Designs for Learning
Volume 7 / Number 1
2014

Digital tablets and applications in preschool – Preschoolers' creative transformation of didactic design

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Little is known about preschoolers and their engagement with digital tablets. This article addresses this gap by drawing on findings from two research projects. The aim is to illustrate how children make meaning, transform and play while engaging with various applications comprised by the materiality of the digital tablets. Empirical video material has been multimodally transcribed and empirical examples are framed by a design theoretical perspective. Findings capture diverse experiences illustrating how preschoolers creatively manipulate and playfully transform didactic designs. The results illustrate how children´s self-initiated play with application's design shifts the balance of authority that typically exists between adults and children, and the article concludes in a suggestion of how the notion of play can be understood with a design theoretical perspective.

PRESCHOOLERS AND DIGITAL TABLETS – CELEBRATIONS AND CONCERNS

Digital tablets mark a turning point for young children's meaning-making and play in formal and informal settings. Despite this, research has not been able to explain the complex interrelationship between the material characteristics, design and meaning potentials of these technological devices for children's learning and play. There is little research about digital tablets in preschool, obviously because it is a new tool, but probably also because of the lack of interest among public authorities in recognizing ICT – information- and communication technologies – in modern early childhood education (Bølgan, 2012). Digital tablets' size, weight and multipurpose design together with the allowing digital interface is viewed to offer powerful op-

DOI:http://dx.doi.org/10.2478/dfl-2014-0009

portunities for meaning-making and play to young children, especially in comparison with earlier generations of computers and laptops which demand advanced reading and motor abilities. Previous research illustrates how digital tablets and their built-in applications, can provide opportunities for preschoolers to engage in useful and purposeful literacy interactions (Sandvik, Smørdal & Østerud, 2012) and computer games are often appreciated as having a positive effect on learning (Gee, 2008). Research lifts digital tablets as a tool that preschoolers easily can navigate and use independently (Beschorner & Hutchison, 2013). Children are often drawn to digital resources such as digital tablets – and so are adults. Research shows that parents are positive to children's use of digital devices because of their potential for learning (Björk Guðmundsdóttir & Hardersen, 2012; Moinian, 2011) – a viewpoint shared by many preschool teachers (Sandvik, Smørdal & Østerud, 2012). On the other hand digital games, as well as new digital applications, are often criticized for hampering creativity which causes the increasing use of digital tablets in preschool to be viewed as a controversial issue. Debates on children and digital devices indicate discourses of "celebration" and "concern" about children´s use of digital media according to Drotner (2009). Instead of simplification and selection of extreme situations, Drotner draws on research that views media practices to be a part of social everyday practices.

The educational goals in Swedish preschool (Lpfö 98/10, 2010) along with the applications' didactic design and representations, frame the context as well as what is worth learning, creating, playing with and enjoying here. With a multimodal and design theoretical perspective in our studies we view children to be able to transform information and to make their own signs as new combinations of form and meaning - Children do not use media in the digital interface (c.f. Kress, 2003); they make it. Here we focus on selected findings to highlight how digital tablets can extend possibilities for preschoolers' participation and agency but at the same time circumscribe their selection and choice since they are only allowed to play with applications that are designed, downloaded and introduced by adults.

The aim of the present article is to illustrate how children make meaning, transform and play while engaging with various applications comprised by

the materiality of the digital tablets. Research questions are: *How do children make meaning of application design? In what ways do children transform didactic designs?* Furthermore, an aim with this article is to illustrate how the notions of affordance and prompt can be developed and used for empirical studies of preschoolers as well as to elaborate how the notion of play can be understood from a design theoretical perspective.

