The patterns of social interaction influencing pupils´ work at computers An empirical study within a Learning Design Sequence

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This paper considers how computerized work is organized in a class for younger pupils in a compulsory school and how patterns of interaction and use of digital learning resources influence the pupils' work at computers within a Learning Design Sequence (LDS). Data come from a case study, which is a part of a wider research project, "Digital media and learning design sequences in Swedish schools – user perspective". The case study is in the research field of information and communication technology (ICT) and the theoretical framework is based on socio-semiotic and socio-cultural perspectives. The methodological approach is user-oriented and the methods I employ refer to field observation and observation of video recordings. Learning Design Sequence is an analytical model, which is constructed by the research project and the data in the case study derives from the phase of "transforming and forming" within LDS. The result shows that processes of organization, patterns of interaction and affordances of the digital learning resources provide essential semiotic resources that mediate and constrain the pupils' work at the computers.

INTRODUCTION

The purpose of this paper is to illuminate how interaction and use of digital learning resources influence pupils' work at computers within a Learning Design Sequence, LDS. The paper reports a part of a wider research project – *Digital learning resources and learning design sequences in Swedish schools – user perspective,* aimed to examine how pupils in compulsory and upper secondary schools use digital media as a resource for learning in education. A major interest of the wider research project has been to analyse how the digital media are designed, how pupils inter-act (with teachers and with each other and with digital learning resources) and how teachers and pupils use the digital learning resources, how pupils represent their learning, and how pupils and teachers reflect on the learning process.

During the project, the research group has constructed a model by the name of Learning Design Sequence LDS (Selander, 2008). A Learning Design Sequence consists of two aspects: (1) "activities and time" and (2) "representations and signs of learning". LDS can be understood as a sequence of learning activities in the classroom, which has a beginning phase - setting, a phase where the task is realised - transforming and forming and finally an ending phase - presenting. Hence, within LDS the phase setting usually begins with a theme or task introduction by the teacher. In transforming and forming the pupils are engaged with their work and use digital learning resources to support their learning. An LDS ends in the phase presenting, the moment where, the theme or the task is presented or examined. The time of a LDS varies between a couple of hours to several weeks. On a macro level the LDS is constituted by symbolic order, traditions in the society and both teachers' and pupils' goals and intentions. The constitution of LDS is also influenced by group climate, interaction between participants and by the digital learning resources they use. In this paper I will explore two research questions:

1. *How is the computerized work organized in the phases of transforming and forming within LDS?*

2. *What patterns of interaction can be identified in the phases of transforming and forming within LDS?*

Below, I will first present a perspective on interaction and use of learning resources as joint activities. Then I will present the method and the result from the study. Finally, I will summarize the findings and provide some conclusions.

PERSPECTIVE ON INTERACTION AND LEARNING RESOURCES

The concepts of interaction and learning resources are central within the theoretical framework based on socio-cultural perspective drawn from neo-Vygotskian theories (Lave & Wenger, 1991; Wertsch, 1995; Säljö, 2001, 2005) and socio-semiotic and multimodal perspective (Van Leeuwen, 2005; Kress & van Leeuwen, 2001; Selander, 2007). These theories explore how learning occurs in social contexts and in interaction between people. According to these theories learning is a question of acquiring artefacts or using meaning-making resources or learning resources in ways that make people enable to participate in multimodal practices. Social interaction creates several opportunities for people in learning. Often they are challenged to use different speech functions or strategies as support in the process of meaning making.

A large amount of research indicates that learning and individual development emerge through social interaction and with use of different learning resources (Wertsch, 1998; Kress & van Leeuwen, 2001; Selander, 2007). A

learning resource may exist both as a material and immaterial tool and therefore it also has a physical side (such as tangible related aspects in the use of the learning resource e.g. the use of a pen, a book or a digital learning resource such as a computer, a mouse or a scanner) and an intellectual side (such as content related aspects in the use of the learning resource e.g. the use of grammar, a model, a formula or a theoretical perspective). The relationship between these two sides is dynamic in a way that they influence action. A learning resource shapes action and it is also being shaped in social processes. Furthermore, the learning resource shapes also actions differently depending on the contexts and the goals of the action. However, the usage of learning resources can also be understood as a mastery of external means or artefacts (Wartofsky, 1973; Cole, 1996; Wertsch, 1998; Säljö, 2005).

