

INTERPRETING THE CURRICULUM – MATHEMATICS AND DIDACTIC CONTRACTS IN SWEDISH PRESCHOOLS

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SAMMANFATTNING

Syftet med artikeln är att belysa hur en vidgad matematikdidaktik kan ta form på några svenska förskolor. För att analysera hur några förskollärare omformar, preciserar och konkretiserar de matematiska målen i förskolans läroplan, med fokus på didaktiska frågor rörande innehåll - vad är matematik för yngre barn? och form - hur kan matematik kommuniceras, placerar jag min studie inom ramen för ett läroplansdidaktiskt perspektiv. Matematikdidaktiskt influeras jag av situationsteori och didaktiskt kontrakt är ett huvudbegrepp i analysen. Termen didaktiskt kontrakt ses som en metafor för uppsättningen av implicita och explicita regler för social och matematisk interaktion i en barngrupp. Jag använder en vidgad definition av det didaktiska kontraktet för att belysa hur förväntningar på relationen mellan lärare, barn och matematik framträder i talet om och transformeringen av de matematiska målen, med fokus på de didaktiska frågorna vad och hur. Sammantaget samspekar huvudbegreppen transformation och matematikdidaktiska kontrakt i texten. Analysen är då inriktad på hur samhällsrelaterade förväntningar som uttrycks i nationella matematiska mål transformeras och framträder i form av didaktiska kontrakt i några förskolepraktiker.

Nyckelord: förskola, matematik, läroplan, didaktiskt kontrakt

INTRODUCTION

In recent years, both national and international comparative studies have emphasised mathematics. Moreover, several studies (Organisation for Economic Cooperation and Development [OECD], 2010) show that students in both Europe and the United States, have difficulties with mathematics. In particular, attention has turned to preschools. The Swedish government believes that the preschool has not fully made use of children's desire to learn (Cabinet Office, 2010). According to Tallberg-Broman (2012), there is a paradigmatic shift in Sweden today, and a new vision of children, parenting and the school's missions is emerging. Since preschool teachers are supposed to guide children in an increasingly complex reality, currently as well as in the future, the demands on their professional skills are increasing (Persson & Tallberg-Broman, 2002).

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In 2011, a revised preschool curriculum was introduced, in which the objectives for children's mathematical development were made much clearer in both scope and content. Currently, preschools should strive to ensure that each child develops, expresses and uses his or her understanding of space, shapes, location, direction, sets, quantity, order, number concepts, measurement, time and change. Further each child should develop his or her ability to reflect, test solutions, and present and follow reasoning (National Agency for Education, 2010).

THE REVISED CURRICULUM FOR PRESCHOOL

In the mission of Swedish preschools, caring, education and learning form a whole. Although the emphasis on caring is unchanged, there is an increased focus on learning and knowledge (Vallberg-Roth, 2011). The purpose of the revision of the curriculum was to develop the quality of education and to strengthen the pedagogical work (Cabinet Office, 2010). The government commissioned the National Agency for Education (Cabinet Office, 2010) to make proposals for clarifying and supplementing some of the goals. Moreover, they were expected to clarify the preschool teachers' responsibility for the curriculum. How children should create, explore and use mathematics is not specified in the document, as it is goal-oriented, without suggestions on how to teach. According to the curriculum, learning should originate from children's development, experiences, interests and circumstances and take place in a playful manner. While the objectives are formulated as goals for preschools to strive towards, there are no goals for the children to achieve because pre-schoolers should not be assessed based on established standards and should not be compared to anyone other than themselves.

THE ROLL OF THE PRESCHOOL TEACHER

According to Doverborg and Pramling-Samuelsson (2011), everyday life at preschools provides many opportunities for children to encounter basic mathematical concepts, but teachers may not have sufficient knowledge about early childhood mathematics to be able to take advantage of these opportunities. Some preschool teachers prefer to focus on areas of language and literacy, where they feel safe; hence, they have no time for mathematics (Lee & Ginsburg, 2009). The uncertainty about the subject might partially be attributed to the fact that there are different conceptions of what is meant by mathematics in preschools. Some educators

believe that teaching mathematics should not start until primary school (Doverborg & Pramling Samuelsson, 1999). Palmer (2010) found that most students of Early Childhood Teacher Education had a negative attitude towards mathematics and linked this dislike to counting, math books, Palmer investigated the student of Early Childhood Teacher Educations' subjectification in relation to mathematics in training. Palmer found that when the students participate in aesthetic, interdisciplinary learning practices, their understanding of mathematical subjectivity is essentially changed. In accordance with the results of the study, she believes that we should rethink didactics for students and young children.