DESIGN THEORETICAL VIEWPOINTS ON PRE-SCHOOLERS AND DIGITAL TABLETS

The theoretical and methodological approach in this article derives from a multimodal, design theoretical perspective – designs for learning (Selander & Kress, 2010; Kress, 2010; Selander, 2008b), from which a few selected notions of importance for this article will be discussed. ICT is here understood as the meaning-making, actional, visual and linguistic resources (Kress et al, 2001) used to communicate. Drawing on Burnett's division of ICT as a) deliverer of literacy, b) site for interaction around texts and as a c) medium for meaning-making, aspects of the two latter categories will here be addressed as we are interested in application design and how children make meaning in the digital interface. Digital learning resources, such as a digital tablet, can offer potentials for children to work with realistic multimodal simulations of the world around them (Shaffer, 2006) and they make a wide repertoire of representational and communicative modes available (Jewitt, 2006).

AFFORDANCES AND PROMPTS

With a multimodal, design theoretical approach childrens' interaction is understood as occurring in different modes simultaneously, holding possibilities for meaning-making (Kress, 2009; Kress & van Leeuwen, 2001; Rostvall & Selander, 2008) and pre-schoolers choose the modes that seem to fit their own interest best and make use of them to make meaning in relation to their previous experiences. Some modes of the digital tablet are more salient, important and prominent in the application composition, (van Leeuwen, 2005) than others in how they catch the child's interest. An important notion here is affordance (Kress, 2009; Kress & van Leeuwen, 1996; Selander & Kress, 2010), which can be explained as the semiotic potential/limitation for representation that is to be found in a mode. According to Gibson (1979),

an affordance is a quality of an object, or a physical environment, that allows people to take action. Kress (2010) means that a computer affords both hardware and software affordances, but since interface interaction on a digital tablet merely occurs on the screen the software affordances are here addressed. What the child recognizes as an affordance depends on the child's needs, interests and the specific situation at hand (van Leeuwen, 2005). Here the notion of prompt is important as it explains an invitation to interaction *"At all times communication is a response to a "prompt"…"* (Kress, 2010:32). We understand the crucial difference between an affordance and a prompt to be that a child is encouraged to answer back or respond to the prompt. As children's perception is selective as well as being culturally and socially conditioned (Selander & Kress, 2010), a prompt is not turned into a prompt until he or she interprets the icon, the sound or the animation presented on the screen in the specific situation as a trigger to some sort of action (Kress, 2010) and a second move in a unit of dialogue (van Leeuwen, 2005:283) such as laughing at an animation or clicking at it takes place. Prompts and salience are decisive for children's meaning-making.

MEANING-MAKING AND PLAY

Children´s capacity for play is acknowledged to be a universal social practice that emerges from the experience of being immersed in daily life together with adults and is characterized by spontaneous imitation, reflection and interpretive reproduction (Göncu et.al. 2000; Kamp, 2001; Corsaro, 2005; Marfo and Biersteker 2011). From a cultural-historical point of view it is through play activities that toddlers constitute their basic awareness of the world and raise their cognition of reality to a more complex and generalized level (Fleer, 2010). The notion of spontaneous play has been further described as part of the skills and competencies necessary for survival and productive community membership in early childhood literature (Fleer, 2010; Rogers, 2011; Rogoff, et.al 2003). This has resulted in an ongoing debate on how and whether digital technologies can fit into the concept of play in preschool settings (Waller, 2009; Rönneberg, 2008; Souza & Cabello, 2010). Research on play asks questions about the value of these devices and what affordances they offer (Waller, 2011; Plowman & Stephen, 2005; Marsh, 2005). More recent play research views play as embodiments of social and cultural relationships. Play can shape and structure children's possibilities

for social action and cultural expressions to constitute the basis for deconstructing power relationships and hierarchy between adults and children, with children themselves in control (Edwards, 1995; Prensky, 2001/2005).