A digital learning resource, e.g. a computer software, is not neutral or passive. The digital learning resource gives the user a direction in usage and for understanding. In that sense the digital learning resource make the user do things that prolong his or her ability to act. These abilities are emerged by the affordances, which are the potential uses of the digital learning resource. Different people will notice different affordances and that variation is depending on the peoples' different needs and interests.

In the view being outlined here, the changes in social interaction provide different opportunities for using learning resources and for making things easier or harder to do. Hence, knowledge develops through interaction when students are engaged with learning resources and with each other (Gibson, 1979; Wertsch, 1998, 2002; Van Leeuwen, 2005).

METHOD

In the wider research project the data has been collected over a period of two years in six compulsory schools and five upper secondary schools in Sweden. The schools are situated in a large city and in the suburbs of that city. The selection process can be described as purposive sampling (Cohen, Manion & Morrison, 2000) and according to that principle, the researchers select schools, learning design sequences and subjects which correspond to the study's needs and purposes. The data collection was organized as ethnographic studies in the sense that data was obtained by field observation, video recordings, informal and formal group and individual interviews and observations of written documents. In relation to the research questions within the wider research project, we used different methods for data collection to be able to identify the full variation in the organization of interaction (Erickson, 1992). The methods we employed refer also to Interaction Analysis, which is an interdisciplinary method for research on human activities, verbal and non-verbal interaction and the use of artefacts and technologies (Jordon & Henderson, 1995).

Collection of data

Data presented in this paper have been collected from a second year class in a compulsory school. In the LDS the pupils' assignment is to write texts about them selves and their families. The digital learning resources they use are: computers and pre-existing clip art, scanners and the software Powerpoint for presentation of narratives.

The participants in the study consist of one teacher and proximately 20 pupils at the age of 7 or 8. The computerized classroom interaction was studied through direct observation of the activity and from video recordings. A selection of participants from the classroom interaction was used to capture a restricted numbers of pupils. Two video cameras were mounted on tripods. A total of 232 minutes video recordings of teacher-pupil-computer interactions were examined and different events were selected for microanalysis (Erickson, 1992). The procedure for microanalysis was following:

- Reviewing all films in regular speed of the recording.
- Identification of major parts of events.
- Identification of different aspects within parts of events.
- Focus on actions – the use of verbal and non-verbal language.

These events are extracts of interaction and they often have a clear beginning and ending. A selection of events from the videotapes was made to obtain varying actions and experiences of what teacher and pupils were doing and talking about in the phases of transforming and forming within LDS. These events were transcribed closely to verbal Swedish language and non-verbal language and for this paper the transcriptions have been translated into English. In the excerpts I will present the transcription in four different columns: (1). Turns at talk, (2). Names of the teacher and the pupils, (3). Speech. Moves and gestures are written between double brackets, (4). Turns with digital resources or actions towards digital learning resources.

The teacher and all of the pupils involved were informed about the study and the research ethics. All of them agreed to participate.

Analysis

The focus of the analysis is interaction and it considers both interactions between pupils and teacher and with and towards digital learning resources. I am aiming on communicative modes, such as spoken interaction around the technology and bodily movements with and towards the digital learning resources. The units of analysis are therefore verbal language and non-verbal actions within teacher-pupil-computer-interaction. The teacher's and the pupils' interactions were analysed according to four factors:

- talk frequency – provides a focus on how much the participants talk.
- turn taking – provides a focus on turns at talk and turns with digital learning resources e.g. computers.
- content – provides a focus on what the participants talk about.
- dialogic engagement – provides a focus on how the participants act in their talk, such as using different speech functions or verb-types.

