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Birthe Lund, Ass. Professor, bl@learning.aau.dk
Annette Rasmussen, Ph.D. student, anra@learning.aau.dk
Department of Education and Learning, Aalborg University
Langagervej 8, DK-9220 Aalborg Oest, Denmark
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Children Cooperating in an ICT Context

Does the use of computers in the context of the Storyline method lead to more inclusive classrooms? So we asked in a research project following primary school children (in Denmark) in a learning environment based on the Storyline and an increased application of computer technology. Our paper will discuss the results of this project and is focusing on the children's interaction and how this is influenced by the computer. Thus we are trying to identify what factors seem to be the most important for the development of the pupil cooperation and cooperative skills. The ideas of the Storyline pedagogy are based on letting the pupils create and illustrate stories within a context that they have negotiated and agreed upon. This pedagogy presupposes that the pupils are able to cooperate and, at the same time, are learning to cooperate within the same process. Our research findings show, among other things, that the pupils develop different strategies of cooperation dependant on their social relationships and their positions in the classroom.

Introduction

This paper will describe how primary school children communicate and interact with each others, when interacting with computers and, on this background, discuss the meaning and practice of cooperative learning. It adopts a perspective that considers the social interactive nature of learning (e.g. Engeström 1987, Lave & Wenger 1991, and Bruner 1996). In this perspective learning presupposes a social and cultural environment that encourages activity in acquiring knowledge and taking a stand to it, and can be ensured by the teacher and by the work in groups that provides greater scaffolding of pupils' comprehension skills. Thus participation and cooperation become central aspects of learning. From an empirical point of view this means focusing on the learners - the pupils first and foremost, rather than the teachers and the project organisers, and on the actual working processes in the classroom, rather than on evaluative statements by the teachers.

In the research project[1], which the paper is reporting from, we followed the application of the Storyline method and an extended use of ICT in the primary school and focused more closely on the aspect of cooperation. Especially we studied what the children were learning by cooperating and how the ICT and Storyline context influenced on their cooperation. Our study was based on the assumptions that cooperative learning depends on such questions as; who is cooperating with whom, what skills are demanded for solving the task, what procedure is required for solving the task, how is the communication between the pupils facilitated, how is the teacher involved, and how does the ICT technology influence on the interaction and the task. This study was built on empirical data from two primary schools that included observations in two 2nd form classes (8-9 years old pupils) at each of the two schools, interviews with teachers at both schools (seven teacher interviews), and interviews with pupils from each of the two classes (twelve pupil interviews). The

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[1] The research project was following the implementation of the Storyline method and an increased application of ICT in Danish Primary Schools, the aims of which were to increase the schools' abilities to include pupils that faced problems in the daily teaching as opposed to sending these to specialist teaching.

paper is focused on the analysis of the observations, concerning the questions: ***How do the children interact with each other and with the computer in an ICT context?*** **And** *how does the ICT in this case influence on the children's cooperation and learning processes?*

These questions will be dealt with, by analysing of selected observation transcripts in which children are supposed to cooperate on writing a text on the computer. The analysis is especially inspired by activity theory (Engeström 1987), within which tools as well as languages mediate how the learner – the pupil perceives and constructs his or her learning in interaction with the teacher and with other pupils. We understand ICT as both a tool and as a medium for communication, used for both mediating and organising actions (Winnograd & Flores 1986, and Lund 1993). So to understand how the ICT influences on learning and cooperation, we must understand how the ICT influences on communication and interaction. But before moving on to the actual analysis, we will briefly outline the declared intentions of the ICT project and the general status of ICT in the Danish *Folkeskole*[2].

The Declared Intentions behind the ICT Context

The schools' application of the Storyline[3] method and an extended use of ICT were assumed to provide for a more inclusive learning environment. The Storyline model recognizes the value of the existing knowledge of the learner, and takes a constructivist approach. Through key questions the pupils are encouraged to construct their own model of what is being studied - their own hypothesis, before testing this with real evidence and research. The key questions are used in sequences that create a context or setting within the framework of a story. Through these key questions the teacher directs the practice, meaning that the teacher knows the story but not the details of the content. The basic idea is to transform the classroom into a setting for a narrative, where children create their own characters in the story and, in cooperation with the teacher, create the setting. When the pupils are creating their own characters, this is supposed to lead to a personal involvement and identification with their characters and the way they live. The model thus attaches importance to encouraging the children to develop their own conceptual model.[4]

The use of ICT was considered the most important ingredient in this Storyline context. The overall financing of the project and the political demands receded on the ITMF[5], and the idea behind this particular course was that an extended employment of standard ICT programmes combined with the Storyline approach would support learning generally and provide an opportunity for including more

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[2] *Folkeskolen* is the joint name of the Danish municipal primary and lower secondary school, which comprises 10 years of schooling, from the age of 6 to the age of 16. In this paper we have decided to refer to this as just the primary school.

