



Center for Family Policy  
and Research  
University of Missouri

## Recommendations for Teaching Early Science Concepts

*This document summarizes key findings from research in Missouri preschools regarding the teaching of early science concepts.*

### Background

This document reflects research findings from over 126 early childhood programs located in urban and rural communities across Missouri (data collection occurred 2009-2011). Classroom observations were conducted by trained and reliable data collectors using the *Early Childhood Environment Rating Scale, Extension* (ECERS-E). The ECERS-E assesses the manner in which academic curricula are being presented in early childhood classrooms.

### Overview of Key Findings

Overall, the quality of science activities/instruction in the preschool classrooms was found to score quite low. The only area of science instruction that was found to score well was the integration of science activities with food preparation. This means that children are actively involved in cooking activities and participated in discussions about food that use appropriate language (e.g., melt, dissolve). It also means that children are frequently encouraged to use more than one sense (feel, smell, taste) to explore raw ingredients. Unfortunately, scores were low for all other aspects of science-related teaching/activities as measured by the ECERS-E. The areas of concern noted in this document had mean scores of 1.9-3.3 indicating quite low quality (on the 7 point ECERS-E scale; 4.0 is the mid-point).

The specific areas of concern, along with recommendations for developmentally appropriate instruction, are presented below:

#### **#1: Lack of classroom learning activities involving non-living objects**

It was found that teachers rarely plan activities that allow for students to learn about materials and objects and their specific scientific properties. To improve in this area, teachers can:

- Regularly plan and introduce scientific concepts. Allow the children to touch the materials, watch how the materials change or interact, and introduce new vocabulary words related to these science concepts. For example, consider activities that teach...
  - How materials change (water freezes and becomes ice; leaves change color)
  - How magnets interact (magnets attract and repel, what objects in the classroom are magnetic and which ones are not?)
  - How some materials sink while others float (what materials sink? Why?)
- Capture the “teachable moments” to draw attention to aspects and changes in materials. For example, how a birthday candle melts after it is lit or how sand becomes warm in the afternoon sunshine.
- Encourage children to use more than one sense to explore non-living things and talk about their experience. For example, what does an apple look like? Feel like? And taste like? How does an apple compare to a potato or tomato?

## **#2: Lack of activities involving living things**

It was found that teachers rarely plan activities that allow for students to learn about living things and their scientific properties. To improve in this area, teachers can:

- Regularly plan and introduce scientific concepts. Create opportunities for children to safely touch some living things (some plants or animals), watch how the living things live and grow (plants or animals in a terrarium or fish in an aquarium), and introduce new vocabulary words related to these science concepts. For example, children can observe how a caterpillar becomes a butterfly through metamorphosis.
- Draw attention to changes in the natural world through daily observation of the weather and how the plants and trees around the playground area change with the seasons. This provides a rich opportunity for developing children's science vocabulary.

## **#3: Infrequent use of natural resources**

It was found that natural resources were infrequently used for purposes other than decoration. To incorporate natural materials into their instruction, teachers can:

- Use natural materials to illustrate specific concepts, e.g., planting seeds or bulbs to demonstrate growth.
- Through regular activities, encourage children to explore, compare, and classify aspects of natural materials (e.g., things that are smooth or rough, heavy or light, furry or slippery).
- Show appreciation, curiosity and respect for children when they show an interest in living things, such as fungi or worms, rather than showing fear or disgust.

## **#4: Inadequate science-related supplies and teaching materials**

It was found that centers frequently lacked a variety of science resources in the classroom. To address this concern in a cost-effective way, teachers can:

- Make sure there is a wide variety of equipment available for children to use. For this age range, equipment often includes collections of natural materials, magnets, mirrors, magnifying glasses, scale, etc.
- Group items in the classroom with similar and/or different properties, e.g., things that roll, stretch, bounce, are made of plastic, metal, rock, etc.
- Include in the classroom library age-appropriate books that are focused on various aspects of science (space, nature, animals, plants, oceans, lakes, etc.). These books may be story-driven or reference books/materials on science topics.

## **Impact on Children**

High quality learning activities focused on science can occur in the classroom or on the playground. By helping children to become aware of their surroundings and the associated vocabulary of science, teachers can play an important role in children's early science knowledge. This is a key aspect of school readiness.

Mascendaio, P. & Hawks, J., 2011

The Center for Family Policy & Research is housed in the Department of Human Development and Family Science at the University of Missouri. The center serves as a resource for the development of effective public policies relating to all children, families, and communities.