The analysis is presented in form of detailed descriptions and excerpts from transcriptions, which highlight essential interaction events. All excerpts are taken from videotaped material and all names of informants have been anonymized in the paper. Theories of interaction and learning resources are then used as a framework to interpret how interaction and the use of digital learning resources influence pupils' work at the computers within a Learning Design Sequence.

RESULT

The result shows that the organization in the classroom creates a structure for responsibility and engagement, which facilitate the working process. Patterns of interaction shape and constitute dialogic encounters depending on whom having the authority, competence and the requested knowledge of the computers.

Work organization within LDS

Within LDS the main curricula goal for the pupils is to learn to use digital learning resources as computers, scanner and computer software i.e. Powerpoint which empower them to produce narratives about them selves. Social interaction and digital learning resources, in an intertwined process, provide both affordances and constrains that shape the narratives the pupils produce. In the processes of learning the pupils are involved in activities that form learning. They learn to use scanners, to write texts and to pick out pictures from Clip Art and to present their narratives in slideshows. These activities become bricks for the pupils in their knowledge construction within Learning Design Sequence, LDS.

Teacher guides social responsibility

In the phases of transforming and forming the pupils have access to computer facilities and to other digital learning resources in a computer classroom. The computerized work is organized individually. The pupils are seated at the computers and they are engaged with the screen and sometime with their immediate neighbours. In the beginning of the phase of transforming the teacher gives instructions for the work in process. The teacher moves around the computer classroom and she establishes herself as knowledgeable and a provider of order and help. The given instructions by the teacher organize and establish a social responsibility. The organisation offers the pupils a model structure; the teacher helps one pupil with concrete difficulties, and that pupil helps another etc. The pupils will inevitable be engaged with each others problem solving. In the transcript the teacher, Anna, is giving the guidelines for activities in the computer classroom. These guidelines tell the pupils how the organization will be constituted in the classroom.

Turns	Actors	Speech	Digital resources
1	Anna:	Let's do it like this. Those who have not been able to scan the pictures, they enter the other computer classroom in pair together with Cecilia and start scanning. So, Cecilia shows the first person how to do it, and then returns and the person who has learned shows the next person. Do you understand?	
2	Pupils:	mm…ok…	
3	Anna:	and then that person returns and finally you have instructed each other. If we are lucky it works and if we are unlucky I have to run between everybody all the time. But I think it will work. I will join the person who enters first.	

When the pupils need competence support, the majority is seeking help first from the teacher and secondly from a friend they know has the skills requested. Hand-raising is a commonly used signal for the pupils to apply when they need help. The teacher circulates around and helps one pupil at the time. When the teacher is not able to help the pupils, the pupils by them selves utilise the given model structure, which becomes a learning resource in their work at the computers. The work is organized in a form that can be described as a social "chain" responsibility, which contributes action and time for the pupils to manage their work at the computers. The teacher is positioning the students as knowing and communicatively competent. The social interaction is embedded in, and realised through, the organisation of the computer class-

room. Hence, organization of responsibility makes pupils to come closer to their own construction of a narrative about their lives.

Communicative patterns within LDS

The analysis displays turn-taking by the teacher and the pupils in way of showing competence and skills in how digital learning resources are used. The analysis of the observation data in the phases of transforming and forming identifies four patterns of interaction which appears when pupils make narratives at the computers. These patterns of interaction are: *pupils as instructor and amateur, teacher as way watcher, teacher as challenger and pupils as inspirers.* The analysis shows that interaction within LDS constitutes variations on patterns, which also hold variation in time.

