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Being and becoming as socialisation in a mathematical activity in preschool

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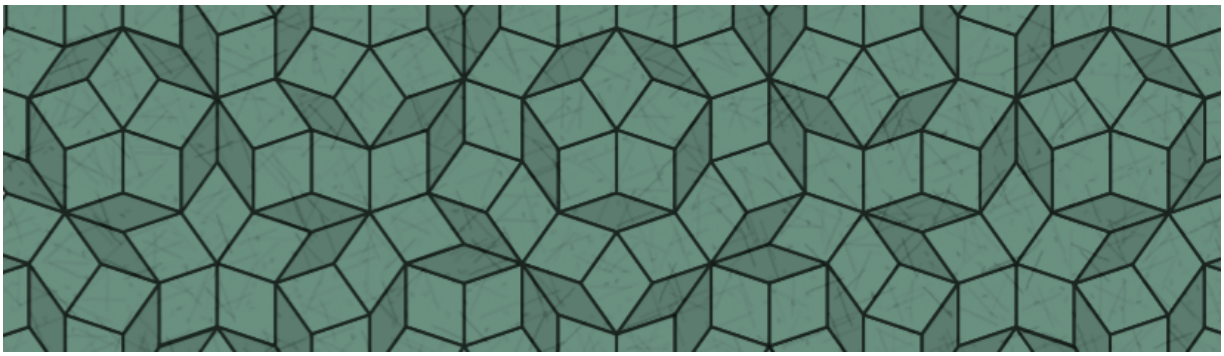

Abstract: This article investigates a map-drawing activity in a Swedish preschool from the perspective of how children are positioned as being or becoming mathematicians by the children themselves, the teacher and the researcher. The children positioned themselves as being mathematicians, who were capable of expressing and using their own experiences and skills. The researcher also focused on the children's expertise and so positioned them as being mathematicians. Nevertheless, there were times when the children acknowledged their need for more skills and knowledge to solve a problem and thus positioned themselves as becoming mathematicians. Similarly, some of the teacher's questions also focussed on developing children's mathematics skills, which thus emphasized children's incompleteness or state as becoming mathematicians. By contrasting the teacher's role with those of the children and the researcher, it is possible to identify how the teacher affects children's socialisation and learning through her questioning.

Keywords: becoming, being, mathematics, socialisation

Introduction

In this article, we investigate how three different types of agents position children as 'being' and 'becoming' mathematicians in a preschool activity around map-making. The agents were participants (self and peer), facilitator (teacher), and observer (researcher). By better understanding how they positioned children as having mathematical experiences and skills (being mathematicians) or needing

knowledge and skills for school mathematics or later learning (becoming mathematicians), it is possible to understand how a preschool experience came to socialise children in particular ways. Children's positions in the world are constructed by themselves and others through discourses. Using the theory of Harré and van Langenhove (1999) about positioning, Wagner and Herbel-Eisenmann (2009) stated:

> Interactive positioning occurs when one person positions another; reflexive positioning occurs when one positions oneself in the conversation. Positioning is not necessarily intentional. (p. 2)

Thus, positioning of children is a dynamic, never-ending process of construction. Children's own positioning will be different to how others, with whom they interact, position them, although the interactions themselves will affect the possibilities for different kinds of positioning.

> Storylines are contestable because whenever one person enacts a certain storyline the others in the interaction may choose to be complicit with that storyline and the way they are positioned in it or they may resist and enact a competing storyline. (Wagner & Herbel-Eisenmann, 2009, p. 4)

However what happens in the moment by moment interactions is affected by the discourses in the wider environment. For example, the discourses that surround what it means to be a preschool teacher and a preschool child are inter-related and are at a more global level than a specific interaction in a particular preschool. Therefore, it is valuable to consider the wider discourses about mathematics education in preschools that are likely to contribute to children's positioning as being or becoming mathematicians.