An idea that seems to be prevalent among preschool teachers is that a pre-schooler learns by participating in everyday situations. Therefore, many educators believe that children are learning all the time and from everything (Björklund, 2007; Doverborg & Pramling Samuelsson, 1999). Some educators believe that children discover mathematics in a natural way when they play games, build with Lego or tidy up toys. However, the problem with these approaches is that it is usually the children who already have some knowledge and are interested who get something out of these activities (Ahlberg, 2000). Children learn independently to a certain extent, but they must be challenged to think one step further and see things from different perspectives. Children can discover mathematics when teachers create an educational environment, when they take a step back and when they let the children play. The foundations of mathematics can be laid through activities such as building with sand, playing with water and various containers, or doing puzzles. However, in order to be able to build on these foundations and to be able to understand mathematical concepts, children need a teacher.

Free play can provide a useful foundation for learning, but a foundation is only an opportunity for building a structure. Adult guidance is necessary to build a structure on the foundation of children's informal mathematics (Hildebrandt & Zan, 2002, p. 2).

In order to be able to follow the curriculum and communicate around some specific mathematical concepts, it helps if the teacher focuses on the content, otherwise the contents will drown into other contents (Thulin, 2011).

DATA PRODUCTION AND ANALYSIS METHOD

This article is based on the data collected between spring 2011 and autumn 2012. My research questions were:

- How talk some preschool teachers about the national curriculum objectives in mathematics with focus on content and form?
- How are the national objectives for mathematics transformed in some preschool teachers' planning and implementation of a mathematical situation?
- Which didactic contracts emerge from some preschool teachers in transforming the national objectives in mathematics?

I conducted interviews with four preschool teachers to investigate how they discuss and interpret the national curriculum objectives for mathematics and to examine how they transform their interpretations into action. I video recorded the preschool teachers implementing a mathematical activity outdoors. The teachers work in two different preschools. They work actively with mathematics in a group consisting of both four-year-old and five-year-old children. The interviewees have been working as preschool teachers for 22, 9, 15 and 32 years, respectively. Two of them have attended mathematics courses at the university since their degree because mathematics was not a part of the programme at the time of their initial education. The two others have not attended any mathematics courses. To answer my research question, I interviewed the teachers individually. In order to be flexible, allow the follow-up of an idea and ask supplementary questions (Bryman, 2010), the interviews were semi-structured. Finally, I video recorded the group with a hand-held camera from a distance.

The preschools included in the study are located in two small communities of the same municipality. They show no major differences in staff composition, group size or children's socio-cultural and economic background.

To analyse and interpret my data, I have used a hermeneutic approach (Bryman, 2010). My understanding is based partly on my experience as a preschool teacher, partly on theoretical perspectives and partly on prior research that discusses the preschool teacher's approach to mathematics for younger children.

BROADER CURRICULUM CONCEPTS – CURRICULAR WORK AS DIDACTIC ACTIVITIES

Since the study focuses on preschool teachers' transformation of the mathematical national curriculum objectives with a focus on content, I placed my study in a curriculum didactic perspective (Gundem & Hopmann, 2002). The formally decided curriculum is interpreted at different levels and is therefore never the same for school politicians, administrators, teachers, parents and children. My study focuses on the perceived curriculum based on the preschool teachers' talk, description and transformation of the national mathematical objectives. There are many ways to discuss curriculum concepts and curricular work as didactic activities. The curriculum is transformed differently and what preschool teachers choose to focus on, will, to some extent, depend on different actors' expectations on each other and on the school's mission. Transformation is not an easy process and it is unique for each actor (Linde, 2006).