[3] The Storyline approach was developed in Scotland and was originally called Topic Work, but since the mid-eighties more widely and internationally known as Storyline. The approach to topic work in the Scottish Primary School came about as a result of recommendations that teachers adopt a more integrated approach to the curriculum. The model is described as child centred, providing a strong structure in the pedagogic work, emphasizing the activity of the pupils, linking basic skills with the real world, producing a high degree of motivation, obvious for interdisciplinary teaching, encouraging feelings of mutual respect between teachers and pupils, emphasizing the importance of both process and skills, helping teachers to provide the correct level of difficulty for each pupil in their classroom, and providing many relevant opportunities for cooperative learn*ing* (www.storyline.com).

[4] These resemble the learning procedure advocated for by Vygotsky-inspired thinking (Hedegaard et al.1999)

[5] The ITMF, which stands for "IT, Medier og Folkeskolen" (ICT, Media and the *Folkeskole*), is a secretariat established by the Danish Ministry of Education. The purpose of the secretariat is to distribute money for the development of educational content and learning materials concerning ICT and Media, and to encourage and facilitate the dialogue between the parties of the *Folkeskolen.*

problematic children in the daily teaching. The general aim of the ITMF is that ICT and media contribute to the development of the pupils and teachers within the primary school. It builds on the expectation that pupils, when applying the computer as a personal tool, will learn at their own speed, at their own level, and by the methods, they have decided on in concert with the teacher. It further assumes that the information technology is an important tool in promoting a more inclusive school, because the technology facilitates the necessary variation of content and method.

According to the Ministry of Education the ITMF is supposed to support the general objective of the primary school. In the objects clause of the primary school it is stated that the school is "*to contribute to the all-round personal development of the individual pupil*" and "*to create such opportunities for experience, industry and absorption that the pupils develop awareness, imagination and an urge to learn, so that they acquire confidence in their own possibilities and a background for forming independent judgements and for taking personal action*" (*Act on the Folkeskole* § 1, 2). The *Act on the Folkeskole* does not mention ICT as an individual, compulsory subject. But it states that ICT shall be integrated in all subject areas, and that this integration creates the possibility of developing the forms of cognition and working methods of the individual subjects. It is further assumed that ICT shall be integrated in the subjects as early as possible in school life, so that all pupils acquire a basic understanding of the ICT concepts and methods (Krostrup 2001:51). The Ministry of Education has emphasised three central aspects of this ICT integration:

- the practical aspect – competences and knowledge of using computers
- the theoretical aspect – knowledge of the concepts and methods applied, when ICT can support the communication and solving of problems
- the critical aspect – understanding the consequences of applying ICT and how it can influence on methods and results

The primary school act and the guidelines from the Ministry of Education thus describe the ICT integration in general terms as a fundamental aspect of all subjects. These general terms constitute the point of reference of the ITMF project as well as the above-mentioned *all-round development of the pupils*.

The Primary Schools and the Storyline Context

The primary schools in Denmark are ruled by the municipalities[6] and vary in their ITC equipment and policies. The school referred to in this paper is a small school (206 pupils) situated in a small country municipality, where the ICT resources are relatively limited (compared to the bigger urban schools in Denmark). For instance the school does not have a separate computer room for all the pupils or any computers in the ordinary classrooms, which means that the availability of the computers is subject to a number of restrictions. Most of the school's computers are placed in an open library setting, apart from a few on the corridors nearby the library. In the library they are lined up so that three computers in a row are facing each other. When classes need to use the computers, the teacher has to book them in advance and would then usually have them available for

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[6] The Danish school system is characterized by a decentralised structure, which leaves a certain influence to the decentralised level of the municipalities. As also expressed in the Act on the *Folkeskole, it* is the municipal council that *shall lay down the targets and framework of the activities of the schools within the provisions of this act.* Accordingly, the law is a framework law that the municipalities have to run schools within and assure is realised. At the institutional level, the individual schools have to define further principles and make decisions in relation to the planning and organisation of the teaching.

only a few lessons at the time. Thus it has to be planned carefully each time, when they need the computers.

The 2nd form class, in which we did the observations, consists of only 16 pupils. In the below observation excerpts they are sharing the library computer setting with the 3rd form class (20 pupils) that are using half of the computers. The pupils usually work together in pairs and with tasks based on a very concrete work description. When working with the computers, two by two, they have to write in turns. In the computer setting there are certain rules to follow, since the pupils have to work fairly unattended by the teacher. As the teacher is unable to keep an eye on everybody, classroom discipline has to be maintained in other ways than strict surveillance. For instance, the pupils are allowed to move around in the room and are supposed to ask and help each other. Thus they are not only supposed to work in pairs, but are also generally to help each other out before asking the teacher for help.