Children and learning mathematics in preschools

Much of mathematics education research has focused on the mathematics that young children are capable of learning and the impact that this learning will have on their school achievement (see Clements & Sarama, 2007; MacDonald, Davies, Dockett & Perry, 2012; Perry, Young-Loveridge, Dockett & Doig, 2008). For example, Duncan and colleagues found in a meta-analysis of six longitudinal studies that if young children knew more mathematics when they began school, they would have better chances of learning at school, including learning other subjects such as reading (Duncan et al., 2007). Research of this kind focuses on what young children needed for school, not what they could do already.

However, emphasising the need for mathematics education to be undertaken in preschool as being beneficial for young children is a change in perceptions from the twentieth century, where it was considered that young children were too immature to engage in formal learning (Meaney, 2014). Views about what young children need to learn about mathematics are thus not static but reflect changes in society, social structure and expectations, and the society's future needs (Lee, 2001). Changes in societal views about the provision of mathematics education in preschools is reflected in the provision and revision of curriculum documents. Recently the Swedish preschool curriculum (Skolverket, 2010) was revised from the original version published in 1998. The intention of this revision was to increase the focus on literacy, numeracy and other subjects, while retaining an insistence that children's own interests should be the starting point for activities (Jönsson, Sandell & Tallberg-Broman, 2012). In planning activities based on the curriculum guidelines, preschools make children aware of those norms and values (Lee, 2001). As Bond (1981) wrote in regard to school education:

> In western societies the formal organization of education in school systems meant that schools became the principal purveyors of social facts and, thus, as formal institutions they were linked with other institutions in determining the structure of society and the attitudes, values, and behavior of the public. (p. 235)

Doverborg and Pramling Samuelsson (2011) raised concerns about the value that Utbildningsdepartament, the Swedish Ministry of Education, through its curriculum gives mathematics and how this valuing may constrain teachers from being able to see aspects of mathematics outside the curriculum. Although the curriculum also indicates that children's own interests should be the basis for their learning, Doverborg and Pramling Samuelsson worried that teachers would only provide activities that promoted the learning of mathematical content, such as numbers, shapes, etc. Similar concerns have been raised elsewhere about the impact of formal mathematics education on children in preschool (Lembrér, 2014). Changes to the valuing of mathematics education in preschool are likely to have an impact on children's socialisation in preschool, and as such they call for investigation.

Consequently in the study presented in this article, we investigated how children are positioned by themselves and their peers, by the teacher and by the researcher in regard to their positioning as being or becoming mathematicians. In order to do this, we used the sociological constructs of "becoming" socialised and therefore needing to gain relevant knowledge and skill to overcome deficiencies and "being" an individual with responsibilities and opportunities. Our research questions were:

> How are children as being and becoming mathematicians by themselves, the teacher and a researcher?
> How is this positioning likely to affect children's socialisation?

Viewing socialisation as being and becoming

Socialisation is a dynamic process with a range of interconnected aspects operating simultaneously. For instance, it can include the reproduction of valued knowledge about children's and others' roles in society through society's key institutions, such as the family, preschools, etc. (Lee, 2001). Traditionally, childhood researchers understood childhood as an arena for developing adult skills and thus as steps towards adulthood. A slightly different perspective is that of Corsaro (1992) who considered socialisation to be a collective process that occurs when children participate in the adult world, while also producing their own unique world with other children. Regardless of the definition, socialisation is transmitted through pedagogical practices and connected to perceptions of childhood. The norms and values of society, including particular understandings of a child, a teacher and mathematical knowledge will shape educators' and others' reasoning about what should, if anything, be provided as mathematics education in preschools. This will then affect the ways that children are positioned in regard to using and learning mathematics.

When childhood is conceptualized as a journey towards a clear and knowable destination of adulthood, children's present lives and activities are seen only in terms of how they contribute to a preparation for this future (Lee, 2001). Childhood is both a stage and a structured process for becoming complete (James, Jenks & Prout, 1998). From the perspective of becoming, socialisation contributes to children being positioned as needing to gain the socially valued knowledge and skills to become adults who can function appropriately in society. Their present states are only of interest in comparison to what they should become.

