

HANDOUT 7

Science Foundations Introduction



FOUNDATIONS IN Science

The study of science is about finding out how the world works. Young children, like scientists, have a sense of wonder and natural curiosity about objects and events in their environment. From infancy, they actively engage in making sense of their world. They build with blocks, move toy cars in different ways, collect rocks, and play with dirt, water, and sand. Children's play and exploration have much in common with the scientific processes employed by scientists. Through exploration and experimentation with objects and materials in their home or preschool environment, children learn the properties of objects: size, weight, shape, what they are made of, their function, and how they move. They discover what different animals and plants look like and how they live, grow, and change over time. Everyday experiences provide children with many opportunities to ask questions, to make sense of what they observe, and to build a coherent understanding of the world around them.

Developmental research indicates that the majority of children are ready to learn and reason about many of the scientific concepts that naturally

capture their interest. From infancy, they actively construct fundamental concepts of the physical and biological world. Throughout the preschool period, children develop scientific concepts and gain knowledge about objects and events in their everyday environment. By the time they enter school, they have a rich body of expectations and coherent sets of concepts about **living things** and physical objects (Spelke 1990; Baillargeon 1995; Gelman 2003; Inagaki and Hatano 2002; Bullock, Gelman, and Baillargeon 1982).

Children's **predisposition** to learn certain kinds of knowledge, and to think abstractly about concepts from biology and physics, support the early learning of science and pave the way for competence in early schooling. Children's natural inclination and ability to observe and try to understand their world, to develop conceptual knowledge, and to reason about many scientific concepts make science an excellent fit for the preschool environment. As such, there is growing recognition at the national level that science is appropriate and important for preschool children (National Research Council 1999, 2000, 2007).



Science in Preschool

Science in preschool is built on children's natural curiosity and tendency to actively explore, experiment, and discover the nature of things in their everyday life. It is not about a discrete body of knowledge or a list of facts presented to children. This approach to preschool science is consistent with a **constructivist approach** on learning, in which children construct knowledge and build theories by interacting with the environment rather than passively taking in information (Chaille and Britain 2002). Science in the preschool years is about children observing and investigating objects and events in their environment. Through a planned, play-based, supportive environment, they expand their existing knowledge and experience of their everyday world. Science is about providing children with the basic skills of **scientific inquiry**, such as observing and describing, **comparing and contrasting**, classifying, experimenting and **recording**, and using the scientific vocabulary associated with these skills. Science in the preschool years not only prepares children for the scientific skills and knowledge they will encounter in school, but also supports their development in different domains, including social-emotional development, language and literacy, and mathematics.

Development of the Whole Child (Science and Other Domains)

Science in preschool fosters a joy of discovery and a positive approach to learning. Making discoveries, identifying solutions, and trying to figure things out develops children's initiative in learning and helps them become

self-confident learners. Science fosters skills that are recognized as critical for success in work and in life in the twenty-first century: critical thinking, problem solving, creativity, collaboration, and **communication** (Bellanca and Brandt 2010). In scientific investigation, children become learners who ask questions, solve problems, propose new ways of doing things, and make decisions based on reasoning. Science experiences also develop children's ability to interact with peers and adults, share ideas, listen to others, and work cooperatively as competent group members—skills that are important to many areas of learning throughout life.

Early science experiences provide authentic situations to learn and use language and literacy skills. Science activities are typically hands-on, providing multiple ways for young children to make meaning of social and verbal interactions and to build language skills, vocabulary, and grammar. Scientific exploration exposes young children to a variety of new words in meaningful contexts, resulting in vocabulary gains (Brenneman, Stevenson-Boyd, and Frede 2009; French 2004). Although science is important for all children, it is especially relevant to English learners and many children with special needs, for whom the development of new vocabulary and language skills in authentic learning experiences is most effective. Conversations associated with scientific inquiry tend to be rich in language. Children develop both their comprehension and expressive language skills as they make predictions ("What will happen if?"), plan explorations, describe findings, and explain their reasoning (e.g., "Why did it