DIDACTIC PERSPECTIVE

Didactics focus on the content of education in general, while subject didactics focus on education in relation to specific subject content (Kroksmark, 1987). I use the Central and North European tradition of didactics, which highlights the theory and practice of teaching on the basis of what should be taught, how it should be taught and why it should be taught in a certain manner (Gundem & Hopmann,

2002). Traditionally, preschools in Sweden do not divide activities into subjects; instead, integrative didactics have been customary and preschool teachers work with themes and subject-integrated activities. According to the curriculum, care, education and learning should shape the activity (National Agency for education, 2010), but how this fits in with subject didactics is not self-evident. The use of the term "subject didactics" may affect preschool activities, but preschool needs a language that can make visible and problematize the new mission (Thulin, 2011). Thulin believes that the preschool teachers' perception of their mission is problematic in practice, because the focus is on care and education, while what should be learned remains unclear. Furthermore, she means that when care, education and learning form a whole, there is a good possibility for implementing a changed knowledge mission in preschools.

To make mathematics visible in preschools, I consider it important to be able to talk about didactics of mathematics. In Swedish preschools, when children help to set the table for a meal, for example, languages, play, mathematics, care and education are mixed together. Even in such contexts, the preschool teacher should be able to focus on mathematics in order to better assist children in understanding mathematical concepts. One might not learn languages in the same way as one learns mathematics. Didactic of mathematics can help us to understand in what circumstances a child may be driven to use a specific knowledge in order to solve a specific mathematical problem. Why does a child do this instead of this? Why is it that knowledge that dictates this behavior? Teachers often try to find activities to introduce a new mathematical knowledge to the children. When one asks himself why, one will see a situation, not as a simple reproduction of knowledge, but as an environment that give answers to the children. Which games will the children play to have this knowledge? How will the children play on to be able to discover or use the knowledge? What information do the children need from the environment to make their choices, and use this knowledge rather than that one? (Brousseau, 2000). However, in the case of younger children, subject didactics focuses more on meaning making and investigation than it focuses on children acquiring a given amount of knowledge (Lundgren, Säljö & Liberg, 2010).

In this article, I will focus on the didactic questions *what?* and *how?* in order to highlight the teachers' interpretation of the national objectives and the examples they give to illustrate their interpretation. By 'what' I mean the interpretation of what mathematics for young children is according to the teachers' interpretation of the Swedish curriculum for preschools. When the teachers talk about 'how' they interpret the mathematical objectives, they also give examples to illustrate how they transform these objectives into practice. The preschool teachers' interpretation and implementation may improve the expectations they have of the children and themselves. To highlight the expectations that preschool teachers have in relation to the interpretation of the curriculum, and the implementation of an activity, I will introduce the concept of didactic contract as a metaphor in my study (Brousseau, 1998; Wedege & Skott, 2006).

