
9. **Peter:** (face towards Julie): **Laughs**
10. **Julie:** (pointing to left side of the screen): **Anna is a girl** (Raises her right hand

11. to top of screen, selects drawing tool)
12. Peter: (points at screen with his left hand to the word ANNA).
13. Julie: (pushes away Peter's left hand with her own right): Stop it (holds on to
14. Peter's left hand)
15. Peter: (points with his right hand towards the word ANNA at the bottom left;
16. Julie pushes it away and grabs it with her right hand): Anna is (Peter lifts his
17. right hand and points towards ANNA; Julie pushes him away) a girl
18. Peter: (draws a line on the screen with his right index finger, Julie points t
19. wards the drawing tool at top left corner of screen)
20. Julie: Eeeii Peeeter (Julie grabs Peter's right hand with her own right, pushes
21. it away from screen to the right) Now we're wiping it
22. Peter: (face towards screen) laughs
23. Julie: (selects eraser tool with her left hand, moves hand to lower left corner
24. and wipes her finger across the screen)
25. Peter: (points towards eraser tool, touches screen, with his right hand. Moves
26. hand to bottom left, moves his hand on the screen surface): Laughs. Stop it I
27. drew some too
28. Peter and Julie: (moving their hands across the screen in big wiping mov
29. ments, clearing the screen of lines. Peter leans his head towards Julie, touching
30. her shoulder)
31. Julie: (pushes her body to the right pushing Peter away from her, points her
32. right hand towards the drawing tool): There Peter now you can have a go
33. Peter: (sits upright on his chair, arms at the sides and hands on the edge of
34. the table)
35. Julie: Please can I do it (Julie points her right hand to the word ANNA and
36. touches the screen)
37. Peter: (reaches for the bottom left side, and Julie pushes his arm away. Peter
38. grabs her right arm with his left)
39. Julie: (still pointing to the word ANNA, leaning forward towards screen): Please
40. peter
41. Peter: (pulls at Julie's right arm with his left hand)
42. Julie: (touches the word ANNA with her left hand and pushes Peter away from
43. the screen with her body)
44. Peter: (points to middle lower area of the screen and moves his hand rapidly,
45. drawing a line as he does so)
46. Julie: (leans forward, pushes Peter away, reaches for top left hand side of the
47. screen). Peter I'm going to tell on you
48. Peter: (moves his hand behinds his back, tries to sit on them. Leans away from
49. the screen, further away than before): Go on then tell on me
50. Julie: (facing the screen, reaching for the top left hand side; selects a tool)
51. Julie: (moves her right hand across the screen in wiping movements): Eeiiij I
52. picked the smallest eraser
53. Teacher: (voice heard from a distance): Peter do you focus on the task?
54. Peter: (turns his head to the left when the teacher talks): It's because she
55. won't let me have a go
56. Julie: (facing the screen, moving her finger across the screen): I do let you
57. Teacher: (voice heard from a distance): You need to work together on this
58. one right Julie

59. **Peter:** (stretches his body away from the screen, left hand to face, brushing
60. with back of hand)
61. **Julie:** (facing the screen, left hand index finger moving): Yes
62. **Julie:** (takes her hand away from the screen, turns head towards Peter)
63. **Peter:** (leans body forward a little, reaches for the word ANNA with his left
64. hand. Pushes Julie away with his body, leans to the left, pushing his body in
65. front of Julie's).

Patterns of interaction in the data example

In this short extract several interesting issues emerge in the light of the theoretical concepts. The level of interaction between the two learners can be characterised as *lower level* and *still lower level* in use of language. The pupils are told to collaborate, and yet their conversation is based on *light-weight interactions.* Primarily, the children focus on their individual interactions with the screen and rather less on each other. In line 3, Julie starts a sentence by saying "Tilla is", but does not pick up on Peter's suggestion "cat" (lines 4 and 6). Instead of this, she initiates a new sentence: "Anna is a girl" (line 10). This is a critical moment in the collaboration process, as it turns out later that the learners never return to Peter´s suggestion. Thus his contribution is not accepted, and he becomes a ratified side-participant, at least in the academic work. This is demonstrated even stronger in the following when Julie eliminates Peter´s contribution by wiping it off the screen (lines 26-41).