The framework of this particular Storyline is titled "Being different". It starts with a general presentation of what it means to be disabled (by a disabled person from outside the school) followed by each group (or, in a few cases, the individual pupil) having to create a person that in some way is disabled. The characters are to be described by way of living, social relations and everyday life. This is seen as an opportunity for the pupils to focus on their own lives in a different ("disabled") perspective. The use of ICT by the pupils includes Power Point layout, internet surfing, and word-processing. Throughout the process the pupils produce a number of different products, related to the particular script. For instance they have to write an ID, they have to find art pictures on the internet and use these as background for their writing, so that it comes out with a nice layout, and they have to make posters or books. Every written word is to be written on the computer. The computers have special features, including e.g. a *Word bank* and a specially designed spelling control programme for pupils. Some of the computers (but only a few) include loudspeakers, so that the pupils can hear the spelling or misspelling of words.

Learning by Cooperating in an ICT Context

In Scandinavia an increasing amount of research in ICT and learning is trying to understand and legitimize the use of ICT in education from a social-cultural theoretical perspective. This is influenced by traditional Russian cultural-historical activity theory that was initiated by Vygotsky and Leontiev's psychological theory, pragmatism, and understanding of language and social practice in general (Engeström 1987). Accordingly there is an increasing understanding of the influence of social context on the individual learning processes. Inspired by the term "*community of practice*" (Lave and Wenger 1991) and the term "*situated learning*" (Bruner 1996), we regard learning in essence as a social phenomenon.

Theories of *social structure* give primacy to institutions, norms and rules, emphasizing discourses, cultural systems termed "*community of practice*", and history. Theories *of situated experience* emphasise agency and intentions and focus on the experience and the local construction of individual and interpersonal events such as activities and conversations. *Theories of social practice* address the production and reproduction of specific ways of engaging with the world and are concerned with everyday activities and real-life settings, with emphasis on the social system of shared resources by which groups organize and coordinate their activities and interpret the world. *Theories of identity* are concerned with cultural interpretation and the social formation of the person, addressing issues of gender, class, and ethnicity. In the centre of these traditions Wenger

places his *"social theory of learning"* (1998). Despite differences among the above perspectives, learning is generally understood as acting and activity interwoven in a complex cultural, social, and material context, which has inspired the point of departure in our research. Consequently the individual is not in itself regarded as a sufficient unit for analysis. Instead we ask how the agents coordinate their actions, how a social order is created, and how the agents interact.

ICT plays an important role since it influences on the organisation and thereby on *where*, *when,* and *how* the pupils can learn. From a social-cultural point of view the question of how we learn is a question of which resources the pupils have access to – such as language and other externalized systems of representation, acquired, not naturally, but through the internalization of social activity (Bakhurst 1991, and Vygotsky 1986), as these resources, by mediating, influence on our interaction with the world. Tools as well as concepts are modifying how the subject perceives the objective world and how knowledge is constructed in this setting - by the learner in interaction with other learners, the teacher, and the ICT. It follows from this perspective that *interaction* and *communication* are central concepts to the understanding of learning, and accordingly can be studied empirically by classroom research. But the social-cultural perspective instantly offers a lot of relevant areas to focus on, several themes and several actors to relate to. Our focus will depart on the assumption that ICT influences on the learning and cooperation process at different levels, such as on the interaction (by the interface), on the communication (what they talk about and how they talk about it), and on the division of labour. The following analysis is carried out on the background of two examples of learning processes where the pupils are supposed to cooperate on formalizing a written description of their person.

Analysis of the ICT Impact

In the selected situations for analysis, the primary school pupils are supposed to cooperate on writing a piece of text on the computer. As part of their Storyline assignment they have been given the task of writing an ID, which is taking place in the library computer room. The task is to be carried out in cooperation between two pupils, but a few of them are working alone. When they have finished their descriptions, they are supposed to give feedback to each others descriptions two by two. Before they start working on their text production, the teacher has given them some directions for behaviour in the computer room, they are given directions for the description of the person, and she (the teacher) finally reminds them to remember their passwords. The description is based on our field notes from doing participant observations[7] (cf. Woods 1983:16) in the school class. We conducted the observations by being two observers present during all the Storyline lessons, by sitting right behind the pupils that were observed, watching them work, and by sometimes taking part in the interaction (since this was hard to avoid as the pupils tended to regard us as assistant teachers).

By analysing this observation we want to describe the background for some of our general assumptions:

1. The relationships between classmates and the ways in which they communicate have a strong impact on the learning process as well as on the result.
2. The ICT influences and, in some ways, disturbs the learning process.
3. Learning *by* ICT does not eliminate the importance of the relations between the pupils and their social and cognitive differences

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[7] We did not have any intention of influencing the situation.