DIDACTIC CONTRACT AS METAPHOR

Guy Brousseau introduced the concept of didactic contract, which was originally used in theory of didactical situations. Brousseau has developed the theory of didactical situations in the 1980s, which is not strictly part of the Piagetian theory, but the characteristics of the objects are marked by this theory. The theory of didactical situations offers a modelling of knowledge, situations of teaching and the roles of the teachers and students in the classroom. Brousseau (1998) studied what happens between teacher, students and the learning object in a mathematical situation. He introduced the concept of didactic contract to illuminate a potential cause of students' failure in mathematics (students who have difficulties understanding mathematics or are completely indifferent to it but who succeed in other subjects). He defined the didactic contract as the teacher's behaviour expected by the student and the students' behaviour expected by the teacher and he studied how it would affect mathematical learning. The didactic contract comprises all the rules that determine, partly explicitly but mostly implicitly, what each partner in the educational relationship has to manage and what his or her responsibilities are to the other partners in the relationship (Brousseau, 1988). Brousseau's use of the didactic contract focused on mathematics in education. The definition of mathematics in Swedish preschools is not obvious (Doverborg & Pramling-Samuelsson, 1999), and the mathematical objectives in the Swedish curriculum are focused on the preschools and not on the children. How mathematics should be taught to children is even more vague. To negotiate a didactic contract with children, the preschool teacher needs to define what mathematics for young children is and how it can be communicated. Although the curriculum can be a starting point, the responsibility to interpret and transform the mathematical objectives lies with the preschool teachers. How they interpret the mathematical objectives is affected by a variety of factors, for example, personal experiences, knowledge and ambitions (Hopmann & Riquarts, 1993). The preschool teachers' interpretation of what mathematics for young children is and how it can be communicated to them affects the rules of a didactic contract and the expectations teachers have of the children. These expectations are transformed into didactic invitations to action, which immediately offer a didactic contract (Mercier, 1997). Teachers usually develop different practices to give children the exact assistance they need, while children try to meet the teachers' requirements by interpreting their signals. However, detailed instructions on how to solve mathematical problems should not be provided because it results in children not learning anything. The didactic contract does not stand still; it moves and changes over the time under the influence of the teacher's or children's behavior (Garcion Vautour, 2002). During the situation, the preschool teacher repeat, clarify or ask a question that allows the didactic contract to move in a direction that the teacher have in mind. Sometimes, it can be a child's discovery, reflection or understanding that allows the contract to move. The contract is not a distribution of data, which is determined once and for all and unilaterally by the teacher. The didactic relation is not controlled exclusively by teachers, children are also responsible. Children must accept to learn. The contract specifies the rules of the game, the game as it is expected to be

played when you come into the kind of interaction that governs the game (Chevallard, 1998). In preschool context the children are not aware of what is defined as mathematics and their expectations are not necessarily connected to the subject. My interpretation is that the preschoolers' expectations is connected to procedures around the situation. Not until the children have been in school for a few years, they can associate mathematics with the content and not the procedures surrounding the situation (Lerouxel, 1993). The preschoolers participate many times in specific situations and recognise what the teacher expect of them and what they can expect of the teacher. With expectations in connection with the didactic contract I mean a situated and performative definition, in other words, what may be interpreted as expectations in the talk and the implementation of mathematical situations in the empirical material.

The didactic contract is often not visible until one breaks it. A child can break the contract when it cannot fulfil the teacher's expectations; for example, the child is unable to count the children that sit in the morning meeting although the group has been doing this the whole semester. The teacher must then renegotiate the didactic contract by asking, for example, the help of the entire group to guide the child (Garcion Vautour, 2002). The contract can also be broken when the children already know what the teacher expects of them; for example, they can subtract the number of absent children from the number of children enrolled at the preschool to count how many are attending on a certain day. In this case, the teachers need to adapt their expectations. The negotiation of a didactic contract is not only a consequence of the teacher's instructions but also a condition for learning (ibid). Blomhøj (1995) believes that the development of a didactic contract must be understood as a consequence of a fundamental educational dilemma—a dilemma between the teachers' intention to follow the mathematical objectives stated in the curriculum and their idea of how mathematics should be communicated effectively. The ability to recognize this dilemma and its importance for the establishment of a didactic contract can become an important tool for educators in their teaching practice.

ANALYSIS OF THE DATA

I analyses my data in tree step. Every step is connected to a research question.

Step 1	Question 1	Interview 1	Transformation What How
Step 2	Question 2	Interview 2 Videotape	Transformation What How
Step 3	Question 3	Interview 1-2, Videotape	Didactic Contract

I did a reflexive interpretation of preschool teachers' stories. I used an abductive analytical method, which meant that I've alternated myself between data and theory analysis (Alvesson & Sköldbberg, 2010). In the preschool teachers talk and implementation of the situations I found differences that i categorised and sorted under different headings.

In Summary, national expectations expressed in the curriculum are transformed in a process, which emerges from the interview with the teachers. The process lead to mathematical situations (filmed material) which I analysed in terms of didactic contract alongside two transformed directions – an analysis of the didactical contract, woven in the transformation of the mathematical objectives and the planning of a situation.

