Early Years Physics and Children's Production of Tablet Videos in Preschool

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Abstract. This presentation is about physics teaching supported by video productions with tablets in Swedish preschools, which were part of a three-year professional development programme on teaching chemistry and physics. Temporal case studies focused on children's and teachers' communication during jointly developed extended teaching sequences with three- to five-year-old children. The children worked in small groups with one teacher. Results indicate that children's video productions by tablets contributed to learning, but with differences indicated for different levels of abstraction. The consequences for future teaching of early years physics are discussed.

Introduction and theoretical framework

Since 2011, physics teaching in Swedish preschools has been reinforced, and in 2019, the current national curriculum also extended the use of digital tools. Teaching physics has a short tradition in preschool and is often viewed as difficult by preschool teachers [1]. We report here on a video analysis of teaching activities that were supported by children's production of digital videos, part of a three-year professional development (PD) on collaborative inquiry teaching of chemistry and physics in Swedish preschools (146 participants). In the PD, a semantic view of theoretical models in science [2-4] was introduced. Science is here viewed to describe phenomena by explanations based on presuppositions, theories, and theoretical models. Observations and experiments are viewed as embedded in theory and 'theory-laden'.

Discussions about the goals for science content in preschools and the consequences for preschool-teacher education and research have shown that teachers with a 'sciencing attitude' embracing children's perspectives can enact teaching activities where 'mutual simultaneity' in teacher-child intercommunication can be established [4-5]. Furthermore, the role of multiple representations has been given attention during the last decades. A pilot study of a multi-step teaching sequence utilising this, with group discussions, experimentation, and the children's documentation in the form of timelapse and stop-motion production, proved productive for children's engagement and interest [6].

In the current PD, the science teaching activities, scaffolded by tablets and based on a consensus theoretical model of the chosen science phenomenon, were developed by teachers and researchers in design groups. Variation theory [7] and developmental pedagogy [8] were put forward as the combined theoretical framework for the teaching activities.

The aim of the analysis presented here is to further develop knowledge about how children's video productions during a teaching sequence can scaffold the learning of abstract objects of learning in physics. The research question guiding the analysis is:

- How can video production by tablets contribute to children's experiences of abstract physics phenomena during a multi-step science teaching sequence in preschool?

Methodology

Three work teams from the involved school district in the PD volunteered for the data collection presented here. During two weeks, teachers were video recorded while enacting the teaching sequence (30-60 min per session). A fifth step was added compared to the pilot [6].

[1] Introductory discussion with children of the jointly chosen real phenomenon.

[2] Collaborative inquiry experiment documented by tablet (timelapse or slow-motion).
[3] Group discussion scaffolded by stimulated recall from the tablet movie.
[4] Collaborative production of slowmation by the children scaffolded by the teacher.
[5] Children explain the stop-motion movie to one of the preschool teachers – Retell.

The video recordings were transcribed, and a qualitative temporal analysis focusing on teacher-child communication was performed. Transcripts of videos were read by each researcher, and critical incidents were put forward, discussed, and a coherent selection emerged. Excerpts related to the second and the two final steps will be presented at the conference. Ethical considerations for this research adhere to recommendations by the Swedish Research Council.

Findings

It was found that the fifth step helped to elucidate the children's experiences and learning. The children's understanding of theoretical models takes time to develop, and the different steps in the teaching model support the learning process. Emerging intermediary objects of learning [4], such as "Is there air in the room?", are significant. Children's interest is stimulated by video production, but abstractions, such as using cotton balls to represent ice cubes, complicate communication.

Specific difficulties were also observed in this study for explanations involving 'intensive quantities', i.e., concepts involving quotients and the density of falling balls. The use of decontextualised generative language and the explicit naming of concepts, objects, and events during the teaching was seen to be beneficial. Documenting a slow phenomenon with timelapse photography or a fast by slow-motion video was seen to stimulate discussions of the experiments.

Conclusions and Implications

In conclusion, we state that, for children to pick up theoretical models of physics phenomena, preschool teachers benefit from keeping a jointly established selected theoretical model in mind during consecutive teaching activities, especially those inherently difficult and abstract. Student preschool teachers would benefit from working with the explicit formulation of theoretical models and slowmation production during their education. In light of current discussions about screen time, we would state a positive experience from using tablets to scaffold the learning of specific content in small groups of children. Further implementations will be discussed at the conference.

References

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