The pupils, whose interaction with each other and with the computer that we focus on here, were especially interesting to us regarding their social relationships and their positions in the school class. The two boys, Erik and Karl, were both considered "weak learners" (by the teacher) and as such had many difficulties in producing a text. Bo had no learning difficulties, but difficulties in being accepted and socially included in the pupil group. The two girls (in transcript 2) were matched as cooperation partners with highly unequal school abilities (according to the teacher) – Sofie was considered "strong" and Emilie "weak" - against the general rule of matching pupils in pairs on the basis of their "fairly" equal abilities. Instead, they were matched due to their friendship. In the subsequent transcripts we have described the detailed interaction of these pupils.

The first transcript is from an observation, where the two boys, Erik and Karl, sitting next to each other, are meant to cooperate on the ID. Next to these two, another boy, Bo, is working alone, and next to him, in front of the last computer in the row, another couple of boys are sitting next to each other and are meant to cooperate.

Transcript 1: The cooperation between Erik and Karl

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When two pupils are sharing a computer, they necessarily have to
take turns when using the key board. Or at least they have to
negotiate who is using the keyboard when. This is what will appear
from the following interaction sequence, which is initiated by
them drawing circles in Power Point:
1.
Erik: "Don't you press, when I want to do something!"
Karl: "I'm not the one who's pressing"
Erik moans, and they elbow each other. But Erik is allowed to draw
circles on the screen, which they seem content on as they both
applaud it. All of a sudden though, Erik has had enough.
Erik: "Now you finish!"
And Karl obeys.
2.
Then they observe the boy, Bo, who is sitting at their side and
working on his own, and his screen work.
Erik asks him: "What are you doing?"
Bo answers: "I'm making a magic wand"
Erik: "Where?"
Bo: "There - it's invisible. (To himself) I like doing this!" Bo
has inserted pictures from a file, even thought they were
instructed by the teacher to work with text files only.
3.
In the meantime Erik has directed his attention towards Karl and
what he is about to do on their screen.
Erik says: "You finish now! Damn it Karl, you keep making it
disappear" (it refers to the text). Erik ignores the fact that he
is punching the keys himself.
Karl: "No, it's you that are pressing too many buttons at once".
While he is saying this, he is continuously drawing circles.
4.
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Erik tries to persuade Karl that they direct their attention towards the prescribed task.
Erik: "*Please stop that, we have to think of something in the right way*"
Then Bo, the boy who is working on his own, enters the scene and takes over their keyboard.
Erik tells him angrily: "*Stay away from our keyboard!*"
Then Karl walks away and leaves Erik on his own behind the computer.
Erik drives the mouse aimlessly back and forth. Then the teacher arrives. She tries to direct them towards the task – to write an ID. She is wondering why the text is written in a circle:
The teacher: "*Why did you write in such a circle? You have to make an ID. What are you going to write?*"
The boys cannot tell her why (the text is in a circle.
The teacher asks another pupil to read aloud, what the task was. Meanwhile Bo is teasing the boys on the other side of him. The teacher gives an example of an ID. The focus is now directed towards the content of the task, and it clearly appears that Erik and Karl do not have a clearly negotiated picture of what person to describe. Then they talk about it – what the text is to contain:
5.
Erik: "*His name is…*"
Karl: "*No, it is supposed to be a woman*"
This time Karl does not follow up on this topic, but enters a new question:
Karl: "*How does one spell 'the girl'?*"
Erik spells it, and Karl writes: 'the girl'.
Opposite the computer, Erik discovers a boy who is messing about with a wire, while Karl continues.
Karl: "*Her name is …*"
This moment some other children are approaching the screen of the boys. Erik tries to cover up the screen, so that the other children cannot see what the boys have written.
6.
The teacher is coming back, and Erik follows up
Erik: "*It should say: 'Her name is Nadja'*"
Now the on-his-own-working boy, Bo, interferes and corrects a spelling mistake, which they have made and he has discovered by looking at their screen.
This interference makes the teacher angry at Bo:
The teacher (addressing Bo): "*This is the last warning – mind your own business!*" And addressing the boys, she says: "*Now you need to write 'My name is' and write it without writing in a textbox*"
Karl is going to write 'my name is' but has made a typing or spelling mistake, which he is made aware of by the teacher. He corrects the mistake. Now Erik interferes:
Erik: "*Nadja*" (saying the name slowly).

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Then Karl is trying to write some words (with great spelling
difficulty), which Erik tries to help him spell.
7.
But once again, Karl averts the communication by entering into an
argument with Bo. Now the boys, Erik and Karl, are sure that he
(Bo) will be removed to another place, when the teacher comes
back. And this is exactly what happens.
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In the first sequence (1) Erik has adopted an adult attitude – he is trying to control the situation by being determined and is accusing Karl of interrupting him. Karl does not understand the situation in the same way and rejects the accusations of Erik.