This is consistent with Evaldsson's (2009) finding that children´s play is not separated from the adults' world, but that children creatively manipulate power and language structures available in the adult culture in their play. The affective and multimodal qualities embedded in digital images and sound presented on the screen together with the opportunities for, and potentialities of, play in young children´s learning and communication shifts the balance of authority to children´s advantage. The relationship between adults and children is found to be horizontal in digital environments (Holm Sørensen, Danielsen & Nielsen, 2006; Kjällander, 2011) and children challenge adults by making meaning other than an intended one by interacting with different affordances offered in the digital interface. The ensemble of different signs as a whole can become meaningful to the child (Kress, 2010) and meaning-making is thought to occur when a child transforms something within different semiotic resources. The child can here take an active interest in a social domain – such as using the digital tablet to take a photo of a toy car. There is a need for elaboration with the concept of play from a design theoretical perspective since the play is not clearly defined. Inspired by Kress (1997) we understand play as a transformative action in which the child makes sense of the signs provided to her or him within the frames of reference of the child's own experience and her or his interest in the present moment. Kress (1997:xvii) states that "*Children make meaning in an absolute plethora of ways, with an absolute plethora of means, in two, three and four dimensions.*" Play is viewed to give children a chance to open up for learning, improvisation, innovations as well as challenging adults' authority and power upon children (Sutton-Smith, 1997). To be able to read and write is no longer a precondition for young children´s interaction with digital devices. Through the interaction with new technologies, young children´s agency is highlighted long before they can talk, read or write (Jewitt, 2006). The subjective nature of affordances and prompts allows young children to contextually transform the meaning they put into different applications and suggests a more agentic view of childhood. Meaning-making involves a change or a development of identities in a social context (Kress, 2010; Se-

lander, 2008a). Identity is here understood as a matter of ongoing subject positioning where identity is not a fixed quality but a relational concept and the result of social interactions, negotiations and power relations (Selander & Aamotsbakken, 2009; Fuglerud & Hylland Eriksen, 2007; Ricoeur, 1994). Identity is a formative process in which children constantly interpret, negotiate and try out different identities (Selander & Aamotsbakken, 2009) in their play. Preschoolers' negotiation of identities is especially interesting here, since they are given yet another arena, platform or dimension to act upon as they are using digital tablets (cf. Moinian, 2007; Shaffer, 2006). A greater fluidity and plurality in the identity formation of young people and children is also widely acknowledged as new technologies open up new spaces for play and for reflection on consumer and production processes (Gee, 2003).

TWO RESEARCH PROJECTS ON DIGITAL TABLETS IN PRE-SCHOOL

A multimodal perspective insists upon the need in each case to look at the environment in which the practice has its place and not the technology alone (Kress & Van Leeuwen, 2001). The aim has been to document situated interface interaction (Lave & Wenger, 1994) and collect naturally occurring empirical material (Potter, 1996). Video recordings provide potentials for understanding multimodal interactions (Norris, 2002), without neglecting that what the camera registers is what the researcher has chosen to see (Wartofsky, 1993). A theoretical model for analysis, called a Learning Design Sequence is used in this study (for information about the model see Selander, 2008b) in order to understand pre-schoolers' meaning-making and play with applications.

This article presents results from two projects. In one project two preschool settings were selected because of their announced interest in research on children´s interaction with digital tablets. Both parents and preschool teachers were interested to know what tablets offer for their practice and for their children´s play and learning. Most of the children had access to tablets, computers and mobile phones at home and most of the practitioners had received specific training in using ITC learning resources at work. Each setting was observed for four weeks, for one hour each week. In the other research project 16 multicultural preschools were included, and three

were chosen, depending upon how they had described their ongoing projects with digital tablets, for close video observations during a year. Parents were positive toward the research project and a minority of the pupils had access to digital tablets at home. Preschool teachers were all interested but new to digital tablets and they received in-service training once a month during this year.