Pupils as instructor and amateur

The pattern pupils as instructor and amateur may be described as an interaction which reflects authority structure and dominance. In these situations an obvious dominance occurs when the pupil as instructor take the role as a leader in the interaction. The instructor leads and guides in the interaction. The instructor is also often taking over the hands on activities at the computer. The interaction of the instructor is characterised by verb-types such as guiding, stating facts and explaining tangible-related aspects in the use of the computer, for example: "press that button", "click there, "put the picture in that place". The pattern as amateur is characterized by verb-types as asking tangible-related questions, agreeing and acknowledging. Through instructions the amateurs receive a map for action which guides them in mastering the computer software. The interaction may be described as asymmetric, but the encounters can reach symmetry when the amateur mastering the use of the digital learning resources in a way the instructor directed. The instructor uses the keyboard and the mouse more frequently than the amateur. The interaction with the digital learning resource is controlled by the instructor, even if the instructor is leaving his or her seat with the purpose to show something at the amateur's computer, it is the instructor who is pointing at the screen, using the keyboard and the mouse. The pupils' way in using the mouse, at the same time as they are giving verbal explanations, is a powerful device in shaping the asymmetric participation between the instructor and the amateur. Through the use of the keyboard and the mouse, the instructor can steer the interaction and influence what the amateur may perceive. The instructor usually returns the mouse, when there is no further need for tangible explanations or if the instructor allows the amateur to make the moves by him/herself. The process of knowing-how carries out externally and the roles rotate in order for all pupils to feel involved in the learning process.

The following transcription illustrates the pupil Karin using the software Powerpoint for the first time. She is sitting at the computer and she is searching for information about the software she uses. The class mate Fia is sitting beside her. After a while Karin is knocking carefully at Fia's shoulder and asking for help. Fia gets up and stands beside Karin. Fia acts as instructor and she is showing Karin the steps in using the software. These steps are to find the file, to start the program, pic out and attach pictures and start to write a narrative in Powerpoint. Fia is taking control of the interaction. She is taking the mouse and moving it up and down over the screen as she was searching for the right choice. She is testing and trying to use all accessible resources. Even if Fia leads the interaction she doesn't have everything in the situation under control.

Turns	Actors	Speech	Digital resources
1	Fia:	first of all, I think that you should begin here, click for wider screen, and then you should go there, no…mm…mm… no, here you can look for your name… Karin	Fia moves the mouse around on the computer screen

Fia's explanation plays a role in dialogic encounters with Karin. Fia's ability to produce appropriate directives, is shaping the understanding and the know-how of mastering the computer. By watching Fia's action – her use of words and the computer – Karin as an amateur receives a structure for how the software works. The verbal and non-verbal instructions shape the social process and influence Karin's ability to learn. Fia's instructive interaction may also be understood as her representation of how the software can be used together with a class mate. There is a lot of pointing at the screen and together they are seeking for Karin's name. The two pupils are involved in problem solving and both of them are active in the interaction in spite of Fia's dominance as a speaker.

Turns	Actors	Speech	Digital resources
2	Karin:	a…b…there	Karin points at the computer screen. Fia drops the mouse and points at the screen as well. Karin takes over the mouse.

Continues on next page.

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Turns	Actors	Speech	Digital resources
3	Fia:	Yes there, you can click there…the file, click at the file, then you double click…	
	Fia:	Then you go to, good, then you are here, then you go to, let's see, go to here, no, now it went wrong	Fia is taking the mouse back and she is using it to demonstrate her current interpretation

In the transcription above Fia discovers her mistake and indicates uncertainty. The transcription shows that the pupils are using the digital learning resources for solving their task in a process. Learning can be understood as process in which the pupils is mastering ways of acting that enables them to participate in a verbal and non-verbal practice. Learning occurs situational while Fia as an instructor tries to master the software at the same time as she explains what she is doing. When she is having difficulties, she uses the mouse as a thinking device and her talk accompanies the action. The following transcription illustrates a finding, where the pupils cooperate to solve a problem.

