Science in kindergarten: The classroom reality of teachers’ curriculum implementation activities

M. Kallery & D. Psillos
School of Education, Aristotle University of Thessaloniki, Greece.

Abstract. The implementation of science curriculum in kindergarten is reviewed in the light of data emerging from a recent evaluation study. The present work examines some disparities between policy and practice relating to the practices teachers are required to use in introducing science in kindergarten. Qualitative approaches have been employed in the evaluation study. Observations of teaching activities in the science kindergarten classroom confirmed the classroom reality of teachers’ knowledge of appropriate teaching strategies, activity organization and classroom management, been in serious need for development. Questions are raised from the evaluation outcomes concerning issues that may have influenced the way outcomes have been shaped and can lead to further research which may give us a better understanding of kindergarten teachers’ needs in science.

Description of the problem and general interest. Introduction of science in early childhood is of great importance for the development of children’s scientific concepts as well as for many aspects of their intellectual development (Vygotsky 1984). The modern beliefs are, that appropriate scientific work can and should begin in infant classes (Harlen & Jelly 1989). The 1990 curriculum reform for the Greek kindergarten (children 4-6 years of age), came up with a quite demanding science curriculum for the kindergarten teachers. This curriculum was based on curricula of other countries with a greater tradition in this level of education. Key factor in the implementation of such curricula is the teachers’ knowledge, since they are expected to have basic subject matter knowledge across a number of fields, the application of appropriate teaching practices and some knowledge of children’s ideas (Shulman 1986). However very little is known from the literature about how kindergarten teachers implement the science curriculum and also about their behavior in the science classroom the importance of which has repeatedly been stressed in the literature (e.g. Harlen 1992).

The present work, which is part of a larger kindergarten teacher evaluation project in science, assesses the practices which Greek in service teachers adopt during the introduction of science activities in kindergarten, in respect to those proposed by the new curriculum. Such teachers, as in many other countries, had been educated on educational sciences and humanities, with some elementary mathematics and very little or nothing of natural sciences (Vicentini 1980).

Design and procedure of research. The present research employed qualitative approaches for collecting and analysing data, since qualitative evaluations provide detailed descriptions of program activities and fitted the exploratory purpose of our study processes. The source of our data was direct first hand observations of science activities in kindergarten classrooms. Curriculum analysis has resulted in specifying key factors that were used to lead the observations. The type of the observational research that was chosen was that of the participant observation and the observer’s role was that of a spectator (Gay 1992). The recording of observations was done on site by taking detailed field notes which constituted our raw data, since
the use of tape recorders was not allowed. The observations were designed to extend over a whole school year in order to cover the whole range of topics introduced to kindergarten children during science activities and were done by the researcher. Eleven teachers were observed in eleven different kindergarten classes in central northern Greece. These teachers were the ones that allowed entrance and observations to be done in their classrooms. Overall 40 science sessions were recorded covering all science topics of the curriculum.

**Data analysis and findings.** The analysis of the data was informed by the aim of the study (Merriam 1988) and was done by the observer who by directly observing the activities was better able to understand the context within which the program activities had occurred. Three levels of interpretation have been used in our qualitative analysis. Units, Categories and Themes. These are the most frequently proposed in literature for such type of research (e.g. Strauss and Corbin 1990). The modeling of our data has been influenced by the themes appearing in the curriculum guidelines in which emphasis is placed on the appropriateness of the activity space; on children’s method of work which is expected to combine mental and physical activity through investigations and experimentation with materials; and on classroom management through which cultivation of children’s autonomy, taking of initiatives and inquiry is expected. The final modeling of our data has been adapted to the singularities that arose and resulted in three major themes. “Activity organization”, “Teaching methodology” and “Classroom management (non academic)”.

Findings show disparities between policy and practice in all the three themes. We shall present in our suggested communication the most striking of our findings some of which are outlined in the present synopsis. Starting with the organization of activities, our teachers have neglected to create and organize a “science corner” in the classroom although the environment where an activity takes place has a strong influence on many factors that control teaching and learning processes (e.g. Chaille and Britain1991). Science activities were held in a space designed for discussions, book reading and story telling. The activity materials were presented to children at the beginning or during the activity and were removed right after the end, so there was no chance for exploration by children. Concerning teaching methodology, one important finding is, that the content of the science activity did not influence the applied teaching processes. Teachers have followed a standard procedure in all science activities, which was the familiar straight forward didactic teaching in the format, teacher’s question - child’s response - evaluation, supplementing it in some cases with demonstration experiments. Children were involved in dialogues, which however evolved only between teacher and children, but in none of the activities there was focus on children’s ideas or diagnosis of children’s ideas behind their incorrect answers. Children did not carry out investigations and experimentation nor were they involved in generating ways to test their ideas. In general none of the activities was designed to physically involve the children. On the contrary, when such initiatives were taken by children, teachers strongly discouraged and dissuaded them. In other words children were to a certain degree mentally involved in the activities but not physically, although physical involvement constitutes a decisive factor in children’s learning in science (Harlen & Jelly 1989). In classroom management teachers used the authoritarian approach which was characterized by enforcement of rules like prohibition of communication between children and the seated attendance of the activity by them. Such an approach hinders their autonomy,
their initiative taking and the development of their scientific attitudes (Harlen 1992).

Conclusions. The findings of our research show serious divergence of practices used by teachers and the practices proposed in the new Greek kindergarten curriculum. Besides our data reveal specific obstacles for the kindergarten teachers in implementing the science aspects of the curriculum. Such obstacles are, the teachers knowledge of effective teaching strategies along with aspects of activity organization and classroom management. All these factors contribute to the complexity of teaching science in preschool.

Our findings in the study with kindergarten teachers reveal some similarities to Smith and Neale work (1989) with primary teachers, where teachers’ knowledge of effective teaching practices proved to be critical in the changes they were able to make in their teaching. Further research on issues that might have influenced the way the outcomes of our evaluation study have been shaped, may give us a better understanding of preschool teachers’ needs in science. Among these issues prominent would be, the way kindergarten teachers perceive the proposed science curriculum and interpret it’s guidelines and the teachers’ believes about the nature of science teaching, a component, proved to be especially critical for their teaching (Smith and Neale, 1989).

References.