

**"Little Scientists" – Emotional and Cognitive Aspects
among Teachers and Children towards Engaging in Science
in Pre-School Education**

Yael Kesner Baruch

School of Education

Ph.D. Thesis

Submitted to the Senate of Bar-Ilan University

Ramat-Gan, Israel

January 2015

Abstract

Early science education is an increasingly acceptable view worldwide and in most countries children are required to engage in science in pre-school frameworks. Accumulating research shows that young children perceive science as relevant to their everyday life, and exciting, interesting, and important for society, as opposed to middle- and high-school children. Positive attitudes towards science, feeling curious about learning science, and experiencing well-implemented science learning practices are all factors that influence both short- and long-term engagement and achievement in science. Therefore, enhancing children's curiosity about the natural world, fostering positive attitudes towards science, and providing accessibility to inquiry experiences constitute the primary goals of science education. Early science education is considered to play a crucial role in achieving these desirable emotional and cognitive states and in influencing future ways of learning science. However, because of the lack of empirical research in early science education, there is a wide gap in our knowledge as to how scientific concepts can be taught to pre-school children and what are the best ways of achieving this goal. The primary focus of this study was to address the emotional and cognitive aspects with regard to engaging in science in pre-school years, from both the children and teachers' perspectives. More specifically, the study's goal was to explore teachers' perceptions, attitudes, courses of action regarding science, as well as conceptions about children's curiosity and children's perceptions, attitudes, inquiry skills, and scientific curiosity. Moreover, the study aimed to examine the relations between the teachers and children's factors in this regard. From an ecologically validated perspective, a cognitive-behavioral research tool was developed and used in order to examine children's perspectives towards engagement in science, in an authentic scientific environment.

A sample comprising 111 pre-school teachers was recruited, and ten pre-school teachers were selected as an investigated group from this sample. Later, 64 children that studied in the classes of these 10 selected pre-school teachers were examined. Six research tools were employed: five were designed for teachers and one was designed for children. An integrated quantitative–qualitative approach was utilized for data collection and analyses.

The results of this study revealed that most of the teachers believe that scientific education should begin in early childhood; very young children can investigate and take part in a process of inquiry, and scientific activities in pre-school can influence children's long-term attitudes

towards science. Despite these views, most teachers felt they did not possess sufficient scientific content and pedagogical-content knowledge. Furthermore, the teachers expressed diverse opinions when asked to identify what constitutes curiosity, how the curious child can be identified, and how a child's curiosity can be fostered. In addition, an in-depth investigation of the pre-school teachers' sample revealed diverse patterns of early engagement in science. For example, teachers engage in science in their pre-school classes in various ways and methods, teachers differed in the importance that they attributed to science education, and the position it has in their classes' routine, in their curiosity towards scientific topics, and in their implementation of scientific inquiry.

From the children's perspective, the study's results revealed that overall, the children's attitudes and curiosity towards scientific engagement are highly positive. However, children's verbal and behavioral expressions with regard to their inquiry skills were less highly exhibited. In addition, children explored items with scientific associations spontaneously and under structured instructions in various ways, and asked questions about those items that indicate higher-order thinking. The criteria associated with these items, such as the degree of familiarity and whether it serves as a source of information were found to have a positive influence on children's curiosity and to impose behavior that is more exploratory.

Statistical analyses of teachers and children's data indicated an overall positive relationship; in the classes of those teachers that were characterized as having the utmost scientific engagement, most of the children also exhibited the highest science engagement level. In contrast, in the classes of those teachers that were characterized as having the least adequate scientific engagement, most of the children also exhibited the least adequate science engagement level.

The research findings carry significant implications regarding teachers' training and professional development, in particular, how science should be taught in the future for pre-school children and how the educational processes, resources, and settings associated with this important, evolving field can be expanded and enhanced in the future with regard to the teachers, children, and pedagogical practice.