In the next sequence (2) their attention is drawn towards Bo and his more playful attitude to the computer. Bo is speaking to himself and is saying that *this* is actually fun – imagining that he has invented a magic wand, by which he now is able to create new things.

Inspired by Bo, Karl takes the opportunity to conquer the keyboard (3); while again, Erik is trying to control the process. The inspiration from Bo has led the pupils away from the *teacher's* intention and definition of tasks.

This sequence (4) illustrates how the pupils are allowed to walk around – but also to walk away, when they are using the computers. All tree pupils are now behind the same computer, whose visual performance they are occupied by exploring. Erik tries to bring Karl "back in line" by pointing out that Bo does not belong to this group. But Karl just leaves him alone. When Erik has the keyboard all by himself, he does not know what to do! His attention seems distracted from the text production towards the fact that Karl has left him. The boys thus express themselves by body language and by simply leaving the place. The teacher is primarily focused on their text production and primarily relates to this aspect.

Here (5) the boys actually succeed in cooperating, as one is suggesting and the other is following up. But it is very difficulty for the boys concurrently to maintain their focus on the screen text. So, when Karl is trying to write, Erik takes the opportunity to observe what the other children are doing. At the same time he is trying to avoid the other pupils' interest in his product.

In this sequence (6) the teacher's appearance seems to remind Erik about concentrating on the task. The teacher does not appreciate Bo's helping comments and tells him so. The spelling difficulties of Karl are visualized on the screen. Erik tries either to help Karl or to show the teacher that he has a positive attitude towards doing so.

It seems difficult for these 8-years old boys to focus solely on the defined task. The attitude of playing with the computer is not easy to integrate with a more goal directed use of the computer for text production. The teacher tries to reduce the complexity by dividing the process - by separating the text production from the layout process. But the computer – in different ways - invites the pupils to explore the possibilities offered by dynamic colours and user-friendly interface. Playing with the computer is very tempting since it offers at quick response compared with the more challenging and very slow process of writing just at single line for Karl and Erik.

In contrast, Bo seems to find it easy to read and write from a cognitive point of view. But he also seems to be bored, which is not surprising since he is working on his own. In his situation it is very tempting to invite others to take part in his games. Within a very short period he both inspires and invites the other boys to take part in his games. But it does not last long before he is – once again – excluded. Karl and Erik actively try to avoid that their classmates should take an active part in their production and thereby discover their poor performance. Karl, Erik, and Bo, all seem very dependent on the teacher and her advice for further progress – Karl and Erik to progress in their writing, and Bo to be socially included in the classroom.

The teacher has to make shifts between helping them out with the content and providing technical assistance. And while helping out with the content, the teacher must be prepared to answer technical questions from impatient children. So there is a continuous change of perspective - for the teacher as well as for the pupils. But sometimes these perspectives are merging, so that the technology interferes at the level of the content and works as a third interlocutor.

Generally the above indicates that the pupils invest energy and attention in several areas at the same time, including time spent on:
- *the task*: learning to write, to use the computer, and to cooperate with peers
- *the medium*: exploring the computer
- *the peer relationship*: maintaining and establishing friendships

The second transcript (below) illustrates how the "stronger girl" in this cooperation takes over and does most of the writing:

Transcript 2: The cooperation between Sofie and Emilie

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Sofie and Emilie are writing a text about the family of a disabled
girl. Sofie is writing most of the time. Emilie has been at the
printer and is now coming back. She is placing herself further
away from the computer than Sofie, looking at the screen, but does
not participate actively in the text production. Sofie is writing
without communicating with Emilie. She writes fluently and makes
no mistakes. Emilie is fingering her hair. There is still no talk
between the girls, while Sofie is writing.
1.
Sofie is supplying their text with long words. She is directing
her attention to Emilie now.
Sofie: "Now, you really should figure out something (referring to
the text)"
Then she (Sofie) is asking me (the observer): "Is it not okay to
write the sentence like this" (she reads it aloud). She does not
direct her question to Emilie at all.
Emilie points out to me how much they have written.
Emilie: "Now we are almost finished".
It is still Sofie who is sitting at the keyboard, which Emilie has
not touched yet.
Emilie is sitting with her side to the computer, diverting her
attention between me (the observer) and what is appearing at the
computer screen.
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Sofie is incessantly writing – long complex sentences; pausing only now and then, pondering on a word or what to write next. Most of the time, Emilie is now watching what happens behind her and next to her, where some other girls are writing and talking.
Emilie (giggling at Sofie): *"Haven't you finished writing soon?"*
Right now Emilie is watching their screen, where the text has almost disappeared, as the background picture has turned too dark. Sofie gets up from where she was sitting, walks away, and comes back with two boys that she has asked for help to make their background picture lighter. The boys try by turns, but they do not succeed in it.
2.
Sofie is placing herself next to Jonas/Bo, who is working on his own. She watches his screen to see what he is writing. They talk with each other for a little while. Meanwhile the teacher has arrived at the place, where Emilie is now sitting on her own in front of the computer. The teacher tells Emilie that it is a jumble that they have opened too many things at the same time. She (the teacher) makes the screen picture lighter, so that it is possible to see the text. While she is doing that, there is a boy who comes up and asks her about something. Disturbed by this interference the teacher lost the text on the screen. She tells the boy to go back to his seat and not disturb, because it has made her make *"a terrible mistake"*. While it upsets her that the text has disappeared from the screen, she stands up and shouts at the pupils that they should calm down, because that one, due to that awful noise, happens to make mistakes. The teacher then manages to find the text again, and she leaves the computer to Sofie – again.
3.
Sofie and Emilie do not seem particularly worried about the disorder of the disappearing text. – They do not talk about it afterwards - or about anything else, when they are united again. Sofie continues to write without entering into dialogue with Emilie, who is watching Sofie write and sometimes fiddling with her own hair. She is mainly occupied by other things than the writing, is watching the ceiling, is watching what is happening around her, and is giggling when the pupil next to them is belching.
4.
The teacher calls in Sofie to help Jonas/Bo for 10 minutes.
The teacher: *"Then Emilie has to manage by herself for a little while"*.
Emilie takes over the writing, but is stuck at the first word. She tries to write the name 'Sarah' of their person and manages with great difficulty, and after having asked others for help, to write it. Then Sofie returns to her seat and sees what Emilie has written.