The projects are thus slightly different, but the design of the study and the objectives are similar. The video camera was always placed so as to document the interaction with the digital interface, documenting children and preschool teachers as well as the screen capturing all modes such as speech, pictures, gestures, screen activity and sounds. Field notes were taken and the nature and duration of each episode was written down along with drawings of the physical environment. The sequences could be as short as one minute or as sustained as 30 minutes and could involve a child alone, a group of children, some adult and child interaction or a combination of these. A design theoretical analysis was made. As multimodal transcription is very time consuming, small units from the films have been chosen for analysis – critical incidents (Flanagan, 1954; Tripp, 1993) – selected according to prerequisite criteria. A selection criterion for this article is that one or several children should be using a game application in the presence of a preschool teacher. The notion of site of engagement (Matusov, 2007; Scollon, 2001) is used to outline the section of the transcribed critical incident. According to Goffman (1981), social interaction is framed by a clear opening and a clear closing (Norris, 2002) – here the mode of gesture opened a site of engagement. Most modes are transcribed, but transcriptions are reduced versions of observed reality (Flewitt, et al., 2009). Modes such as speech have been thoroughly transcribed whereas smell is only mentioned. A specially designed multimodal transcription chart was designed (c.f. Jewitt, 2009; Insulander, 2010; Lindstrand, 2006; Rostvall & West, 2005) and used to analyze the sites of engagement (cf. Conversation Analysis). Each site of engagement has been broken down into meaningful units of analysis that are possible to handle (Rosenstein, 2002) and understand. Speech is transcribed inspired by a method called Jeffersonian Transcription Notation (Jefferson, 1984) and the following is an example.

Transcription notes	
Text	speech as in written language
!?	signs as in written language
[text]	overlapping speech
(text)	unidentified speech/sound
...	pause
xx	interrupted speech
TEXT	loud speech

Unlike microanalysis everything must not be transcribed; instead modes necessary to create logic in the flow of interaction are transcribed (Linderoth, 2004). QuickTime and Microsoft Word were used for transcription and the text interprets and represents an event – it is not the event itself (Green et al., 1997; Rostvall & West, 2005). The following is an example of two rows in such a transcription chart.

Time 	Preschooler's gesture, Movement, body position, facial expression	Preschool teacher's gesture, Movement, body position, facial expression	Preschooler's speech and sounds	Preschool teacher's speech and sounds	Digital tablet's sounds	Digital tablet's image
03.02	A sits looking at screen with pointing finger. B lifts hand with rattle.	Stands up. Looking over A and digital tablet.	A: This?	Here xx	-	Santa Claus' face.
03.04	A points at screen. B puts rattle in mouth.	Puts one hand on hip.	A: THIS?	Yes.	-	Santa Claus' face.

Such fine-grained transcriptions were used to explore how multimodal interaction unfolds moment-by-moment. The notions of affordance, prompt and transformation are conceptual tools along with our understanding of play. Many transcriptions were made and some were chosen and redesigned into excerpts in order to make the three examples coherent. These excerpts are designed as thick descriptions in line with Geertz (1973) where

children's modes are described along with the context of for example signs provided by the digital tablet or the preschool teacher. Nearly 100 different game applications have been studied within the frames of the two projects, most of them are "play&learn"-apps. Almost 50 multimodal transcriptions were made and analyzed and three of them were selected and transformed into examples because they were appreciated as representative for the entire collection of empirical material.

Both studies are thoroughly designed according to research ethics (Vetenskapsrådet, 2004; Vetenskapsrådet, 2005) following the four outspoken guidelines, meaning that authorized letters of information were sent to and signed by all parents of children included in the study; all personal information is coded; all images made were unidentified; and the empirical material is only used by the research team and kept locked in a safe. The names used in the excerpts are fictitious, or assumed (cf. Løkken & Søbstad, 1995).

EMPIRICAL FINDINGS ILLUSTRATED BY EMPIRICAL EXCERPTS

The two research questions: *How do children make meaning of application design? In what ways do children transform didactic designs?* have guided the analysis and the results will be discussed in this section. Through intensive and multimodal observations examples below are meant to illustrate the kinds of meanings that children impart to various applications. The applications' content both frame and design what is possible for young children to make meaning from. Children´s individual backgrounds, gender, class, ethnicity and plenty of other factors also play roles when they ascribe meaning to various applications. In both studies it was evident that the digital tablets and their prefabricated applications can offer extended opportunities for meaning-making and play to young children. Earlier studies present how toddlers are interacting randomly with the digital interface (Statens medieråd, 2010), something to which our study proves the opposite. Whenever the tablet´s sound was turned off, a decreased interest and less attraction from children´s side could be noted, especially among the youngest. Visual modes such as images, photos and animations are often appreciated as affordances by older children but to toddlers we found sound to be the most prominent prompt and the one to which they tended to make a second move as an answer (van Leeuwen, 2005), for example by

