

# **PRESCHOOL CHILDREN'S COLLABORATIVE SCIENCE LEARNING SCAFFOLDED BY TABLETS – A TEACHER'S VIEW**

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*The potential of tablets to support collaborative inquiry-based science learning and reflective thinking in preschool has previously been investigated by us through the analysis of teacher-led activities. These included the children making timelapse photography and Slowmation movies and we reported an enhanced and focused reasoning about water phase changes in situations where timelapse movies were used for stimulated recall. Furthermore, we showed that children communicated in a more advanced manner about the phenomenon and they focused more readily on problem solving when active in experimentation or Slowmation producing contexts. In this paper, we shift focus to the participating teacher and his perspective on science and the work with timelapse and Slowmation in the preschool context. With a theoretical framework of developmental pedagogy and phenomenography, the preschool teacher's talk about the learning object (science or tablet), and about the act of learning was analysed from three perspectives: the relation between teacher-science/tablet, the teacher-children, and the children-science/tablet. Further, possibilities and challenges expressed by the preschool teacher in relation to the three perspectives were identified and interestingly, our preliminary data shows that most possibilities are described in the relation between the children and science. To the contrary, most challenges described are found between the teacher and the science learning object, in terms of lack of knowledge. This finding is consistent with our own experience of preschool teachers' insecurity in science and points to the need of further discussing teacher's experiences of science and science education alongside their experience of children, children's learning and the role they perceive for themselves during science learning activities.*

*Keywords:* Preschool, Science, Tablets

## **1. INTRODUCTION**

One identified important factor for children's learning, whether it is in preschool or in the education system as a whole, is teacher's content knowledge (Nihlfors 2008; Gitomer and Zisk 2015). Research also points to some key factors where teacher's knowledge of science is one central issue for the learning (Siraj-Blatchford et al., 2002; Yoshikawa, 2013). Further, Fler (2009) expresses the link between early childhood teacher's limited science knowledge and teacher's confidence and competence to teach science. However, she, together with other researchers, also point to preschool teachers' pedagogical content knowledge and attitude towards science as having impact on children's learning (Fler, 2009; Thulin, 2011; Spector-Levy et al., 2013). How teachers use their knowledge together with the children in practice and teachers' views of children, children's learning and the teachers' role are reflected in the children's possibilities to learn. As Fler states "The challenge goes beyond content knowledge to teacher beliefs and pedagogy practices" (Fler, 2009, p. 1074).

Reflective collaborative inquiry, scaffolded by tablets, is a construct that has not been studied extensively in preschool (e.g. Fridberg, Thulin, & Redfors 2016). Here, we make use of timelapse photography and 'Slowmations'. Timelapse photography is a technique that shows a slowly changing event in accelerated speed and this is accomplished by photographing the event at certain intervals, and when played at normal speed the event seems much faster. A Slowmation on the other hand is a stop-motion animation played in slow motion to explain a science concept (Hoban 2007). The work model implemented with children age three to six (Fridberg, Thulin, & Redfors 2016) constitutes four different learning contexts, i.e. hands-on experiments, timelapse photography, stimulated recall followed by Slowmation creation where the children

represent explanatory models in different materials, is versatile and opens up possibilities for the children to generate, represent and discuss explanatory models.

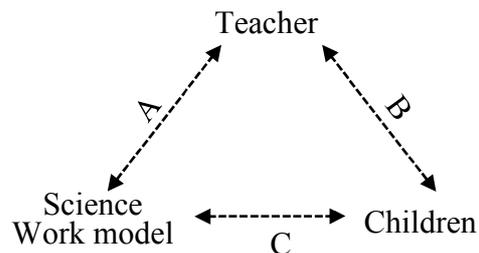
From a theoretical framework primarily based on phenomenography and variation theory (Marton & Booth, 1997), focusing on developmental pedagogy (Pramling Samuelsson & Asplund Carlsson, 2008), this work aims to analyse variations of, in retrospect expressed experiences by the teacher, for the four different contexts of science learning during a semi-structured interview. The research question guiding the study is:

- What differences in referential meaning can be described to the teacher's statements about the science teaching-learning contexts and the perspectives 'what' and 'how'?

## 2. METHOD

A semi-structured interview with open-ended questions was performed with the teacher one year after the finalization of the project. The teacher answered spontaneously with follow-up questions from the researcher. In addition, we used stimulated recall where the teacher watched selected parts of the video-recorded activities with the children, and was asked to reflect on his role. The activities were chosen to represent four enacted learning contexts analysed previously (Fridberg et al. 2016). The teacher's statements were analysed and categorized with specific focuses, depicted in figure 1.