TWO DIDACTIC CONTRACTS

In this article, I will concentrate on some of the mathematical concepts preschool teachers talk about and implement. In my analysis, I will discuss two didactic contracts that I will develop. In my data I find a tendency towards two different ways of communicating mathematics. One way is child-initiated and the other way is teacher-initiated. In the child-initiated contract (CI) mathematics is perceived by the body. In the teacher-initiated (TI) contract, mathematics is thought of as an easier form of primary school mathematics. The preschool teachers talk about the importance of starting with concrete material to help children to understand, but they seem to have different ideas of how to communicate mathematics as well as different expectations of the children.

THE CHILD-INITIATED CONTRACT (CI)

In the CI contract the preschool teacher believes that young children should perceive mathematics with their body. The children can get a conceptual perception when they walk a tightrope around a square sandpit, for instance, they will understand the surface of it.

Susan: When they are young, it is important, from the beginning, to get the feeling of mathematics. What you learn with the body stays in your head."

When the children are playing and the preschool teacher notices that they are counting something, she goes to find out about their thoughts and tells them how she thinks. However, she does not want to tell them how it should be.

Susan: I see something here: There are three. What do you see? It is not, "I have the correct answer". No, it is based on what they see.

The preschool teacher does not want the children to remember what the teacher says without understanding the mathematical concept; namely, she does not want to respond to the children's questions by merely giving them the correct answer. It is more important to look for an answer together with the children. The interest is in the process of finding an answer rather than to find a correct answer. To help children in the process, the preschool teacher will ask open questions:

Susan: I don't ask yes or no questions, and I do not want these answers from the children - this will not develop children or the activities we do. Instead, you can do research together with them and ask questions that challenge the children's thinking and encourage their willingness to learn.

The preschool teacher based her planning of a mathematic situation based on the children's interests. She listens and observes children to find out what they are interested of. If the preschool teacher suggests an activity, it is always based on what she believes belongs to the children's interest areas:

Susan: We can go on a number hunt. I may say, "five has disappeared! Where is five?" Five could be the number five, or it may be a symbol for five, for example, five cars, the number of the street, or something similar.

Susan also says that the children are very excited about treasure hunting. They will draw a treasure map, look for a treasure and communicate about positions and orientation:

A treasure map is enormous fun. ... Every child likes to look for treasures, and mathematics is very clear and visible to the children when looking for treasures.

EXPECTATIONS

The preschool teacher expects the children to control the situation by showing an interest in something. Thereafter, she helps them to go further by asking questions, in order to do the research together. The children should be active with their bodies when exploring their surroundings, and they have to learn at their own pace—playing is more important. Mathematics should be incorporated into a theme. The preschool teacher expects the children to show their interests and the teacher to be aware of these and follow them up in a theme in which mathematic content is included. Mathematics is used as a tool.

THE TEACHER-INITIATED CONTRACT (TI)

In the TI contract the preschool teacher believes that mathematics at preschool level is the same as mathematics at primary school level, just easier:

Åsa: When I was at primary school, we worked a lot with mathematics./.../It was for slightly older children, but I have had the great advantage of taking it down to the younger children's level here.

The preschool teacher will, for instance, work with fractions and patterns in order to help the children to be prepared for school mathematics. There is a belief that children will understand if they can follow the entire process concretely from the beginning to end. The preschool teacher can plan situation where the children are asking how to divide things, such as fruit or clay, so that every child in the group receives a piece:

Åsa: Everyone will get a bit and there were eight children. ... "How can everyone get a piece? Yes, we have to share! How shall I divide? Yes, in the middle. And then how do I divide? Yes, you have to divide one more time. ... It's four, then

it's four quarters." They were four years old, these children, and a little boy says, 'you have to divide each of these four quarters one more time because you will get eight pieces and then everyone will get one eighth.' Four years! But it's because it's so concrete.

The teacher planned many situations where the children were asked to work with mathematical concepts. Åsa gives this example for working with patterns:

They had to collect leaves and pinecones. Then, we lay one leaf, one pinecone, one leaf, one pinecone and so on; thereafter, we went ahead and lay three. We did patterns: "sticks, leaf, and pinecone! What will come next? Sticks, leaf, and pinecone!

Åsa explained how she introduces location to the children during the day:

We work a lot with location in different ways. We have tree stumps where we meet when we have our outdoors day. Sometimes when we are waiting, I ask 'Can you stand behind the stump? Can you stand to the right of the stump? Stand in front of? Stand on?