imitating the sound. Children´s interactions with the digital interface include transforming different types of designs into something closer to their own interest and previous experiences. The multimodal transcriptions of children's talk and other modes provide illustrations where children clearly relate the application´s images to their own everyday experiences. Excerpts from both studies are used here to describe how children playfully resist adult authority since applications are designed, installed and introduced by adults. Children are here seen to be transforming the didactic design built into applications on the tablets. *Transformation* contributes to our understanding of how children change the meanings that are offered and create their own spaces for play. The transformation that occurs when young children use semiotic resources – for example lines in a paint program – in a game in order to create a new aim with the application – for example making race tracks for their toy cars – is important because it provides the children with new opportunities to challenge relations between adults and children. They can here choose to play although the didactic design focuses on drawing. The following empirical examples are presented and discussed using a multimodal, design theoretical framework with a few inputs from childhood studies in order to give readers a chance to comprehend the empirical material and the analysis of the selected sequences.

Emma, three years old, is sitting alone with the tablet on her lap. She looks intensely at icons and swipes her fingers randomly on applications chosen and introduced by her teacher previously. Finally she stops on an icon and taps her finger on the application to open. Four animals: a horse, a sheep, a cow and a tiny bird are pictured in a row, with prompts to be placed by the user in their appropriate environment. There is no spoken direction on the application. Emma has to decide which animal should be placed in which natural setting. She slides her fingers on the horse and draws it to a green field. She repeats the same procedure over and over again for 50 seconds. Then she captures the horse and places it on a tiny branch where the little bird is supposed to sit. This response is rejected by the application and the horse falls down while Emma giggles loudly. She then places the cow on the tiny branch which falls down and she giggles again while viewing her unsuccessful attempts. Emma continues to place the animals in impossible positions for another 50 seconds before the teacher announces its time to go for lunch.

Emma is sitting silently by herself during video recording. She seems focused and engaged with her body, her hands responding to the images on the screen. Her gestures are playful and she smiles from time to time. Emma demonstrates awareness of what she was required to do and she follows the didactic design of the digital game which intends to teach the appropriate environment for four animals, but then she starts transforming the symbolic meanings which are known to her. It can be viewed as Emma engaging in play activity, reflecting on ways for challenging the desired response preexisting within the application. Emma completes the task incorrectly this time, ignoring the negative screen-based feedback. She negotiates her identity (Selander & Aamotsbakken, 2009) transforming it from a learner/consumer to a producer/designer (Kress, 2011) when she actively engages with activating the undesirable responses. This transformation is made possible through Emma´s attempt to take up a new prompt. Knowing the right answers worked as potential prompts for Emma, encouraging her to act in a creative and new way. According to Kress (2010) affordances can be viewed here as invitations to act and respond. What invites Emma to respond changes with her abilities and through repetitive interaction with the same application. The analyses show the complex and contextual character of the way Emma interacts within the frame of the same application. What Emma finds as most inviting and fascinating alters contextually during the short observation period. The application's affordance contained both learning and play opportunities and Emma is positioning herself alternatively first as a learner and later on as a player: someone who can challenge the digital design and position herself as someone who allows herself innovations and playfulness. The possibility of, for example, putting the horse in the tree was appreciated as a prompt (Kress, 2010) by Emma. This can also be explained by a parallel to how children choose to reject the right answer in order to play and have fun – they want to position themselves as playfully questioning, experimenting with something that is beyond or at least in addition to, the answers that have been provided by previous experiences. Answers and solutions can here be viewed as a side-effect and the only thing left when learning is over and done with (Mariett-Olsson, 2013).