This example also shows how the interaction by the teacher has the potential of including Peter further in the work. Throughout most of the situation, Peter's participation is controlled by Julie. Both physically and verbally she keeps Peter out of the problem solving. The attention of the teacher seems to be attracted by the fact that Peter pulls himself away from the screen (lines 48-50). Her inquiry into whether Peter is focused on the task reveals her preconception of the situation. When Peter complains about Julie not letting him participate, the teacher tells Julie that they need to "work together" and is satisfied by the answer "yes" from Julie. However, in the continued interaction between the two learners (not included in the transcript here) the pattern of participation does not change; Julie continues to control it. This short interaction between the teacher and the two learners illustrates a key finding in the data material in general: There is very little common ground in the understanding of the concept of collaboration between the teacher and the learners. Furthermore, it is often found that the interaction between learning partners is dominated by light weight interactions and low level communication.

In the design for learning in question, the learners are expected to share the main learning artefact (the touch-screen) between them as a shared problem solving space. As illustrated in the example above, access to the screen can be absolutely critical to the mode of participation. In this example, which is one of many we have found it the material, the verbal contributions of one

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learner have almost no impact on the actions of the learning partner (see lines 7; 15; 18-19 for examples), and it seems that only by touching the screen will you be ratified as a participant. Peter maintains a role as side- or non-participant for the majority of time he is working with Julie, and even the intervention made by the teacher only changes this for a very short while. This sequence illustrates issues related to Matusov's concept of intersubjectivity very well. It is unclear what Julie agrees to in line 61 when saying "yes"; however, it is clear that for a short while the intervention of the teacher affects the interaction between the two learners, but with no long-term impact. In terms of learner behaviour, it seems that the collaborative potential of the technology is not exploited in this situation. This situation also raises the question of what the teacher can do to guide the learners' participation patterns towards a higher level of communication and a deeper level of collaboration. This issue is also discussed by Mercer et al. (2010) who identify three "talk skills" for dialogic teaching and learning, namely disputational talk, cumulative talk and exploratory talk.

DISCUSSION

The data material in this project allows us to study a range of different issues, which we will do in future work. In the following, we focus on four selected issues illustrated by the data-analysis above: Video data in research and development; how to teach collaborative skills to young learners; the role of the teacher in supporting participation in learning partnerships, and finally the affordances of the touch-screens and design for learning.

Video data in research and development

Mutual learning between researchers and practitioners is fundamental to the research design applied. Among other things, the learning process was facilitated through video feedback sessions with both the teachers and the ICT advisor, who was also the project leader. As described above, the sessions helped bridge the gap between our understanding of the social practice and that of the teachers. Through close scrutiny of carefully selected sequences from the data set, the teachers saw their work practice and routines in a new perspective. Seeing what went on between two learners prior to the intervention of the teacher was an eye-opener; as was the opportunity to carefully study the interactions between pairs of learners. As a consequence of our first feedback session, the seating arrangement in the classroom was changed; some of the learning partnerships were changed; and least but not last, the teachers decided to listen longer before intervening in conflicts between the pupils. It should be added, however, that to benefit from video feedback sessions, a considerable amount of preparation is needed, both in selecting and transcribing video sequences, and also in ensuring openness and trust in the group of participating co-workers. It became clear in the very first session that the video recordings give a varied picture of what goes on in the classroom, and to share

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problematic issues requires both trust and professionalism in the group.

How to teach collaborative skills

One objective of project Move and Learn was to develop the collaborative skills of the children. However, data shows that there is very little common ground in relation to the term "collaboration" itself, and it seems that there is a missing link between the goal and the actual teaching activities. In many of the situations we have observed, collaborate appears to be used as a term without sense and meaning in the context. According to Vygotsky, a more capable peer can guide the learning activity of a child, but how can children learn from each other in an almost symmetrical partnership? We find it important that the teachers specify the necessary competencies in collaboration between young learners, and furthermore describe the levels of action and language which are part of the learning goals for the second year classes. Even if learners verbalise their thoughts in a mutual partnership it is still difficult to judge how interactions on the interpsychological level influence the intrapsychological level – or in other words, how their (inter-)actions influence their learning. In order for the learners to benefit from the social memory in the classroom, different ways of shaping intersubjectivity in class must be addressed by the teacher. More specifically, different forms of participation in collaborative activities could be rehearsed through exercises.