Consequent to this, preschools have an important role in merging and perusing possibilities for socialisation. For example, in Björklund and Pramling Samuelsson's (2013) research in a Swedish preschool, the teacher determined the learning object, the mathematical concept of a half, that children needed to work with and the methods for supporting children to engage with it. In this way, the children are positioned by the teacher and the researchers as needing certain knowledge in order to become mathematicians.

Alternatively, socialisation can be considered as causing changes to be made to a culture and the society surrounding it, through altering the valued knowledge, values and norms. By documenting children's creative contributions to a shared peer culture, Corsaro (1992) concluded that the socialisation process itself is transformed if children are given support to produce their own shared worlds, rather than simply being part of situations in which an unequal adult–child relationship dominates. From this perspective, children are positioned as being knowledgeable, active participants in the construction of their childhood and their experiences (Ebrahim, 2011; James, Jenks & Prout, 1998; Markström & Hallden, 2009) and their interests and previous experiences are linked to the many different contexts in which they operate (James et al., 1998). Qvortrup (1994) suggested that children's being is about stability, completeness, self-procession and self-control, capacity for independent thought and action, and thus should be respected. In her research on one to three year olds in Swedish preschools, Franzén (2015) indicated that even the youngest children had skills and knowledge for understanding mathematical concepts about space.

However, children's being and becoming should not be considered in opposition to each other. Uprichard (2008) critiqued becoming when it involved children as 'incomplete' and thus incompetent, with adults as 'complete' and 'competent'. In reviewing previous research, she noted that the issue of context had been raised as important in regard to competence. In some situations, children can display higher levels of competence than adults and so the distinction between being and becoming as one about completeness and competence was not helpful. Instead, Uprichard (2008) stressed that children's being and becoming are complementary. Similarly, Trondman (2013) critiqued the distinction between being and becoming and described children's present and future as an integrated whole. Adults have a responsibility to work with children to provide an open future. From this perspective, childhood is a process of 'growing up' in which the future, rather than being a naturally unfolding process, depends on changing contexts. Research done in a Swedish preschool about how a teacher and a group of children interacted showed that children were positioned simultaneously by the teacher as in control of the play situation and their own learning and also as learners needing to gain specific knowledge and skills (Lange, Meaney, Riesbeck & Wernberg, 2014). By conceptualising children's possibilities for learning in this way, children are neither restricted to what they can already do, nor seen as bringing nothing with them to the learning situation.
In a previous study (Lembrér & Meaney, 2014), we found that the goals and guidelines in the Swedish preschool curriculum (Skolverket, 2010) constructed children as active agents whose knowledge and skills should be valued while also needing to become mathematicians by learning certain predetermined knowledge. From this, we considered that further research was needed to investigate how children were positioned as being and becoming mathematicians in specific interactions.

Methodology

To undertake the necessary further investigation, we chose to re-analyse a conference paper (Lembrér, 2013) that included extracts from the interactions of a group of young children engaged in drawing a map. The interaction between the children and the teacher was discussed in the conference paper as an example of the measurement knowledge and skills. In the present study our aim was to identify how

the children, through reflexive positioning, as well as the teacher, and the researcher, through interactive positioning, presented the children as being or becoming mathematicians.

Preschool teachers play a significant role in the socialisation of the young children in their care (Fleer, 2010). Coates and Coates (2006) argued for a recognition of the value of the interactions between a preschool child and an adult or another child as being useful for extending ideas or exchanging points of view. Therefore, it was important for the preschool child's own as well as their peer's contributions to be part of the investigation. Although some work has been done on teachers acting as researchers investigating their own teaching practice (see for example, Jönsson, 2007), approaches to how researchers learn to reflect on their practice is much rarer. Dunn's (2012) reflection on her different roles while collecting data on girls' play in a drama club that she also ran is one of the few studies of this kind. However, we considered that researchers have a powerful role in the positioning of children in what is known about mathematics education in preschools. Thus it seemed valuable for the second author, to take on the role of dialogue partner. Our joint discussions about the interactions from the perspective of a teacher and a researcher can be seen as mirroring Baker and Johnson's (1998) suggestion for what can be achieved through researcher–teacher interviews about secondary English classes:

> The purpose of the talk was to critique and perhaps re-theorise practice rather than defend it, that is, to move the teacher's practice and theory forward. It was prospective talk as well as retrospective talk … it was more than reflecting, and more than accounting. The post-lesson conversations involving the researcher and the teachers were another form of practising their respective professional knowledge. Talking about teaching was action in pedagogical space: a place for reformulation, renewal and recasting subject English as it could be enacted. (p. 233)

As well, in order to provide the necessary distance for the reflection and accounting of practice that an analysis of children's interactions required, we chose not to mention the teacher/researcher by name in the results section but use the relevant title instead.