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Sofie: "I already wrote 'Sarah'- you don't need to write it
again".
She (Sofie) erases the name that Emilie has just written.
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In the first long interval there is hardly any exchange between the girls. Sofie has completely taken over and is doing all the writing. Due to their division of labour Sofie is writing as long as she knows what to write. Only when she pauses, she seems to notice that Emilie could participate in the process. Though Emilie is not participationg she regards the product as a result of a joint effort - cooperation, which appears by her saying *"Now we are almost finished"*. Like the boys in the previous example, Emilie is somewhat impatient. Sofie does not either address Emilie for help, when I comes to technical problems. Without informing Emilie, Sofie leaves her place to watch what the other pupils are writing, which indicates that she takes an interest in that.

The "medium" interferes with the text production in the sense that the use of Power Point and use of green colours makes it difficulty to see their own writings. It also complicates matters that they have opened a lot of windows at the screen and are not able to close them down. This places the teacher in a very demanding situation. She (the teacher) must concentrate on such diverse matters as the text, the Power Point program, the dysfunctional printers, and other pupils who need help to save their text, knowing she must not make any mistakes, since it could delete their texts. The girls do not take any particular interest in solving these problems. Once again there is a division of labour - Sofie with hands on the keyboard and a non-involved Emilie. When the teacher asks Sofie to help some other pupils, Emilie is left on her own at the keyboard. By concentrating she writes: f'Sahra'. But Sofie erases this only contribution by Emilie, without Emilie objecting to this.

Only Sofie is focused on the task, but just until the Power Point program interferes with this. In spite of the fact that there is hardly any communication between the two girls, they come up with a good description. But they did not cooperate. The relations of power in favour of Sofie (related to difference in writing skills) have prevented any disagreements in coming up. Sofie did not even expect Sofie to helpful, when it came to technical problems, and nor did she feel obliged to informing Emilie about these. But Emilie also accepted this situation and her position as such. Emilie however displays a feeling of having taken active part in the writing process, as she refers to the written text in terms of ownership.

The teacher tries at all levels to minimize technical failures to appear by giving clear instructions for entering the programmes, closing, printing, saving, etc. But this is not sufficient for limiting the unexpected input from this third partner in the teaching that in unpredictable ways intervenes in the process and in the product. The unexpected inputs sometimes create problems for the teacher's possibility of maintaining control of the process. But then they create happiness among the pupils that share the experience with each other. Their choice of words indicates how it is just as much the machine that controls the pupils, as the other way round:
Sometimes they said:" *Look what it does now!"* And in other cases: *"Look what I made it do!"*

There is no doubt that the pupils experienced the technology in a completely different way than they normally did by playing the computer games. Even if the boys (and by and large only the boys) played at the school computers during the breaks, this was not directly observable in their handling the computer in a school context of writing and doing the lay out. Thus, the ICT in certain ways facilitated the writing process, in other ways impeded it. It facilitated the writing process by giving the correction possibility through the spelling control, by making the text more readable, and by

displaying the text on a screen. On the one hand, this gave the pupils the opportunity of dissociating themselves from their writing, which could facilitate the joint articulation and writing. But as appears from the case of Emilie, this did not necessarily happen. On the other hand, the use of the computer impeded the writing process by slowing it down - it takes a long time to type when you use only one finger. The attention was directed towards the computer, its icons, and its symbols, which means away from content of the writing. While the display on the screen could facilitate the process, it could also impede it by displaying incapability and providing a very visible basis for comparison (*"How many lines have you written?" "That is not the way to spell it!" "How come you have not written any more?"*) And finally the spelling control caused a number of misunderstandings and unexpected input instead of providing assistance.