Turns	Actors	Speech	Digital resources
3	Fia:	no I do not remember how I did, then we can go to here, good, mm good, yes	
4	Karin:	I have only scanned two pictures	
5	Fia:	Ok, you can then, click on that if you want. Do you want to write anything more on this one?	
6	Karin:	No I will write a new one	
7	Fia:	Will you begin writing a new one?	
8	Karin:	Yes	
9	Fia:	Then you click, new picture and you can start writing	Fia is giving the mouse back to Karin.
		((Fia returns to her own seat))	

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When Fia is having problem Karin becomes more active in the interaction. The given information facilitates problem solving. The transcription also illustrates a situation where Fia is reflecting upon the limited content in Karin's writing and she tries to make Karin aware of it. Karin ignores the instruction and instead she wants to write text to a new picture. I argue that a cooperation occurs, which helps the pupils to learn the functions of the software. Both verbal language and non-verbal actions are involved, and these mediational means together make problem solving possible for them. Fia points at objects at the screen and she synchronizes her talk with events on the computer screen. Verbal language is insufficient to effect the reach of mutual understanding.

Teacher as way watcher

The pattern teacher as way watcher is common during the classes in the computer classroom. The interaction of the way watcher is characterised by verbtypes such as explaining tangible- and content-related aspects in the use of the computer, instructional questioning, stating opinions or facts and judging the correctness of actions (verbal and non-verbal). The interaction is asymmetric because the teacher is talking much of the time and making all decisions concerning the computerized work. The interaction is also asymmetric when the teacher is showing something new on the wide screen. In that situation the teacher operates the computer. In general, the teacher is letting the pupils manage their own computers, especially when she is explaining or guiding them to learn different ways to handle the computer software. In these settings the teacher invokes both tangible-related structures (eg. affordances related to the keyboard or the mouse activities) and content related structures (eg. semantic structures of a narrative), which shape the pupils actions at the computers. These structures may be understood as guidelines or tool kit for how and what to do and write at the computers. Several times the teacher illuminates what facilities the computers provide. The pupils receive these affordances, both tangible- and content-related, and the pupils´ acting become more or less enforced by the software. In the working activities, the pupils utilise the kind of structuring tools provided by the software and these structuring tools shape action and lead to a change in writing styles. In the computer, symbolic distinctions empower them to act and to think in certain ways. In the following transcription the teacher instructs the pupils what they should do after writing their texts. The teacher asks instructional questions and a few pupils raise their hands to answer.

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Turns	Actors	Speech	Digital resources
1	Anna:	when you have inserted all the pictures, I want you to read the text very carefully and look for spelling mistakes. What should it be more besides looking for spelling mistakes? Sven – what do you think I am going to say you must do with your text? No idea? ((few pupils raise their hands))	
	Anna:	Here we got three, they think they know what to do with the text when you have… what else? What do you say?	
2	Klara:	correct spelling mistakes, insert dots and capital letters	
3	Anna:	Yes, that will do	

Teacher as challenger

The pattern teacher as challenger occurs when the teacher gives suggestions how the pupils can develop their texts. The interaction of the teacher as challenger is characterised by verb-types such as content related questioning, authentic questioning and encouraging. The interaction is often asymmetric in the sense that the teacher is talking much of the time and has the authority. It is not common that the teacher is taking turns at the computers, but when it occurs it can be described as pointing at the screen or activities with the mouse for showing minor guidelines in the working process. The pupils seem to view themselves as the owners of the keyboard or the mouse in these settings. The excerpt illustrates that the teacher acts as challenger while the pupil assign the role of amateur.

Turns	Actors	Speech	Digital resources
		((Anna goes to Karin))	Anna is leaning over the computer and she is looking at the computer screen
1	Anna:	Now we shall see, ohh you have succeeded to open everything here	

Turns	Actors	Speech	Digital resources
2	Fia:	I helped her	
3	Anna:	You helped her, yes, that is good, so what can you do now on the third slide? You have got a new picture and everything. Was it Fia who helped you? ((Karin is nodding her head))	
	Anna:	Mm, now I said like this, I shall take a picture of you and then we will insert it here	Anna is pointing at the screen
	Anna:	Then you can write about…now I have to help Vincent and the others first so it will take a while	Anna is pointing at the boys further down in the classroom
	Anna:	Do you want to continue to write about yourself?	