Analysing being and becoming mathematicians

To operationalise the concepts of being and becoming mathematicians so that they could be used to analyse the interactions in the conference paper, the theoretical definitions of James et al. (1998), Lee (2001) and Qvortrup (1994) were used. Consequently, children were judged as being mathematicians when their existing mathematical skills and knowledge seemed to be valued and they were described as capable of independent thought and action. On the other hand, when the skills and knowledge (e.g. concepts of measurement) that children would need for their future or children's incompleteness, dependency, changeableness at the present time and their journey towards adulthood were highlighted, then the children were deemed to be positioned as becoming mathematicians.

The seven transcript extracts discussed in the conference paper were re-examined to identify, first, whether and how the children positioned themselves and each other as being and becoming mathematicians; then the teacher's and finally the researcher's positioning of the children were examined. In the later sections on being and becoming mathematicians, the reasoning for categorising an extract are described in detail.

Participants

The exchanges which were analysed in the conference paper took place in a Swedish preschool, in an age-integrated preschool group. The five children, aged between two and six years had chosen to draw a map. The results section of the original paper mentioned only four children: Child 2 was not

represented in the interactions, as his only action was to hand toy vehicles to Child 4. The activity began spontaneously before breakfast as children's play, with the children (one boy in particular) suggesting they should draw a map. Beginning as an observer, the teacher, became an active participant in the activity with her questions and the children's answers indicating that she affected the course of the activity (Hasselgren & Beach, 1997).

The exchanges were in Swedish and have been translated into English. It is not always easy to translate young children's Swedish as their language is developing; consequently, it has been clarified in places to make it more understandable. This has changed the form but not the content of the children's language.

Ethical considerations

This research followed the ethical code of Swedish Research Council. Consequently the teacher held a conversation with each family to inform them about the purpose of the study. It was emphasized that all participation was voluntary, and the families could withdraw their children from it at any time. All participants were given fictitious names in the article (Child 1, Child 2, Child 3, Child 4 and Child 5) to ensure their anonymity, and the empirical material and notes stored in a manner that ensures integrity.

The positioning of children

The re-analysis comprises the seven interactions that were analysed in the conference paper (Lembrér, 2013). The interactions were around drawing a harbour, a railway, a road and an airport runway. Rather than introduce the exchanges linearly as is done in the conference paper, we first discuss them from the perspective of children, either interactively or reflexively, being positioned as being mathematicians before discussing them as examples where children are positioned as becoming mathematicians by themselves or peers, the teacher or the researcher.

Being mathematicians - skilled and knowledgeable

In the conference paper, four exchanges were considered as illustrating when children were positioned as being mathematicians by the children themselves, the teacher and the researcher. The skills and knowledge to take action or make decisions were used by the children during the interactions and were recognised by the teacher through her asking open-ended questions which supported the children to show their capabilities. As all four examples showed similar ways that their peers, the teacher and the researcher positioned the children as being mathematicians, one particular episode is provided, in which Child 4 drew a harbour.

