



# **Nurturing Early Science Learning Through Exploration and Discovery**

November 21, 2008

David Heil & Associates, Inc.  
Portland, Oregon

# The Importance of Early Science Exploration



Young children are natural explorers. Every waking minute is a new opportunity for a young child to see, touch, and do new things, making meaning of the exciting world around them.

Because their natural curiosity is unfettered, early explorations in science expose children to the rich knowledge that comes from investigating phenomena they encounter every day.



# What The Research Says

“New research shows that babies and young children know and learn more about the world than we could ever have imagined. They think, draw conclusions, make predictions, look for explanations, and even do experiments.”

*The Scientist in the Crib, Gopnik, Meltzoff and Kuhl, 2000*

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## What Our President-Elect Says

“As President, I will launch a Children's First Agenda that provides care, learning and support to families with children ages zero to five. We'll create Early Learning Grants to help states create a system of high-quality early care and education for all young children and their families. We'll increase Head Start funding and quadruple Early Start to include a quarter of a million at-risk children. I will create a Presidential Early Learning Council to coordinate this effort across all levels of government and ensure that we're providing these children and families with the highest quality programs.”

President –Elect Barack Obama

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# More Specific To Science!



“I do not accept an America where elementary school kids are only getting an average of twenty-five minutes of science each day when we know that over 80% of the fastest-growing jobs require a knowledge base in math and science.”

President-Elect Barack Obama

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## The Value of Early Science Exploration

“With carefully selected materials and thoughtful guidance, children’s explorations will encourage them to observe more closely, develop new ideas about the world, and build a foundation of experiences and ideas on which to construct later understanding.”

“Science in early childhood classrooms also provides a rich context in which children can develop other important skills, including muscle control, language, early mathematical understanding and cooperation.”

*Chalufour and Worth  
The Young Scientist Series,  
2003*

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## Early Childhood Development Core Concepts Relative to Science Learning



1. Human development is shaped by a dynamic and continuous interaction between biology and experience.
2. The growth of self regulation is a cornerstone of early childhood development
3. Children are active participants in their own development, reflecting the intrinsic human drive to explore and master one's environment.
4. Human relationships are the building blocks of healthy development.
5. The course of development can be altered in early childhood by effective interventions.

*Adapted from: Neurons to Neighborhoods:  
The Science of Early Childhood Development  
National Research Council, 2000*

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## Important Assumptions about Early Science Learning



- All children are naturally curious and can successfully engage in developmentally appropriate scientific inquiry.
- The best science content draws from a child's own experiences, interests, and questions about the world they live in.
- Children learn from each other, and discussion, expression, reflection and illustration help build their language of science exploration.

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## Additional Assumptions about Early Science Learning



- The richer and more varied a learner's environment is, the richer and more varied the child's learning experiences will be.
- Care givers and teachers can use particular strategies, materials, and environmental resources to encourage and support early childhood science learning. They don't have to be science "experts" to do this!
- Parents also play a critical role in their young child's science learning by modeling exploration, encouraging inquiry and building the child's confidence as a learner.

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## **Big Idea:**

Children are natural explorers. Methods of scientific inquiry help them bring meaning to their explorations.

## **What the Experts Say:**

“Children can best learn science when it is experienced through hands-on, meaningful and relevant activities.”

*Conezio and French  
Spotlight on Young Children and Science, 2003*

“Students should be actively involved in exploring phenomena that interest them both in and out of class. These investigations should be fun and exciting, opening the door to even more things to explore.”

*Benchmarks for Science Literacy, AAAS, 1993*

## **Key Ingredients:**

- Multiple hands-on activities and explorations
- Incorporate play, questions, simple experiments, and discussion
- Individual and group interactions foster both confidence and cooperation

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## Big Idea:

Science exploration should be integrated into the fabric of a child's life.

## What the Experts Say:

“Learning is viewed as integrated, and opportunities to develop math, science, and literacy skills can occur simultaneously rather than in discrete, segmented lessons.”

*National Association for the Education of Young Children*

“Using inquiry-based science, by its very nature, requires the use of language, mathematics, and social skills. A science program will not detract from learning of these basic skills. Rather, a science program will provide the meaningful context in which these skills can be learned best.”

