NSTA Position Statement:
Early Childhood Science Education

Introduction

At an early age, all children have the capacity and propensity to observe, explore, and discover the world around them (NRC 2012). These are basic abilities for science learning that can and should be encouraged and supported among children in the earliest years of their lives. The National Science Teachers Association (NSTA) affirms that learning science and engineering practices in the early years can foster children's curiosity and enjoyment in exploring the world around them and lay the foundation for a progression of science learning in K–12 settings and throughout their entire lives.

This statement focuses primarily on children from age 3 through preschool. NSTA recognizes, however, the importance of exploratory play and other forms of active engagement for younger children from birth to age 3 as they come to explore and understand the world around them. This document complements NSTA's position statement on elementary school science (NSTA 2002) that focuses on science learning from kindergarten until students enter middle or junior high.

Current research indicates that young children have the capacity for constructing conceptual learning and the ability to use the practices of reasoning and inquiry (NRC 2007, 2012). Many adults, including educators, tend to underestimate children's capacity to learn science core ideas and practices in the early years and fail to provide the opportunities and experiences for them to foster science skills and build conceptual understanding (NRC 2007, p. vii). Also underestimated is the length of time that young children are able to focus on science explorations. Effective science investigations can deeply engage young children for extended periods of time, beyond a single activity or session.

NSTA supports the learning of science among young children that will create a seamless transition for learning in elementary school.

Young Children and Science Learning

NSTA identifies the following key principles to guide the learning of science among young children.

- **Children have the capacity to engage in scientific practices and develop understanding at a conceptual level.**
  Current research shows that young children have the capacity for conceptual learning and the ability to use the skills of reasoning and inquiry as they investigate how the world works (NRC 2007, NRC 2012). For example, their play with blocks, water, and sand shares some science-relevant characteristics. Young children also can learn to organize and communicate what they learn, and know the difference between concrete and abstract ideas (Carey 1985). Adults who engage children in science inquiry through the process of asking questions, investigating, and constructing explanations can provide developmentally appropriate environments that take advantage of what children do as part of their everyday life prior to entering formal school settings (NAEYC 2013, p. 17; NRC 2007).These skills and abilities can provide helpful starting points for developing scientific reasoning (NRC 2007, p. 82).

- **Adults play a central and important role in helping young children learn science.**
  Everyday life is rich with science experiences, but these experiences can best contribute to science learning when an adult prepares the environment for science exploration, focuses children's observations, and provides time to talk about what was done and seen (NAEYC 2013, p. 18). It is important that adults support children's play and also direct their attention, structure their experiences, support their learning attempts, and regulate the complexity and difficulty of levels of information (NRC 2007, p. 3). It's equally important for adults to look for signs from children and adjust the learning experiences to support their curiosity, learning, and understanding.

- **Young children need multiple and varied opportunities to engage in science exploration and discovery** (NAEYC 2013).
  Young children develop science understanding best when given multiple opportunities to engage in science exploration and experiences through inquiry (Bosse, Jacobs, and Anderson 2009; Gelman, Brenneman, Macdonald, and Roman 2010). The range of experiences gives them the basis for seeing patterns, forming theories, considering alternate explanations, and building their knowledge. For example, engaging with natural environments in an outdoor learning center can provide opportunities for children to examine and duplicate the habitats of animals and insects, explore how things move, investigate the flow of water, recognize different textures that exist, make predictions about things they see, and test their knowledge.

- **Young children develop science skills and knowledge in both formal and informal settings.**
  Opportunities to explore, inquire, discover, and construct within the natural environment and with materials that are there need to be provided in formal education settings, such as preschool and early care and education programs through intentional lessons planned by knowledgeable adults. In addition, children need to have opportunities to engage in

science learning in informal settings, such as at home with cooking activities and outdoor play or in the community exploring and observing the environment.

- **Young children develop science skills and knowledge over time.**
  To effectively build science understanding, young children need opportunities for sustained engagement with materials and conversations that focus on the same set of ideas over weeks, months, and years (NRC 2007, p. 3). For example, investigating the concept of light and shadows over several weeks indoors and out with a variety of materials and multiple activities will allow children to re-visit and re-engage over time, building on observations and predictions from day to day.

- **Young children develop science skills and learning by engaging in experiential learning.**
  Young children engage in science activities when an adult intentionally prepares the environment and the experiences to allow children to fully engage with materials. The activities allow children to question, explore, investigate, make meaning, and construct explanations and organize knowledge by manipulating materials.

Declarations

NSTA recommends that teachers and other education providers who support children's learning in any early childhood setting should

- recognize the value and importance of nurturing young children's curiosity and provide experiences in the early years that focus on the content and practices of science with an understanding of how these experiences connect to the science content defined in the *Next Generation Science Standards (NGSS)* (NGSS Lead States 2013);

- understand that science experiences are already a part of what young children encounter every day through play and interactions with others, but that teachers and other education providers need to provide a learning environment that encourages children to ask questions, plan investigations, and record and discuss findings;

- tap into, guide, and focus children's natural interests and abilities through carefully planned open-ended, inquiry-based explorations;

- provide numerous opportunities every day for young children to engage in science inquiry and learning by intentionally designing a rich, positive, and safe environment for exploration and discovery;

- emphasize the learning of science and engineering practices, including asking questions and defining problems; developing and using models; planning and carrying out investigations; analyzing and interpreting data; using mathematics and computational thinking; constructing explanations and designing solutions; engaging in argument from evidence; and obtaining, evaluating, and communicating information (NRC 2012, NGSS Lead States 2013);

- recognize that science provides a purposeful context for developing literacy skills and concepts, including speaking, listening, vocabulary development, and many others; and

- recognize that science provides a purposeful context for use of math skills and concepts.

NSTA recommends that teachers and other providers who support the learning of science in young children be given professional development experiences that

- engage them in learning science principles in an interactive, hands-on approach, enabling them to teach about science principles appropriately and knowledgeably;
- are ongoing and science-specific;
- help them understand how children learn science and engineering practices (NRC 2012, NGSS Lead States 2013);
- inform them about a range of strategies for teaching science effectively; and
- include the use of mentors to provide ongoing support for educators for the application of new learning.

NSTA recommends that those in a position to provide financial, policy, and other support for early childhood education should

- provide appropriate resources for teachers and children;
- ensure a positive and safe environment for exploration and discovery;
- ensure teachers receive sustained science-specific professional development that includes how children learn and how to teach science;
- provide mentoring; and
- establish a coherent system of science standards, instruction, appropriate assessment, and curriculum.

Parents and other caregivers can nurture children's natural curiosity about the world around them, creating a positive and safe environment at home for exploration and discovery. These recommendations can be found in NSTA's position statement, Parent Involvement in Science Learning (NSTA 2009), found at *www.nsta.org.*

—Adopted by the NSTA Board of Directors
January 2014

References

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