Following is the part of the conference paper which presented the interaction and analysis of dialogue as Child 4 was drawing a harbour:

> *The following exchange illustrates how Child 4, the girl who drew the railway, began to draw a harbour. The harbour was needed because, as the children discussed, it was possible to travel by boat. Child 4 took a pen and drew a line in front of a boat, then she put another boat behind the first and repeated this until she had five boats, lined up one behind the other, like cars parking on a street, and drew two lines:*
> *Child 4: I'm drawing a harbour, I place my boats behind each other and I have five boats. I have to draw all five to get space.*
> *Teacher:Do you make space for your boats?*
> *Child 4: Yes, I know how large a harbour should be now.*
> *Teacher:How do you know?*

> *Child 4: My first boat is behind this line (she points). I have drawn two lines now, you see (she takes away the boats and points to the two lines).*
> *Teacher:Okay, a line in front of the first boat, and a line behind the fifth boat.*
> *Child 4 used the boats, as physical objects, to find out and measure the area needed for the harbour. To do this, she built on the attribute idea of comparison by using length as a default for area measurement. The iteration was of five boat lengths, which formed the area of the harbour when boats were placed one after the other. Similarly to when she was drawing the railway line, the child used five identical units and filled a space without gaps, suggesting the unit concept of tiling. By drawing a line at the end of the last unit, she identified the endpoint for her measurement, which is a component of the concept of scale. As the teacher, I took the opportunity to use ordinal terms, 'a line in front of the first boat, and a line behind the fifth boat', to highlight these endpoints. (Lembrér, 2013, p. 2154-2155)*

In the example, Child 4 positioned herself as being a mathematician by showing and describing how she determined the appropriate area for the harbour - "My first boat is behind this line (she points). I have drawn two lines now, you see (she takes away the boats and points to the two lines)". To do this, she used her existing knowledge and skills to mark out the space needed by each boat.

The teacher considered Child 4 to be in control of the interaction by asking two open-ended questions: Do you make space for your boats? and How do you know? The teacher could not necessarily predict the answers and in asking them indicated that the child had the necessary knowledge to answer them. Thus, the child is positioned by the teacher as having the capability to make her own choices rather than needing help to solve a problem.

In the description of the interaction, it can be seen that the researcher suggested that Child 4 had used length as a default for measuring area. By noting that she used five identical units side by side without gaps, the researcher also suggested that Child 4 understood the measurement concept of unit tiling, basing this judgement on previous research by Bush (2009). Consequently, the researcher positioned Child 4 as a skilled and knowledgeable mathematician who was capable of using existing skills to solve the problem of how to draw the harbour.

Becoming a mathematician - possibilities and constrains

The positioning of children by the teacher, the researcher and the children themselves as becoming mathematicians appeared in only one of the 7 extracts discussed in the conference paper. In this short example, Child 5 was positioned as needing to develop skills and knowledge of measurement.

> *The next example shows Child 5's explorations of width, putting two vehicles side by side and using his experience and knowledge about traffic and directions. Child 5 starts by drawing a road which he links to the train station.*
> *Child 5:How much space do I need? I want to have a two-lane street, so my car can drive in both directions.*
> *Teacher:What do you think? How much space does your car need, how wide is the car?*
> *Child 5 looked at the car and drew a straight line beside it. He moved the car sideways and drew another line. The street was compared to how wide the car was. Child 5 used two identical units, the cars, and put them side by side on the road to see if they fitted into the space. By doing so, he subdivided the width of the road in order that the cars could drive in both directions. The cars were placed side by side with no gaps between, indicating tiling. He estimated the width of the road by placing the cars together in a similar manner to what Child 4 had done with the trains. (Lembrér, 2013, p. 2152–2153).*

Child 5 was unsure about his knowledge and skills so he asked the question, "How much space do I need?" By showing his uncertainty, he positioned himself as becoming a mathematician. The teacher directed the conversation for resolving the issue by asking Child 5 to focus on one aspect of a car, its width. Although the teacher's question suggested that the child could not solve the problem himself and therefore was lacking in skills, it also indicated that the child would understand how to use the width of the car to solve the problem. Therefore, she positioned him as becoming a mathematician by asking a question that she herself knew the answer to, but by not providing details of how to measure the width, she seemed to anticipate the child had some knowledge for responding to her question, "How much space does your car need how wide is the car?". This question opened up possibilities for utilising Child 5's existing knowledge in an active and reflective manner – with a possibilities for new knowledge to be acquired. Child 5's action after this question showed that he could make use of this information to determine the width of a road. It is possible to hypothesise that if the child had not been able to respond appropriately to the teacher's question, the teacher would have posed another question with the hope that the child would be able to successfully respond to it.