In this example, a 6-minute-long sequence was recorded, with the youngest children in a preschool setting. Five children, three girls and 2 boys between 22 months and three years old, are sitting in a circle. The preschool teacher informs the group that they are going to meet four exciting figures. On the white board he has drawn a circle, a square, a triangle and a rectangle giving each and every one of them human names as well as human characteristics such as eyes, mouth, hands and feet. He introduces each figure with their names as circle Cissi, quadrate Conrad, rectangle Richard and triangle Terry. He repeats the names pointing to the figures several times before taking up the tablet and choosing an application where a round big face with two round big eyes and a wide open mouth asks the children to feed him with various geometrical forms. The application is designed with a focus on four geometrical forms. The monster asks for different geometrical forms to eat and the children make plenty of unsuccessful attempts. The teacher points to the right form from time to time. The application provides the children with both visual and spoken directions as on the monster´s forehead one can see the form he is asking for. They swipe randomly, most of the time the wrong figure. The monster refuses of course to eat the wrong form and complains: “This is not what I like to have. I want something else. I want to have a rectangle!”

The teacher both points to the required form and names it at the same time. He makes rhetorical questions asking them "What is it the monster wants to eat? Is it a circle?" One of the children answers pointing at the monster: "It is dangerous!" After many attempts to feed the unsatisfied monster one of the children swipes her finger in the monster´s eyes. The monster screams: "Ouch! Ouch!" The little group of children takes turns swiping their fingers in the monster´s eyes and mouth. They smile. The children giggle and laugh. The teacher formulates a new task and asks them: "When does the monster say Ouch! Ouch!" "The eyes!" says the youngest one in the group.

OUCH! OUCH! – A PROMPT

The analyses of this example draws on Kress' (2010) statement that what is a prompt cannot be predetermined in didactic processes, rather they turn to become a prompt when they trigger the user´s interaction: the second move in a dialogue (van Leeuwen, 2005). The required "feeding the monster activity" does not make sense to the children and they seem to find it hard to follow the verbal instructions: instead the activity is transformed into a playful exploration of how to irritate the monster by pushing a finger into his eyes. The formal learning afforded by the game design, based on recognizing geometrical figures is changed into a play of pushing a finger into the monsters eye, irritating him and laughing at the sound of his moaning "Ouch! Ouch!". Through playful interaction they resist the pre-existing didactic design of the application and transform the prompt for learning geometrical figures to engage with the monster's corporal signs of irritation. This captures the group´s attention and allows them to engage with the monster now, initiating a new prompt, and developing their own play through transformed representations. The didactic design and content of an application is meant to encourage the user to focus on certain things by giving children prompts (Kress, 2010), in one or several modes.

The monster´s (and the teacher´s) verbal instructions about the specific geometrical forms do not turn into a prompt for these young children, rather the "Ouch! Ouch!" triggers their interaction and connects the happenings on the screen to embodied experiences of pain they have previous experiences of.

This scene takes place during three minutes in the hallway in the afternoon. Jim, one year old, is standing by a digital tablet that sits on his preschool teacher's lap. He looks straight at the screen throughout the documented sequence. Another toddler sits at the preschool teacher´s lap and yet two other toddlers are standing next to them watching the screen.

The preschool teacher turns the tablet in Jim's direction. He is allowed to choose between different applications. Without hesitation he chooses a game designed as a barber shop where you can cut Santa Claus' beard or the branches of a Christmas tree. He taps the icon and the application opens up. At the bottom of the screen there are a few different tools (a pair of scissors, a comb and a colouring brush) to use for "hairdressing" the Christmas tree in the middle of the screen. Jim bends over the screen and taps the different icons which all give different sounds. He leans his head down and seems to listen. He begins to tap the tools systematically. The digital tablet provides sound effects. The preschool teacher grabs his hand, to catch the colouring brush with his finger and swipe the tool to the tree to colour the branches thereby showing him how to use it. Jim says: "No" and goes on tapping the tools systematically. Suddenly Jim taps an icon to start a new game and the head of

a Santa Claus appears in the middle of the screen. The same tools are in the foreground and Jim continues tapping the tools. The preschool teacher taps the scissors with her own finger and swipes them to Santa's face, cutting his beard. Jim ignores her and continues tapping the tools, whereafter it is another child's turn.