In the TI contract the preschool teacher will introduce situation where children can practice addition or subtraction. Åsa likes to introduce small competitions where she asks questions and the children try to answer:

Should we have a competition? And the prize is – everyone gets a prize – the prize is a sandwich if you respond correctly... Then I can be quite advanced: "What is nine plus two"... And you know someone understands it, 'Please, there will be a prize, please take a sandwich.'... And the youngest are asked what is $1 + 1$, and sometimes they need a little help: perhaps, $1 + 1$ (shows with fingers). A surprising number of children actually manage the abstract idea because we've previously worked with so many concrete ideas. They have internal images.

Åsa explains that children must have fun and that they know that they will get a sandwich anyway. She emphasises that they have done a lot of concrete activities before.

The teacher can introduce a situation to help children to perceive mathematics by Justifying their choice and following reasoning. The children have to know how to justify their answer in order to understand what mathematics is about. One preschool teacher describes situations in which the children have to pick up two things that they believe are related and justify their choice. She says that nothing is right or wrong but that children should justify their decisions:

Åsa: They may say, "I think these are related because they are yellow, and they are made of plastic". It is to describe - they learn to describe ... with words, shapes, sizes, colours and materials. They may feel like scissors and a fork work well together because they are both made of metal.

Malin explains that she has cards and a big picture with numbers on it. The children can pick a card and put it on one number of their choice:

If the card shows a picture of a cake and three candles, the children can choose what image they prefer, and they may put it wherever they like. Someone put it on the number one because it's one cake, and someone else put it on the number three because it's three candles. There is nothing that's right, nothing is wrong, and they decide, but they have to justify their choice.

EXPECTATIONS

In the TI contract the preschool teacher initiates many activities, and she expects the children to be interested in and pay attention to her instructions. She challenges the children with teacher-initiated mathematical situations but does not expect the children to show their interest in mathematics because they do not know yet what they are interested in when it comes to the subject. The teacher is expected to create an interest. The children will perceive mathematics by finding the correct answer. The preschool teacher seems to have high expectations of the children's possibility to understand abstract mathematics if the teachers give them the opportunities to do so. Mathematics is used as a goal comparing to the CI contract where mathematics is used as a tool.

BREAKING THE DIDACTIC CONTRACT IN THE CI CONTRACT

According to Brousseau (1998) and Blomhøj (1995), the didactic contract is not visible until some of the actors breaks it. This can be seen in one of the videotapes. In the following videotape the preschool teacher organises a play where children can select four objects that they have previously found in the school yard and discuss which one is not related to the others. The children have to explain which one they wish to remove and why they would like to do so. I classified this situation in the CI contract because the preschool teacher let the children make their own choices and try in their own way. She introduces the play and then takes a step behind. When Lotta works with mathematics and children, she wants them to discover many different ways to solve a problem. She expects them to find many different solutions but she does not explain to the children what she expects until one of them breaks the contract.

Olle: Yes, but what is this? You should take it off. They are not the same as those. They are the exact same letters, white with letters. Not white with letters. Error.

Lotta: It is very good, and you others have also thought about a solution. Very good, Well done, Olle, very good. What do you say? Let's gather around.

Olle: What did you think? You thought it was a little difficult? You thought it was easy, and it was not.

Clara: You can't know whether we think it is easy.

Lotta to Olle: (puts hand on Olle) - There are several different solutions; it was really good.

Olle: Did you guess right?

Lotta: There are many correct solutions. You had a very good explanation of how you thought, Olle, and, David, you too. You also thought very well. And Eric, you thought in the same way and Clara also. Very good.

Olle would not accept that there should be more proposals for objects that do not belong together. He thinks that the others would try to guess what he is thinking. He breaks the didactic contract; and when Lotta explains that there are many correct solutions, the contract becomes visible.

My interpretation is that the preschool teacher had expectations that the children would find many different solutions and understand that there are many solutions to the same problem. The children expected of the teacher to let them find their own way. They follow the rules of the game and they do not protest when somebody else comes with different solutions. But Olle does not accept the rules and Lotta has to explain. Her and Olle's expectations were both visible.