Unlike the child and the teacher, the researcher did not mention the child's lack of knowledge about how to determine the width of the road. Consequently, the researcher positioned the child as being capable based on what the child already knew and could do and so considered the child from the perspective of being, rather than becoming, a mathematician.

Being and becoming mathematicians – simultaneous foci

Three of the interactions from the conference paper aligned with the positioning of children as being *and* becoming mathematicians simultaneously. These were to do with drawing a runway, a road and a bridge. In the case of drawing the road, which was described in the previous section, Child 5 started by being positioned as becoming a mathematician by both himself and the teacher, although not by the researcher. However, as the interaction developed, the child and the teacher reset the parameters of the interaction so that the child came to be positioned as being a mathematician. This change seemed to facilitate Child 5's learning as the situation became more play-like. Within a playful activity, the power relationships between the child and a teacher are different to those in a formal teaching situation. In playful activities, children have better possibilities for engaging or withdrawing from a situation so a teacher must pay attention to the children's own interests (Lange et al., 2014). This seems to have been what happened as the child took over the control of the interaction.

A further example of children being positioned as both being and becoming mathematicians is provided below and shows how the teacher worked with the children to form a bridge for the map.

> *Sometimes physical objects were not sufficient for developing some ideas and it was I, as the teacher, who provided the stimulus. When it was time to draw a bridge, I challenged them to think more about height and width. To begin with, I took a piece of paper and said, 'How long should the bridge be?' A girl replied, 'As long as a car'. Then I cut a piece of paper, so that it was as long as the car the girl gave me.*
> *Teacher:Is it a bridge? (The teacher looked at Child 4. who put the piece of paper on the map.) Is it a bridge?*
> *Child 4: No, how should we make one? What should we do?*
> *Teacher:(took a larger piece of paper, gave it to Child 5.) Can you cut out a strip, which has the same width as this piece (the piece Child 4 cut, which was too short)? It's as wide as two cars. This has sufficient width to be a road in two directions.*
> *Child 4: We take two cars put them on the piece of paper, one after the other. Is that enough?*
> *Teacher:How do we know that the bridge has enough width and height to allow a train to drive under it?*

> *Child 5: A train must be able to drive under the bridge, we try.*
> *(The teacher takes a train, holds up the piece of paper and pushes it upwards until there is space enough to drive the train under it.)*
> *Child 4, together with Child 5, wanted to build a bridge for cars to drive over and trains to go under. The width of the paper was compared to the width of two cars. Child 4 said, 'We take two cars, put them on the piece of paper, side by side, and cut'. In placing two cars side by side, they showed the concept of iteration. The cars were identical units, and these units filled the space without gaps, thus tiling was used. Relativity in measurement took place when they needed to cut a piece to fit two kinds of units, cars and trains. The piece of paper, the cars and trains were compared directly. (Lembrér, 2013, p. 2154-2155)*

At the beginning of this extract from the conference paper, the teacher asked the children about how to build a bridge. The teacher positioned herself as the expert as she knew the answers to most of her questions, but positioned the children as becoming mathematicians who need guidance to find the "correct" answers. Her questions seemed to assume that the children were not capable of independently making the bridge, a complex task which required them to recognise that the bridge needed to be both wide enough to fit two cars driving in opposite directions and high enough for a train to pass underneath. However, it seemed that she also expected the children to respond to her suggestion with the knowledge and skills that they had. This was borne out when a child answered her first question immediately. Her suggestion "as long as a car" can be considered as an example of the child positioning herself as being a mathematician.

At this point, the teacher could have indicated to the child that this suggestion was incorrect and explicitly positioned her instead as becoming a mathematician. Instead the teacher followed up on the child's suggestion and had the child evaluate whether the solution was appropriate or not. The child used the evaluation to then ask for help, thereby positioning herself as becoming a mathematician, needing support from others in order to make a suitable bridge.