Five minutes later the preschool teacher says that she must go to change a nappie and lifts Jim and the tablet up, putting them on a sofa. Jim immediately moves his finger a little bit above the screen, his eyes focused on the screen. The icon he seems to be searching for is not displayed and he swipes in order to find it, which he does. He taps on the icon and finds his way into the barber shop, chooses the Christmas tree and begins to tap the tools systematically. Tess, two years old, seems interested in the sounds from the tablet and climbs up onto the sofa next to Jim. She looks at Jim and moves her body in time with the sound, singing, clapping her hands and shaking a rattle. Jim does not take his eyes off the screen and seems not to take any notice of Tess's dancing, clapping and singing. Tess leans in Jim's direction, looking at the screen and touching his shoulder. Jim leans away from her and she hits him in the head.

CREATIVE TRANSFORMATION

The preschool teacher in this example designs a setting characterized by institutional norms of "free play" where the toddlers are allowed to explore the digital tablet, i.e. there is no specific subject-related aim – except the outspoken resource of all the different applications the children are encouraged to engage with. The selected game provides a lot of different signs, but most of them are not within the frames of this toddler's experience nor his interest (Kress, 1997). It offers a lot of different affordances (Gibson, 1979; Kress, 2009; Kress & van Leeuwen, 1996; Selander & Kress, 2010; Selander & Svärdemo-Åberg, 2009) such as scissors to cut hair with and jars of colour to paint with. Jim is unlikely to take an active interest in a setting designed as a barber shop, since he probably has no earlier experience of such a place and perhaps he does not even know Santa Claus or Christmas trees. Jim cannot, or does not want to, make meaning in the setting, nor by the visual modes; instead he tries to transform the setting and objects into something that makes sense and is meaningful to him: sound. Sound is, in this study, proven to be the most prominent mode to toddlers and the sounds are appreciated as prompts (Kress, 2010) by Jim. His interest in playing music with the sounds makes him transform the media into something new and here he enters another dimension, using Kress' (1997) expression. He deliberately makes a second move in a unit of

dialogue (van Leeuwen, 2005): a representation other than the intended. While doing this he challenges the game design as well as the preschool teacher by transforming the hairdressing activity into a music activity. This creative transformation is similar to that of a jazz musician playfully improvising, different identities guided by interest and enjoying the very moment. This challenge of relations will be further developed focusing on how the digital environment offers possibilities for toddlers to interpret, negotiate and try out different identities (Selander & Aamotsbakken, 2009).

A child must be understood by considering the environment or setting he or she acts in (Bauman, 1991; Butler, 1999; Lyotard, 1984; Nordin-Hultman, 2004). This example illustrates how Jim seems to interpret the didactic design as allowing and therefore plays and tries out as a musician instead of a hairdresser. He is interested in the mode of sound, which he finds salient (van Leeuwen, 2005) in the digital interface, and he makes meaning of the information presented in a design activity by composing the sound into some kind of music. It is likely that Jim does this because of his urge to play with the different sounds rather than to challenge his preschool teacher. Nevertheless, he ignores the preschool teacher's as well as the game designs instructions and affordances that are all about cutting, colouring and combing – he realizes his interests for playing in a certain cultural environment (Selander & Kress, 2010). A possible finding here is that Jim interprets the situation as didactically designed with free frames having a possibility to play. There are several components in the setting that indicate this: the situation takes place in the hallway, the group is not intact and some toddlers are sitting while others are standing and the preschool teacher positions herself in the background. The didactic realizations are viewed as decisive for children's identity making (Nordin-Hultman, 2004) and it would be interesting to see if Jim would transform the application similarly, had the situation been framed by the didactic design of for example a morning meeting where the didactic design of the setting, physical environment and aims are more structured and the relations less horizontal.

CONCLUSIONS AND IMPLICATIONS

The two studies provide important insights into experiences of young children between the ages of 1 and 4 years old engaging with digital tablets and their applications. The findings in relation to the three outlined research questions will be discussed in this section. We want to emphasize that comprehensive empirical materials have been collected and analysed but that only three delimited examples are presented here – it is therefore impossible to draw general conclusions on a broader scale. Good examples, such as the ones presented in this article, are thought to provide valuable and relevant information on research topics of interest (Flyvbjerg, 1991) and some conclusions can be drawn using the examples as an illustrative support to the discussion.