Anna is interested in what Karin has to say. No specific knowledge is in focus and there are no specific instructions to give. Anna is just curious on Karin's own voice or her own perspective on the daily life. In interaction, Anna is using an open and authentic question to seek Karin's thoughts on the matter. Authentic questioning are seldom utilised by the pupils in interaction.

Turns	Actors	Speech	Digital resources
	Anna:	or are you going to write about this, that you have moved? You should, aha you know… Do you remember how you insert letters?	Anna is watching and pointing at the screen
4	Karin:	mm, there	
5	Anna:	There yes, and then click there	Anna is pointing at the screen again
	Anna:	no, somewhere at the paper, and then you start to write about… how was your weekend?	

Turns	Actors	Speech	Digital resources
		What has happened? Where have you stayed? Tell us everything you can think about and write it all down	

Anna is helping Karin to come up with ideas. She formulates content related questions which are supposed to guide Karin in her writing. Anna leaves Karin to start to write on her text. Karin gets involved to create a text for a presentation in Powerpoint. The content Karin is constructing relates to things she knows and easy can describe.

Pupils as inspirers

The result shows a pattern of an interchange of ideas and the pupils become each others inspirers. In the interaction the pupils also show each other what they have learned. They present to each other a competence of story telling and they show an open construction of narratives. The interaction of the inspirer is often symmetric and it is characterised by verb-types such as interchanging of tangible related experiences and encouraging. In playful way the pupils acknowledge each others narratives and their focus is on the form of the texts instead of the content. The pupils work individually but occasionally they are cooperating and giving each other support e.g. showing each other different choices of pictures and texts. In these settings, it is most common that the pupil who is seated at the computer handles the keyboard and the mouse. Pupils, who are gathering around, point and give comments on the content matter at the computer screen. Content related cooperation concerning the text development rarely occurs; instead the pupils are commenting each other's ideas. The pupils are talking almost constantly while working at the computer. The pupil use speech as a mediational tool which accompanies their thought when they operate at the computer. They are acting ideas out and using humour in their interaction. The excerpt describes how two pupils, Per and Fia, are making comments in a spiritual way about the content of a picture.

Turns	Actors	Speech	Digital resources
1	Per:	Fia, Fia …look…where is the marker …there, check it out	He is sitting at his computer next to Fia
2	Fia:	check out Nina's picture	she is leaving her seat at the

Turns	Actors	Speech	Digital resources
			computer and stands beside Per and points at his computer screen
	Fia:	that one, that one, wait, don't do anything, don't do anything, that one is funny, there is Nina when she is little, hi	
	Fia:	Check this, check this, hi ((she makes a funny face))	
	Fia:	In this picture ((she makes a funny face again))	
	Fia:	look at this, hi, I did like this, hi, ahh, ahh ((she makes a funny face again and she sounds like a baby))	
	Fia:	It is so funny ((she leaves Per and goes back to her own seat))	

The working process makes the pupil interchange their experiences of narrative writings at the computers. The pupils give each other ideas and they test and retest different choices in cooperation. Content related issues are not common in the communication by the pupils. Instead, there is the teacher who helps the pupils to reflect on content related aspects in their writings e.g. that the page "my self" must contain ten personal items or interests. In the social interaction the pupils use the interaction to master the learning process in writing the narratives.

FINDINGS AND CONCLUSION

If I return to the beginning of this paper, to the research questions, I have tried to show how computerized work is organized and how teacher and young pupils interact, which purpose is to illuminate how interaction and use of digital learning resources can influence pupils' work at computers within a Learning Design Sequence, LDS.