The teacher then took a train to demonstrate a possible solution. In doing so, she positioned herself as knowledgeable and by implication, the children as not having appropriate skills or knowledge at this point. However, by presenting her ideas as an exploration of the problem, rather than the definitive answer, possibilities were opened up for the children to contribute to the solution. They did this by exploring how to utilise the knowledge and skills they already had in this new situation. Consequently, the children alternated between positioning themselves as being knowledgeable about the problem and so being a mathematician, and showing a lack of knowledge and thus becoming a mathematician. This can be seen when Child 5 said, "A train must be able to drive under the bridge" which showed appropriate knowledge for solving the problem, but also uncertainty when he finished with, "we try". By making this statement, he positioned himself as both being and becoming a mathematician.

This example shows some of the complexity and different ways that children were positioned as becoming mathematicians, while also being recognised as having relevant experiences and skills. This was also the case in regard to the researcher's perspective. The focus of the researcher's comments in the conference paper was on what the children could do in regard to determining the appropriate width of the bridge by placing two cars side by side on the paper and thus making a direct comparison between the height of the bridge and the height of the train. This positioned them as being mathematicians who used their own ideas to solve the task. At the same time, the researcher seemed to suggest that Child 4 and Child 5 were learning about the measurement concept of relativity although this is not stated explicitly. Suggesting that children have something to learn, positioned those children as becoming mathematicians.

The re-analysis of the conference paper highlighted the role of the teacher's questions and children's responses to these questions in positioning the children as becoming and later being mathematicians. The questions seemed to support children to see possibilities for solving a problem without giving them the answer directly. This positioned them as both becoming mathematicians who could not solve the problem without help, but at the same time being mathematicians, who would use their own experiences and knowledge in order to gain new mathematical knowledge or problem-solving strategies.

Discussion

In this study, our purpose was to understand the positioning of children as being or becoming mathematicians by the children themselves, the teacher and the researcher. This was because we had been interested in how the potential tensions between children's being and becoming identified in the general goals for the Swedish preschool curriculum (Lembrér & Meaney, 2014) might play out when activities were implemented in preschools. The analysis suggests that as a child-initiated activity, in which the teacher spontaneously responded to what the children were doing, strongly affected the structures surrounding the ways of interacting and this then affected the norms and values that came into play. As Björklund (2010) suggested children encounter many phenomena in the world which they try to understand. Through interactions around these phenomena, children have opportunities to explore their own and others' ways of understanding the phenomena. The context of map making was one child's idea but it was readily accepted by the other children who eagerly contributed, drawing different components on the map. This context allowed for different kinds of interactions, generally around solving different problems to do with the map drawing. Although originally conceived as an example of the kinds of measurement concepts that children displayed in contexts that were of interest to them, the re-analysis of the conference paper suggests that the children and teacher made spaces for the children to learn, which built upon what the children could already do.

The analysis of the interactions in the conference paper indicates how the children affected their own socialisation through their actions while doing particular tasks or problems. Although children's interests and experiences have been acknowledged previously as being important (Coates & Coates, 2006; Johansson, 2011; Karlsson, 2011), the concepts of being and becoming mathematicians provided insights into the role of the children in the interactions. The task seemed to offer opportunities for the children to position themselves as being mathematicians who had appropriate knowledge and skills. It also provided possibilities for them to identify the knowledge and skills they considered that they were lacking in order to solve problems which often they had solved themselves. In so doing, they positioned themselves as becoming mathematicians.

The children often positioned themselves as being mathematicians. Although it is unlikely they would have labelled the knowledge and skills that they used as mathematical, they did exhibit appropriate knowledge and skills of measurement to solve several of the problems that they set for themselves in drawing a map. Fleer (2010) suggested that younger children in preschool probably are unaware of the value of their own experiences and the teacher has to encourage this awareness. In some instances, watching another child solving a similar problem allowed the children to utilise knowledge and skills that they had not immediately recognized as being relevant for the problem, as was the case with Child 5 drawing the roadway.