From other observations we noticed that the machine was sometimes perceived as a third communication partner. For the pupil it was making concrete proposals, although it was a question of listing various proposals. As outlined below, in an example where the word processing suggested a word that was not appropriate in the context, the pupils by mutual consent still relied on this proposal. In other situations the pupils discussed what importance they should attach to this third interlocutor, which was referred to as *"it"*:

- *"It says that it is misspelled, but that is just because it does not know the word"*. Here they referred to the fact that the word bank does not contain proper names.
- *"It says that it is misspelled, but so it is not, because that was how the teacher spelled the word"*. Here the spelling control caught an actually misspelled word, but due to the authority of the teacher the pupils disregarded it. The teacher had previously pointed out on that the maschine did not know all words, but this was with special regard to the proper names.
- *"It suggests that we write this"*. The machine was "unreliable" to the pupils, as they wanted it to do a particular thing and it did something else. In this case, the pupils chose a word at random without completely knowing the meaning of the chosen word and let it form part of the text.

To answer the questions they were given, the pupils had to seek information in a self-directed way. But as regards the text production of the pupils, it was important not only that they had a certain knowledge in advance, but also that they had certain basic abilities of reading, spelling and writing, especially when demanded to use a word processor. For some pupils it was a very slow process to find the different letters on the keyboard, to check them on the screen, to check the whole word, and then the sentence. At the same time the pupils were aware of the fact that everybody in the room was able to look at this process and follow the speed and the progress, not to say the number of misspellings. Some pupils tried to avoid this by covering the screen by paper or books.

Summing up, the pupils' attitudes, their relationships, their cognitive capacities, the actual tasks and the technology interacted in almost unpredictably ways, including:

- *The way of cooperating and communicating with each other and with the medium means a lot to both the process and the output.*
- *The ICT appears as a third communication partner, influencing on the text production, when interfering at the denotative level, corrections are interpreted at the connotative level.*
- *The relation between the pupils, concerning knowledge as well as social position, plays an important role in the learning context of ICT.*

Conclusions

The observations illustrate that a number of circumstances interfere with and disturb the text production which was part of the formal curriculum. In this sense, the attention of the pupil is competing with a lot of other things. The lacking concentration on the defined task is not necessarily and solely due to the ITC but is partly related to the ITC context and the way this context by its physical organisation influences on the learning process. Depending on the pupil's general ability and his or her status among classmates (in this context), it appears that while the pupils are learning to write (while writing), they are also learning something about their position in the classroom.

It is a requirement for cooperating with others that the pupil is acknowledged as a potential cooperation partner, that the peers have an expectation of him or her as being able to contribute with something, that he or she has a potential (a feeling of mastering something) or giving to others that feeling. So to participate and to be included actively include such abilities as:

1. To focus on the right task

The ability of concentrating on a task and not letting the surroundings disturb the task - of producing a text as exemplified - seems to be demanding for these young pupils. Something is happening around the pupils all the time. It is easy to be distracted by other pupils' projects, by pupils asking for help, or by the teacher giving a message. Unexpected things might appear on the screen and interesting problems appear for the pupils sitting next to you etc. Sometimes you must help other pupils asking for help, and then it is defined as cooperation; other times their need of help must be ignored, as helping out is not considered appropriate. Whether something, regarding subject knowledge, is learned by this, depends on how advice is given and received – and whether it can be received by the classmates. The pupil must learn to divide his or her focus and "read" the actual task.

2. To have empathy

The ability to read the other's intention is important – to be able to tell whether he/she is willing to help or is he teasing. It demands that you are able to look at something from another's perspective and be attentive to other people – that you are able to abstract from your own needs. If this "social intelligence" has not been sufficiently developed there is a risk that the pupils will mistake each other, misunderstand each other, and enter into, maybe fruitless, conflicts.

3. To express yourself

The ability to verbally express your own intentions is a necessity to direct a process in the desired direction. When you are not able to express your intentions sufficiently clear, you might either withdraw from the process or enter into a physical conflict. But the ability to verbalise your intentions is technically insufficient however, if the demands you are posing cannot be accepted by the other part.

4. To organise your time

It is very important that the pupil is capable of understanding what "time" is, understanding how much time is available for a task, and understanding that one has to have to target ones work if the amount of time is limited. Thus the pupil must develop an understanding of time being limited; knowing him- or herself enough to know how much time it takes to solve a tasks, which is more or less equivalent to having tried it before.