The results of the project have given support to the ideas that social interaction and the use of digital learning resources influence pupils' work and narrative writings at computers. In the beginning of the LDS, the teacher initiated a social responsibility that seemed to have an impact on the computerized work. The goal was to encourage pupils to help and get involved in each other's understanding and learning processes. Hence, the work organization – a mediated social chain responsibility, seemed to influence the interaction between the participants. In the study, I have identified four patterns of interaction: *pupils as instructor and amateur, teacher as way watcher, teacher as challenger and pupils as inspirers.* Different topic focuses and working exercises and different power and authority structures provided different patterns of interaction. Below, I illustrate the dynamic process which concerns the use of digital learning resources and social interaction. On the vertical level the model presents a dimension of topic and working exercises towards different aspects in the use of digital learning resources and on the horizontal level the model presents a dimension of authority in co-operation.
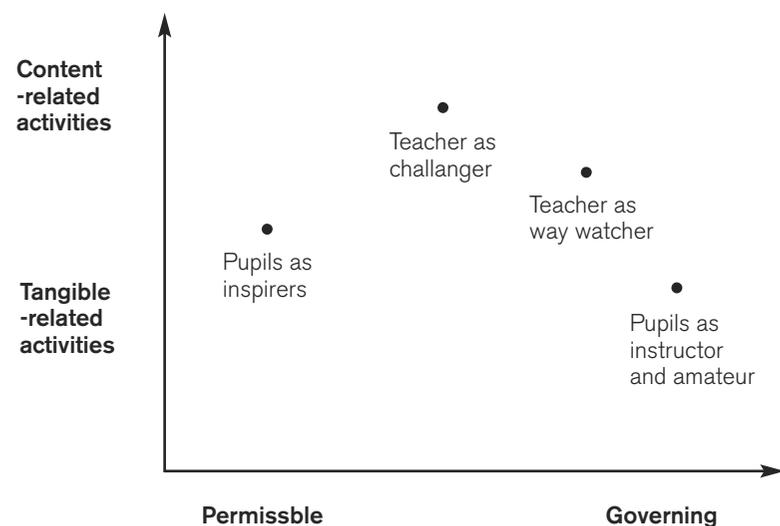

Figure 1: The model illustrates the process between topic and working exercises and authority in co-operation.

The pattern teacher as way watcher was most common during the phases of transforming and forming. In these situations the teacher was often focused on certain educational content, both tangible and content related issues concerning the digital learning resources. The teacher used verb-types such as explaining, instructional questioning, stating opinions or facts and judging the correctness of actions (verbal and/or non-verbal). She was strictly guiding the way in mastering the computer work. In these interactions the teacher also gave the pupils both tangible- and content-related structures which influenced their work and writing at the computers.

The pattern pupils as instructor and amateur illustrated more an interaction of an active instructor and a passive amateur. The interaction led to situational asymmetry and an opportunity for the pupils to present knowledge and their position of power. In the interaction, the pupils were exclusively concerned about the technical details of the task and the step-by-step procedure. In the tangible-related activities the amateur received not often the opportunity to get a hands on training at the computer. It was the instructor who was guiding the activities and handled the computer, both verbally and non-verbally. This structural interaction contained limited collaborative strategies.

The pattern teacher as challenger was characterized by verb-types such as content related questioning, authentic questioning and encouraging. The interaction led to more symmetry and bigger opportunity to emphasize content related issues. The teacher was concerned in some ways to challenge the pupils in their writing.

On the other hand, the pattern of pupils as inspirers did not increase focus on the content matter but the pattern created playfulness and creativity. The interaction also provided opportunities for pupils to collaborate in the sense that the pupils explored and expressed ideas and opinions of each others experiences, but many of the pupils narratives were developed individually. The pupils as well as the teacher were sometimes equally treated as resources for interaction and learning.

To conclude this paper, the digital learning resources were in itself supportive during the learning process and eventually the pupils came to use a lot of the computerized work without the need of continuing outside support. The usage of digital learning resources influenced the pupil's work in a way that the tools provided in the software empowered the pupils to act in certain ways. These ways of action were also constituted by social interaction, e.g. the speech of the instructor accompanied the use of the software. I would also like to emphasis that different patterns of interaction seemed to have an important influence on the teacher and the pupils using them and on what the main focus would be in the computerized work. Different aspects (tangible or content related ones) in the use of the digital learning resources gave also the user a hint for a potential usage or interaction. These findings highlight the need to understand how particular patterns of interaction and use of digital learning resources support or shape some activities but not others.

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[1] For further information: www.didaktikdesign/learnit

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