At other times, such as when they wanted to make a bridge, they sought more explicit instructions about what they should do. Completing this task also enabled the children to identify the skills and knowledge that they did not have. Coates and Coates (2006) suggested that children's ideas can be extended further through interactions with others and this certainly seemed to the case in this interaction. Although these examples suggest that the children were becoming mathematicians, their

demeanour in how they sought and found help suggested that they were comfortable and confident in doing this. Radford (2008) suggested that learning involves objectification of new knowledge as well as subjectification, becoming someone. If it is accepted that being a mathematician involves recognising and being comfortable with knowing that one's skills and knowledge may not be sufficient, then becoming a mathematician must be seen as a natural extension of being a mathematician. The children seemed to be learning the knowledge, values and norms of the society in which they lived, in this case specific measurement understandings. The manner in which they did this, through problems that were of interest to themselves, seemed to provide possibilities for them to produce, not just reproduce, knowledge, norms and values needed for dealing with new problems in their uncertain futures.

In the interactions, the teacher and the children's peers, followed the children's lead in positioning them as being or becoming mathematicians. For example, when the children displayed their capabilities and positioned themselves as being mathematicians, the questions the teacher asked were ones she did not necessarily know the answer to, such as when Child 4 made a harbour. However, when Child 4 indicated that she was not confident or capable, as in the example of the bridge building, the teacher asked question to which both she and the children already knew that she knew the answers to. The purpose of the questions was not to find out new information about what the children were doing but to guide the children into successfully solving the problem. The teacher's role was thus adapted to that of the child with whom she was interacting. Highlighting how the teacher contributed to positioning the children as being or becoming mathematicians shows how the children's control of the choice of activity influenced the sorts of questions that could be asked when children were knowledgeable and when they requested support.

The teacher also appeared confident and capable in the interactions, suggesting that she positioned herself as being a teacher. However, it is clear that the children surprised her at different times, such as when the first child decided that the activity should be making a map. By allowing the children to have control of the activity, she did not relinquish being a teacher but did show that she had things to learn from the children. In this way, she positioned herself as becoming a teacher, with incomplete knowledge of what these children could do. This is not a critique of her as a teacher but rather it shows that understandings about becoming are relevant for adults as well as children, a point previously highlighted by Uprichard (2008).

The researcher's positioning of children as being or becoming mathematicians was different from that of the teacher. It seems that the original research question supported a focus on children being rather than becoming mathematicians. However, the positioning by the children, and to a lesser extent the teacher, provided opportunities for the interaction between the being and becoming to be seen simultaneously. Thus, the research question in the conference paper seemed to contribute to important information in the interaction being missed by the researcher.

Nevertheless, focusing on measurement concepts as the valuable knowledge that children needed to learn suggested that the researcher was not so much interested in the production of new knowledge as a reproduction of existing knowledge. Although their problem solving skills were noted, the possibilities that these might lead to the production of new knowledge was not discussed by the researcher.

Like the children drawing the map, the researcher used her skills and knowledge to solve the problem identified in the research question. Although the researcher did not openly admit, as the children did, what she did not know or could do, her description of the children's knowledge, such as in the discussion of the first extract, suggests that her analysis did not always clearly show her what the children could or could not do in regard to measurement. From the re-analysis of the data, she can be considered to simultaneously position herself as both being and becoming a mathematics education researcher.

Conclusions

In this paper, we have investigated the socialisation of a group of children interacting in a Swedish preschool by exploring how they were positioned as being and becoming mathematicians by each other, by the teacher and by the researcher. Socialisation is important for it considers how children are integrated into a society through learning the necessary and valued knowledge to become fully functioning adults and to reproduce the knowledge that society sees as important to pass on to future generations. At the same time, rather than specifying any predefined knowledge, skills and abilities that children should acquire to achieve success in everyday life, the central focus of being is to accept children as active citizens, who already can influence their own lives. These activities unfold against the background of how institutions engage in pedagogical practices that recognize and build on the multiple worlds in which children live.

As noted in the previous section, reflexive research such as used in this study can provide feedback about the many levels at which socialisation occurs. To achieve this, reflexive research also requires an ability to stand away from the positions that adults have in children's lives to consider what other alternatives might be possible. This is not easy to do, especially as a beginning researcher so possibilities such as having a conversational partner are important and need to be discussed more often in research of this kind.

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