Participation patterns in learning partnerships – two examples

Clark (1996) claims that the roles of the participants emerge only as the nature of the joint activity becomes clear; this can be said to be true for the collaboration of the children. However, the data also show that both the activity itself (e.g. creating sentences by drawing lines between words) and the situation around it (e.g. the division of labour between the learning partners; the goal of the activity; etc.) become subject to negotiation between the children. Quite often the learners fail to agree on both goals and how to proceed with the work. With a low language level, many issues remain unsolved throughout the session and hinder true cooperative approaches. To the surprise of both ourselves and the teachers, we found what appear to be some quite striking gender issues in the participation patterns observed. The data documents numerous instances of an asymmetrical power relation between girls and boys in the learning situations. Often the girls seem to control the situation, and with both verbal and physical means control access to the touch-screen. What from a distance looks like boys acting up and causing disturbances in the classroom, is quite often a reaction to being put in a role as side- or even non-participant by a female learning partner. Interestingly, we also found that even if the boy is kept in a pattern of limited participation he is not completely expendable. If he leaves the table, his partner will often stop or slow down her work until he returns. This pattern of keeping the partner in the role of an audience we find intriguing, and this will be explored in future research.

The affordance of the touch-screens and design

It could seem that the interactional patterns described above were bound to happen, and to a certain degree we agree. In future development for educational use, designers of touch-screens and software should address these problems when designing for children's collaboration and dialogue. However, it is not merely a matter of technology since digital collaborative classroom environments and pedagogical designs need to be addressed as well – especially in the teaching practice. We find that qualifications development is a key stone within the discussion of transforming the interaction of the classrooms to reach a higher degree of collaboration and intersubjectivity.

In this study, the touch-screens support only single touch, meaning that one person at the time can manipulate the screen. This is a restraint for collaboration in some sense, but it could also force the children into a discussion before touching the screen. In the near future, WSS will introduce multi-touch screens in the classrooms and we will study how this may influence the interactional patterns and the collaboration between the learners. A question for further exploration is: How to support the learning journeys of the children through the interactivity of the touch-screens combined with a collaborative and dialogue inspired pedagogical framework?

CONCLUDING REMARKS

Our findings suggest that a design for learning which emphasises collaboration, dialogue and learning partnerships requires an explicit and elaborate understanding of these concepts for teachers as well as learners. This will help teachers give meaningful feedback and make supportive interventions when needed. Furthermore, the pre-understandings in relation to interaction patterns of the pupils play a critical role for the teacher's view of the activity in the classroom, and therefore also for how he or she can cultivate intersubjectivity between learners.

Overall, we have seen a design for learning where technology becomes a resource for the learners as well as the teachers. This leads to a less teacher-centred form of classroom management which on the one hand gives room for some learner autonomy but on the other hand is influenced by the competing agendas of the learners.

Finally, the introduction of technology as a learning tool in the classroom poses a challenge to the pedagogic approach, the teaching materials as well as the role of both learners and teachers. Clearly, there is also a potential for developing learner-centred teaching, and supporting independent work of collaborating pairs or groups of pupils. It is vital, however, that the new roles of the teachers are explored in authentic classroom settings through the daily interaction with learners and the new technology.

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Acknowledgements

[1] The names of the school and all participants have been changed by the authors.

[2] By design for learning we mean the totality of three elements: The physical surroundings and layout of the classroom; the digital resources and technological framework; and finally the learning materials and activities designed by the teacher.

References

Alexander, R. (2008). *Towards dialogic teaching: rethinking classroom talk* (4th ed.). Dialogos.

Barab, S., & Squire, K. (2004). Design-Based Research: Putting a Stake in the Ground. *Journal of the Learning Sciences*, 13(1), 1. doi:10.1207/s15327809jls1301_1

Blomberg, J., Giacomi, J., Mosher, A., & Swenton-Wall, P. (1993). Ethnographic Field Methods and Their Relation to Design. In *Participatory design: Principles and practices* (pp. 123-155). Hillsdale, NJ: Lawrence Erlbaum Associates.