AN ELABORATED UNDERSTANDING OF THE CONCEPT OF PLAY

An attempt to narrow or to develop the concept of play within the frames of design theoretical perspectives is made in this article. Inspired by Selander & Aamotsbakken (2009), Selander & Kress (2010) and Kress (1997) play is here understood as a transformative design activity in which children are designing their own process by way of interpreting, negotiating and trying out different identities while making sense of affordances provided by the digital resource, within the frames of reference of their own experience and present interest. By coupling childhood studies and design theoretical writings and by analysing empirical material from different angles some ideas about how children make meaning and play when using digital tablets in preschool is discussed in the following.

THE ALLOWING DIGITAL INTERFACE: A PROMPT TO PLAY

In general the studies indicate that the digital tablet´s digital interface – with modes such as images, colours and sounds rather than text – is apt for young children who do not read or write traditional letters yet. With a digital interface where a toddler can manage complicated activities just by pointing at a screen, and where the result of the movement with the finger occurs at that very spot (as opposed to a computer where the child uses the hand to maneuver the mouse for an effect on the screen), digital tablets can be understood as intuitive, confirming earlier research results that young children navigate and work independently with digital tablets

(Beschorner & Hutchison, 2013). The empirical material illustrates how the digital tablet is not only mobile but also allowing, since the digital interface affords children to play and learn together, often lying around the tablet on the big, round preschool carpet. This, along with the fact that a digital tablet is cheaper than a computer, indicates that it henceforth will be used in preschools. The two studies also show how a digital tablet has built-in affordances other than the pronounced – it not only allows children to explore and use media in ways other than the desired, it is also designed to prompt children to play according to their own interests in order to make meaning in the digital interface. More particularly, the two studies illustrate how children are able to select the applications from a wide range of offers on the tablets and use the emerging play affordances intentionally in every application to act in ways that extend and reshape the representations to which they are introduced. Children´s interactions with the digital interface include transforming different types of designs in order to make them more close to their own interests and previous experiences.

PLAY AS A TRANSFORMATIVE CREATIVE ACTIVITY

The contribution of this specific article is partly a matter of confirming how children challenge adults in play and how relations between adults and children are flattened and sometimes swapped in play. There are also some new findings and empirical evidences which can be used to argue for the value of recognizing, respecting and including children´s agency as conditions for their meaning-making and play since this is one of preschool's most important commissions. Emma playfully reshapes the design of the game by resisting the representations offered to her, Jim plays music in an application designed to communicate details in a barbershop and some young preschoolers keep irritating a monster instead of feeding it with geometrical shapes. This is a significant pattern in the empirical material of the two studies: children amend the game´s design, actively manipulating and playfully exploiting authorative pre-existing designs of the applications. They position themselves as producers instead of consumers in order to make meaning in the digital interface – and the digital interface encourages them. Children are here seen, not only to appropriate or transform, but also to revolt against the set didactic design. Along

with that notion, preschool children constantly transform the applications in their activities: they do not *use* digital media, they *make* it (Kress, 1997). Digital games have often been criticized as hampering creativity, but this study illustrates that children's use of applications are creative when they use the available modes to make new meanings. Multimodal and design oriented theory contributes to highlight the creative dimension of learning and play activities for young children (Kress & van Leeuwen, 1996; Kress, 1997). In this study, "designs for learning" is used as an analytical tool in order to understand how preschool teachers choose appropriate applications as well as to understand how digital constructors shape learning environments within the frame of an application. The analyses of the entire empirical material show that young children transform and redesign digital media intentionally – they are didactic designers too, within the dimension of play (Kress, 1997). The new design and aims they choose for their activities are here viewed as play where they transform signs provided in the digital interface and challenge relations and draw on alternative identities, changing from learning consumers to playing producers. It also illustrates how peers (as opposed to authority here personified by the preschool teachers) appreciate, understand and engage in the new meaning as communicated by the child.

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