5. To be patient and enduring

The pupils have to be able to wait for help by the teacher or to seek help by other pupils. They have to be able to accept that writing is a slow process, when at the same time you are learning to read, to use the computer, to express yourself, and to cooperate with others. Impatience can be expressed by "opting out" – by walking away, by doing other things such as playing, by trying loudly to attract attention to yourself, by demanding the teacher's attention here and now, or by destructively erasing or changing what is written on the screen. The pupil has to learn self-control.

It was possible to identify different cooperation strategies according to what the pupils brought to the cooperation practice and according to the school settings. The constellations of groups and their level of competences influence on the intensity of discussions, on the degree of participation by each pupil, and on the outcome of the cooperation.

With regard to the ICT context, it both enhances and impedes on the process of cooperation. On the one hand, the use of computer technology is seen to enhance cooperation among pupils due to the visibility of the text production, which leads to questioning each other's products. The reflective and hypothetical thought, caused by explanatory talk among peers, also amplifies the children's initiative in their learning and cooperation with grown-ups (cf. Frønes 1994). This is illustrated by Zuckerman (1999) by situations where children are obliged to request the teacher's help, which usually happens in cases of disagreement, of a conflict of positions, when the children are unable to come to a shared opinion. But when asking the teacher at this point, the children have done the job of discovering their own logic – have done their own reflections. Here the typical way to address the teacher is: "He thinks that… and I think that… Which of us is right?" On the contrary, if they address the teacher without having cooperated on the question, it is the adult who has to do the major reflective work. The children do not grasp the situation and continue to address the teacher with infantile requests for help, every time receiving it. The illustration shows the general benefits of cooperation – also outside an ICT context.

On the other hand, it might lead to competition among the pupils, if they use the public display as means for comparison or exorbitant imitation. Also in cases, where the technical problems, minor or major, take up an overwhelming amount of time, the technology will impede on the motivational factor of achieving something. The use of ICT is considered time consuming for the pupils, as they spend a lot of time waiting for assistance from the teacher. Children of this age generally seem to have difficulties in solving the technical computer problems that appear. But this is also what they are supposed to learn.

In many cases the pupils did not achieve much concerning the amount of written text on the computer. In some cases, this was due to the impediments by technical problems, which meant that they could not proceed with their task. The technical problems could be caused solely by the computer (lack of passwords, problem by printers etc), or by the pupils not possessing sufficient technical skills in reading, spelling etc. The question that remains to be answered is, whether the introduction of the computer makes it easier for the pupils lacking the technical skills, of for instance reading, to be included in the classroom or not. Some of our findings indicate that the word-processor in some settings complicated the writing process by interacting at to levels: – *Literally* in the way the pupils cooperated *at* the computer, where one of the participants would happen to purposely erase the text written by the partner; and on the *text content* level, where pupils would accept words from another context by accepting the suggestions of the spelling control. The

"weak" pupils, with dyslectic problems, working together easily became impatient and frustrated by the slow writing process and found it difficult to focus on both the narration and the technical aspect of texts production at the same time as cooperating with each other.

References

Bakhurst, David (1991): *Consciousness and Revolution in Soviet Philosophy*. Cambridge.

Bruner, Jereme (1996): *The Culture of Education*, Harvard University Press.

Engeström, Yrjö (1987): *Learning by Expanding: An activity-theoretical approach to developmental research*. Helsinki: Orienta-Kunsultit.

Frønes, I. (1994): *De likeverdige. Om socialisering og de jevnaldrendes betydning*. Universitetsforlaget Oslo.

Krostrup, K.R. (ed.) (2001): *Folkeskoleloven med kommentarer*. 6. version. Vejle: Kroghs Forlag.

Lave, Jean & Wenger, Etienne (1991): *Situated learning: Legitimate Peripheral Participation*. New York: Cambridge University Press.

Lund, Birthe (1993):*Datamater og dialogbetingelser*. Systime.

Hedegaard, M. (1999): "The Influence of Societal Knowledge Traditions on Children's Thinking and Conceptual Development", in Marianne Hedegaard and Joachim Lompscher (ed): *Learning Activity and Development*, Aarhus University Press.

Vygotsky, L.S. (1986): *Thought and Language*. Cambridge.

Wenger, Etienne (1998): *Communities of Practice: Learning, Meaning, and Identity*. Cambridge, Mass.: Cambridge University Press.

Winograd, Terry & Flores, Fernando (1986): *Understanding Computers and Cognition. A New Foundation for Design*. New Jersey: Ablex Publishing Corporation Norwood.

Woods, Peter (1983): *Sociology and the school. An Interactionist Viewpoint*. London: Routledge & Kegan Paul.

Zuckerman G. (1999): "Diagnosing Learning Initiative", in Marianne Hedegaard and Joachim Lompscher (ed): *Learning Activity and Development*, Aarhus University Press.