BREAKING THE DIDACTIC CONTRACT IN THE TI CONTRACT

In the TI contract the preschool teacher believes that if children can follow every step of a process, they will develop mental images and, consequently, be able to think abstractly. She wants to arouse an interest in mathematics among children. Below are some examples of situations in which the didactic contract is broken and becomes visible in the videotape. Åsa asks the children to find two sticks in the forest and compare them to decide which one is the largest. Then she gives the children different instructions to follow, to help them pay attention to mathematical concepts. She is just about to give a new instruction.

A child to Åsa: Miss, look! A bee in the stump.

Åsa: A bee! Now it will be harder.

All the children run back to the meeting circle and Åsa tells them what to do next.

Åsa gives the children instructions. When a child breaks the didactic contract by stopping at a tree stump and drawing attention to a bee, Åsa clearly shows what she expects the child to do. She repeats what the girl said and then continues to instruct the children on what to do.

The interpretation I make of this situation is that the preschool teacher's intention to focus on specific mathematical concept, leads to a didactic contract, where children are expected to follow the instructions. When they make their own associations, or they call attention to something else, the preschool teacher thinks they lose their focus on what should be taught and they break the contract. It can be compared to the CI contract where this kind of child initiative is encouraged by the preschool teacher.

In these two examples the implicit rules of the didactic contract turn explicit when a child does not follow or does not accept the rules. The didactic contract can move when children or the preschool teacher acts in a way that helps children to perceive some mathematical concept. These examples are developed in my theses (Delacour, 2013, forthcoming).

SUMMARY

Since the mathematical objectives in the Swedish curriculum have no method instructions, they open possibilities for several didactic contracts. In the analysis of the interviews and the videotapes, the preschool teacher's interpretations of the mathematical objectives differ, leading to two separate ways of transforming the objectives into practice. The preschool teachers have different expectations of the relationship between children, teachers and mathematics.

In the child-initiated contract, mathematics is about number concepts, shape, size, differences, but the preschool teachers do not expect the children to understand the concepts. The preschool teacher believes that children need to feel mathematics with their body by for instance walking a tightrope; feeling the distance; seeing the forms, the colours and the numbers. Understanding will come once they are mature enough. The didactic contract offered to the children is based on learning by doing. The preschool teacher communicates mathematics by offering opportunities to explore. All the activities have their starting point in the children's interests. The preschool teacher seems to have faith in the children's ability to seek knowledge and to learn from each other. That is, they expect the children to take an active part in the planning of the activity by showing and sharing their interests among themselves.

In the teachers initiated contract, mathematics for children is about learning to recognise and name shapes and about understanding fractions and patterns; consequently, children should pay attention to differences and justify their answers. The preschool teacher works with concrete material, but the mathematical concepts she uses are sometimes abstract. The didactic contract she offers is based on cognitive skills. She communicates mathematics by initiating situations in which the children can learn mathematical concepts by following the instructions and trying things practically. When children have been following every step of a process, they will obtain mental images and will thus be able to think abstractly according to the preschool teacher. The preschool teacher task is to evoke the children's interest in mathematics.

CONCLUSION

Preschool teachers have a very important role to play in communicate mathematical concepts with children. Prior research conveys a very pessimistic vision of preschool teachers' knowledge of mathematics for young children and argues that they are unsure about how to communicate mathematics (Perry, Dockett & Harley, 2007). Many preschool teachers believe that children learn constantly and from everything (Björklund, 2007). Children can discover mathematics when teachers have created an educational environment, taking a step backwards and letting them play. Free play can provide a useful foundation for learning; however, in order to build a structure on the foundation of their informal mathematics, children need a teacher's guidance (Hildebrandt & Zan, 2002).

The results of my interviews and videotapes show that these preschool teachers are very confident about what mathematics is and how it should be communicated, but their interpretations of the curriculum differ. Furthermore, their understandings of mathematics for children and how it should be communicated differ from one another and lead to different didactic contracts. The purpose of this article is not to find the best way to communicate mathematics to preschool children but rather to open a discussion about what happens when mathematics didactic is a part of the Swedish preschool discourse.

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