*Worth and Grollman*

*Worms, Shadows and Whirlpools: Science in the Early Childhood Classroom, 2003*

## Key Ingredients:

- Activities connect science to familiar aspects of everyday life
- Science explorations incorporate music, literature, the outdoors, even snack time and lunch!
- Different learner modalities and styles are accommodated through both structural and free-choice experiences.

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## Big Idea:

Literacy is a skill, not a content area. Language and literacy skills are best built in the context of personal experiences.

## What the Experts Say:

“Children are most likely to learn language and literacy skills when they have opportunities to use these skills in authentic situations.”

“Young children, like scientists, need to practice the process skills of predicting, observing, classifying, hypothesizing, experimenting and communicating. Like adult scientists, they need the opportunities to reflect on their findings, how they reached them, and how the findings compare to their previous ideas and the ideas of others. In this way, children are encouraged to develop the attributes of a scientist.”

*Conezio and French  
Spotlight on Young Children and Science, 2003*

## Key Ingredients:

- High quality books included in every kit
- Inquiry-based explorations help develop language skills through group discussions, written and verbal expression, problem-solving, and new vocabulary.

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## Big Idea:

Parents, and other adults, are essential to healthy early childhood science learning.

## What the Experts Say:

“Nothing affects the academic outcome for a child as much as the involvement of a parent or other adult caregiver in that child’s education.”

*Barber, Parizean & Bergman, 2004*

“When parents are involved, students achieve more, regardless of socio-economic status, ethnic/racial background or the parents’ education level.”

*National Standards for Parent/Family Involvement Programs*

*National PTA, 1997*

## Key Ingredients:

- Teachers play multiple roles including facilitator, guide, and co-explorer
- Child experiences are shared through a variety of displays, drawings, and story boards
- “Family Connections,” included in every kit, are sent home with the child to invite parents/child explorations

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It's okay to say "I don't know."



## *Exploring Water*



“Why does my raincoat keep me dry? Why are water drops always round?” Children observe a water drop, watch how it moves, and experiment with what does and doesn’t absorb water.

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## *Exploring Play*

“Why does my ball bounce?  
Why do my sneakers slow me  
down on the slide?” Children  
explore the phenomena behind  
their everyday play: friction on  
the slide, balls & gravity,  
shadows and how their own  
body moves when at play.



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## *Exploring Insects*



“What is that neat bug on the window? Will it bite?” Children learn about the basic body parts of insects, act out their life-cycle and go on a “Critter Safari” in search of insects to observe.



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Building vocabulary  
is an important  
early science  
learning step



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## Another Sample Family Science Activity

Age:  
8-13

Participants:  
Group, Family, Pair

### Supplies

- paper, a variety of types
- paper clips
- clear plastic cups
- small flashlight
- small portable mirror
- plastic soda straw
- sheet of aluminum foil
- tape
- balloons
- spoons
- rubber bands
- pencil
- string
- ruler
- resealable sandwich bags

## Evidence, Please

### Why

To test ideas and offer explanations for findings.

### What

Scientists ask questions about the world around them and search for evidence to confirm their ideas. Evidence can support some things, but it may require ongoing investigation before a conclusion is reached. The challenge of this activity is to find evidence that demonstrates a science idea or concept for others using household items.

### How

- Divide into teams. Collect one large set of supplies for the whole group. You may want to add other household materials to your supply list.
- Each team selects one of the topics on the *Evidence, Please List* to investigate using their collection of household materials (see page 90). For a challenge, one team can choose a topic for another team to investigate and demonstrate.
- Decide how much time you will have to investigate the selected topic, and prepare a demonstration of your evidence.
  - Use the *Evidence, Please List* for ideas on what evidence to demonstrate. Practice your demonstration to be sure it shows the evidence you want.
- Each team presents their evidence on the selected topic.
- During the presentations, record other science ideas you discovered on the *Evidence, Please List*.
- Add answered and unanswered questions to a Question Quilt (see page 86 for a full description of this activity).





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A set of these slides can be found at:

[www.davidheil.com](http://www.davidheil.com)