Clark, H. (1996). *Using Language*. Cambridge University Press.

Coghlan, D. (2005). Kurt Lewin on Reeducation: Foundations for Action Research. *The Journal of Applied Behavioral Science,* 41(4), 444-457.

Danmarks Evalueringsinstitut. (2009). IT i skolen. Undersøgelse af erfaringer og perspektiver (p. 97). Danmarks Evalueringsinstitut. Retrieved from http://www.eva.dk/eva/projekter/2008/it-i-folkeskolen/projektprodukter/it-i-skolen-erfaringer-og-perspektiver

Dysthe, O. (2003). *Dialog, samspil og læring* (1st ed.). Århus: Klim.

Gillen, J., Staarman, J. K., Littleton, K., Mercer, N., & Twiner, A. (2007). A 'learning revolution'? Investigating pedagogic practice around interactive whiteboards In *British primary class-rooms. Learning, Media and Technology*, 32(3), 243. doi:10.1080/17439880701511099

Jordan, B., & Henderson, A. (1995). Interaction Analysis: Foundations and Practice. *The Journal of the Learning Sciences*, 4(1), 39-103.

Littleton, K. (2010). Research into teaching with whole-class interactive technologies: emergent themes. *Technology, Pedagogy and Education*, 19(2), 285. doi:10.1080/1475939X.2010.491240

Matusov, E. (2001). Intersubjectivity as a way of informing teaching design for a community of learners classroom. *Teaching and Teacher Education*, 17(4), 383–402.

Mercer, N., Hennessy, S., & Warwick, P. (2010). Using interactive whiteboards to orchestrate class-room dialogue. *Technology, Pedagogy and Education*, 19(2), 195. doi:10.1080/1475939X.2010.491230

Mercer, N., Warwick, P., Kershner, R., & Staarman, J. K. (2010). Can the interactive whiteboard help to provide 'dialogic space' for children's collaborative activity? *Language and Education*, 24(5), 367. doi:10.1080/09500781003642460

Neale, D., Caroll, J., & Rosson, M. B. (2004). Evaluating Computer-Supported Cooperative Work: Models and Frameworks. Presented at the CSCW'04, Chigaco, Illinois: ACM.

Nielsen, J., Dirckinck-Holmfeld, L., & Danielsen, O. (2003). Dialogue Design–With Mutual Learn-ing as Guiding Principle. *International Journal of Human-Computer Interaction*, 15(1), 21.

Ottestad, G. (2010). Innovative pedagogical practice with ICT in three Nordic countries - differences and similarities. *Journal of Computer Assisted Learning*. doi:10.1111/j.1365-2729.2010.00376.x

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Psathas, G. (1979). Everyday Language. *Studies in Ethnomethodology*. New York: Irvington.

Rogoff, B., & Wertsch, J. V. (1984). *Children´s Learning in the "Zone of Proximal Development". New directions for Child Development* (Vol. 1984). Jossey-Bass Limited.

Säljö, R. (2003). *Læring i praksis : et sociokulturelt perspektiv*. København: Hans Reitzel.

Schmidt, K., & Bannon, L. (1992). Taking CSCW seriously. Supporting articulation work. *Journal of CSCW*, 1, 7-40.

Tiller, T. (2000). *Forskende partnerskab : aktionsforskning og aktionslæring i skolen*. Vejle: Kroghs Forlag.

Twiner, A., Coffin, C., Littleton, K., & Whitelock, D. (2010). Multimodality, orchestration and par-ticipation in the context of classroom use of the interactive whiteboard: a discussion. *Tech-nology, Pedagogy and Education*, 19(2), 211. doi:10.1080/1475939X.2010.491232

Vygotsky, L. (1978). *Mind in society : the development of higher psychological processes*. Cambridge Mass.: Harvard University Press.

Vygotsky, L. (1986). *Thought and language* (Translation newly rev. and edited /.). Cambridge Mass.: MIT Press.

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