Figure 1. The triangle of analysis depicts the three relations A, B, C focused in the analysis of the teacher's statements related to A) the object of learning in terms of science and the timelapse/Slowmation work model, B) the children, and C) the children's relation to science or the work model.



With developmental pedagogy as framework, the statements regarding relations A-C could be further divided into 'what' and 'how' aspects of science and the work model, and from these aspects and through a phenomenographic analysis we could identify areas of possibilities and challenges with science or timelapse/Slowmation, described by the teacher. An internal categorization of areas is ongoing, where categories focusing variation is emerging.

## 3. RESULTS

The possibilities and challenges identified in the ongoing analysis of the teacher's statements involving science and the work model can be summarized as belonging to the themes *knowledge*, *time*, *interactions*, *number of children* and *children's preconditions*. A detailed analysis with categories representing differences of meaning will be presented at the conference.

The teacher describes his experienced lack of knowledge in science and how the project increased his knowledge and expanded his view of natural science from biology to include also chemistry and physics. The analysis of his reasoning identified, lack of scientific knowledge, too many children in the activities, and time pressure as experienced limiting factors.

The possibilities described lie in the work model itself. It takes into consideration the children's interest in tablets and captures many of the areas in the preschool curriculum, such as natural science, mathematics, language but also includes values and interaction. The work model, with discussions, hands-on experiments

and timelapse/slowmotion production where the children represent the phenomenon in different materials, is versatile and opens up learning of the science phenomenon from several perspectives. This, according to the teacher, is consistent with the preschool teacher's mission to include all children based on their individual needs and preconditions.

#### 4. DISCUSSION AND CONCLUSIONS

When different subjects in the preschool curriculum are discussed, it is often from the children's perspectives, and about how the content can be presented to fit the children's interest and previous experiences. In the present study, we expand our previous work with children and science learning scaffolded by tablets to include the teacher's view and experience of science and the jointly developed work model.

The possibilities and challenges described are important keys to further discussions about the teaching of science in preschool. Interestingly, most challenges are expressed in the teacher – learning-object relation (A), and in terms of an experienced lack of knowledge, while most possibilities are described in the children – learning-object relation. The children show interest and they are capable, it seems to be the knowledge and attitude of the preschool teacher that are the limiting factors. This study casts a light over the preschool teacher role in science teaching and contributes to important discussions about the same.

#### REFERENCES

- Fleer, M. (2009). Supporting scientific conceptual consciousness or learning in 'a Roundabout way' in play-based contexts. *International Journal of Science Education*, 31(8), 1069-1089.
- Fridberg, M, Redfors, A., & Thulin S. (2016). Preschool children's Collaborative Science Learning Scaffolded by Tablets. *Research in Science Education*, online first.
- Gitomer, D. H., & Zisk, R. C. (2015). Knowing what teachers know. *Review of Research in Education* March, 39, 1–53.
- Hoban, G. (2007). Using Slowmotion for engaging pre-service elementary teachers in understanding science content knowledge. *Contemporary Issues in Technology and Teacher Education*, 7(2), 1-9.
- Marton, F. & Booth, S. (1997). *Learning and Awareness*: Lawrence Erlbaum Associates.
- Nihlfors, E. (2008). Kunskap vidgar världen—Globaliseringens inverkan på skola och lärande. Underlagsrapport nr 26 till Globaliseringsrådet [Knowledge broadens the world—The impact of globalization on education and learning]. Stockholm: Utbildningsdepartementet/Globaliseringsrådet.
- Pramling Samuelsson, I. & Asplund Carlsson, M. (2008). The playing learning child. Towards a pedagogy of early childhood. *Scandinavian Journal of Educational research*, 52(6),623 - 641.
- Siraj-Blatchford, I., Sylva, K., Muttock, S., Gilden, R., & Bell, D. (2002). *Researching Effective Pedagogy in the Early Years*. Research report RR356 University of London: Institute of Education.
- Spektor-Levy, O., Kesner Baruch, Y., & Mevarech, Z. (2013). Science and Scientific Curiosity in Pre-school—The teacher's point of view. *International Journal of Science Education*, 35(13), 2226-2253.
- Thulin, S. (2011). Lärares tal och barns nyfikenhet. Kommunikation om naturvetenskapliga innehåll i förskolan. *Gothenburg Studies in Educational Sciences*, 309: Acta Universitatis Gothoburgensis.
- Yoshikawa, H., Wieland C., Brooks-Gunn J., Burchinal M. R., Espinosa L. M., Gormley W. T., Ludwig J., Magnusson K. A., Phillips D., & Zaslow M. J. (2013) *Investing in our future: The Evidence Base on Preschool Education*. Soc. for Res. in Child Dev. <http://fcd-us.org/resource/evidence-base-preschool>.