

How Children Discover the World: A Case Study Research Approach and Preliminary Results

Abstract

The education debate unleashed by the results of TIMSS and PISA again forges the importance of early natural science instruction into the public awareness. It calls for a reform at the primary level; preschool instruction should be improved and children should be taught according to their age. Results from developmental psychology support the claim for an early area- and domain-specific instruction in preschools. There have been various efforts and initiatives in this direction for some time now in the individual German federal states. Some states have delivered educational concepts by the way of education plans for the preschool level. In Baden-Württemberg an Orientation Plan for Preschools has been in the pilot phase since 2005, but it is supposed to be implemented in 2009 as part of an education plan.

Context and Aim of Study

Current knowledge about natural science learning focuses overwhelmingly on the school and cannot easily be transferred to the preschool. The development of natural science thinking in the preschool age has so far only partially been the focus of research on natural science didactics. Up to now only certain areas of natural science thinking for children of preschool age have been researched. From a developmental psychology perspective, there is no objection to introducing natural science phenomena to children of this age group, since important cognitive and social skills that build the basis for developmental progress already exist. Moreover, developmental changes are not always global and spanning several areas, as assumed by Piaget, but rather occur often on the level of specific knowledge areas depending on the lessons offered (STERN 2004). Nonetheless, the question remains of how to design a program for teaching preschoolers that promotes motivational learning in the natural sciences without overburdening the child. Systematic observations of children's skill development during natural science instruction at the preschool age, from which appropriate measures for early instruction can be derived, are lacking. It is therefore necessary to isolate the developmental processes that occur during early natural science instruction and to prove them empirically.

The new Orientation Plan for Preschools in Baden-Württemberg names six fields of development (senses, body, language, thinking, feelings and compassion, meaning and values) that education and child-rearing should be devoted to. The goals of the last preschool year are thus oriented toward adjustment to the elementary school curriculum and are based on a rather holistic approach. The study presented here focuses on four out of the six aspects of child development that are significant for learning: language, thinking, general behavior, and social behavior. The goal is to investigate to what extent behavioral and comprehension skills develop with early natural science instruction in preschools.

Research Queries

The following questions direct the research and shall be answered by the investigation:

- What influence does the early natural science instruction have on the behavioral and comprehension skills of the children?

Here it will be analyzed how the children react to the lessons of early natural science instruction offered by their teacher with respect to language, actions, and social behavior; which ideas and meanings they develop in these situations; and whether gender-specific differences can be observed.

- Which lessons from the situations in early natural science instruction are transferred by individual boys and girls to other situations?

It will also be investigated how the children deal with the tasks and materials given to them in other situations and with concrete problems regarding behavior and language; which quality is inherent in this transfer; and how this quality changes over time.

Theoretical Background

The theoretical framework for the study and description of meaning development and learning is based on the Bremen studies on meaning development during learning in physics instruction, which deal with interactions and cognitive processes in the school classroom and which shall be tailored to and further developed for the conditions of early natural science instruction. Significant here is the changing relationship between the learning subjects and their learning environment. Knowledge is acquired by the child situationally in a circular process of expectation → perception → behavior and not simply transferred from the interaction partner or the learning environment. The situational context here is quintessential: it provides possibilities for action and therefore elements of recognition for the child that prompt meaningful constructions and thereby thought processes. Meanings can be further developed in the course of behavior within the situational context (WELZEL 1995; AUFSCHNAITER 2001). The children's perceptions shall be reconstructed in such a way that the interactions among the children, between the children and their learning environment, and between the children and the contact person (teacher) within the particular learning environment can be observed and interpreted.

Research Approach

For studying a little researched area, it is decisive that the depth of the object under investigation be initially kept to a minimum, as the many questions that arise must be put into a systematic context in which they can be answered. The investigation is therefore designed to be a qualitative, descriptive case study.

In our project, which is initiated and sponsored by the Klaus Tschira Foundation, 30 teachers from 4 preschools were given additional training in early natural science education, selected children are systematically observed and the development of their behavior and comprehension skills are investigated. Initiated by this training, among other factors, the teachers have been regularly offering activities for exploring natural phenomena with the children since March 2006. Such activities, in which the children remain the focus of interest, have been and will be observed on video over a period of 12 months. The language, thinking, general behavior, and social behavior of 6 selected children will be analyzed in gender-specific categories throughout the process. Based on select video and additional interview data, children's cognitive processes will be formulated as a reconstruction of meaning developments in early natural science instruction situations. The video material will be evaluated using the Category-Based Analysis of Videotapes (NIEDDERER, TIBERGHEN, AND

BUTY 1998) to describe the instruction profiles, the child-child and child-teacher interaction, and the communicated contents for the interpretation of the children's development in the chosen areas of emphasis. A reconstruction of meaning developments shall result from idea lists in selected sequences (WELZEL 1995).

The layout of the investigation, the research approach, and the preliminary results will be presented.

Literature

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