



The Cat in the Hat Knows a Lot About That!™ **EXPLORER'S GUIDE**



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Doing Science with Young Children

- 1. Science for young children begins with wondering and questioning.** Children are invited to express their innate curiosity about the living things, objects and materials, and events in the world around them. They are encouraged to wonder, predict, and generate their own ideas.
- 2. Science for young children invites all children to participate.** ALL children, including girls and boys, children from different cultures or ethnic backgrounds, children with disabilities, and children with varying interests, abilities, and learning styles have opportunities to engage in doing and learning science. For example, a child with vision impairment is invited to explore using his senses of hearing and touch.
- 3. Science for young children focuses on direct experience.** Children have many opportunities to directly observe and explore the living things, objects and materials, and events in the world around them. For example, as they learn about animals, children observe the birds, worms, snails, and insects in their own backyards and playgrounds.
- 4. Science for young children is an active process.** Children participate actively in science inquiry—the process of finding out. They have space, time, and encouragement to ask questions, make observations, try things out, develop and test their ideas, collect information, and think about what happened.
- 5. Science for young children includes many varied experiences about an idea.** Children have lots of opportunities to observe and investigate a particular idea so as to gradually develop their science understanding. For example, while learning about the life cycle of plants, children plant seeds, observe and measure plant growth, and compare the growth of different plants. They also look at plants around their neighborhood and visit a local plant store or nursery.
- 6. Science for young children includes many opportunities for them to communicate what they are doing, noticing, and finding out.** Children are invited to think and talk about their explorations and ideas with others. They have materials available to represent their ideas through drawing, painting, and/or making 3-D models.





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Science Inquiry

Science is about **how** people find out new knowledge as much as it is about **what** people find out. When scientists investigate new questions or ideas, they engage in the lively process of science inquiry. They plan and carry out investigations to test their predictions and, depending on what they find out, they may keep, revise, or toss out their old ideas. Very often, their discoveries lead to new questions and further investigation. This means that supporting young children's abilities to think and act like scientists is much more than telling them information or giving them science facts. It's also more than demonstrating or showing them interesting things.

Supporting young children's science learning means engaging them fully, actively, and directly in science inquiry.

You can take advantage of daily opportunities to engage children in the process of science inquiry. You can invite them to learn, use, and practice the following inquiry skills in the context of their explorations. Remember that inquiry is a dynamic process. Children probably won't use all the skills in one exploration, and they won't necessarily use them in order.

Raising Questions

Young children's science explorations often begin with questions. They have questions about the world and how it works, but often don't have the language ability to articulate them. You can help by observing children as they encounter new objects, materials, or events and asking questions that invite them to express their questions like "Are you wondering about what that insect is doing?" You can also model wondering by asking questions like "I wonder how this flower is different from that one?"

Making Predictions

Just as children generate questions about the world, they also generate predictions about what will happen based on their previous experiences. Starting with predictions is a great way to get children motivated or interested in an investigation. Ask questions like "What kinds of creatures do you think we will find in the garden?" or "What do you think would happen if we brought your snowball inside?" Remember that children must have some previous experiences on which to base predictions. Otherwise, they can only guess.





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Planning and Carrying Out Investigations

Although children raise questions and make predictions all the time, they need adult support to follow through on planning and carrying out investigations. You can help them do this, and keep them fully engaged in inquiry, by asking questions like “How do you think we could find out?” and “What do you think would happen if . . . ?” You can also help by keeping the plans for investigation clear and concrete, so that children can actively participate in each phase. For example, children could make a plan to find out what conditions seeds need to sprout by planting bean seeds in small pots, placing the pots in different locations inside and outside, and checking on them daily to observe any growth.

Making Observations by Using All the Senses

Children often use their whole bodies to explore the materials and objects in their world, and you can support them in using all their senses by suggesting that they listen, smell, and touch as you go about your daily routines. For example, draw children’s attention to interesting sounds and smells outdoors, and encourage them to try to identify the sources. Whenever possible and appropriate, encourage children to hold, manipulate, and feel objects and materials, and invite them to describe characteristics of items based on touch. You also can help them learn to use tools like magnifying glasses to extend their observations.

Collecting and Recording Data

Collecting and recording data are important to help children remember what they found out so they can talk and think about it later. You can model this for children by making notes or jotting down interesting things you and the children notice. You can engage in more systematic data collection with children by keeping a weather chart, for example. Provide paper and crayons or colored pencils to encourage children to make drawings of their observations of plants and animals. They also might label their drawings or add a few words. If they are not writers, do it with them.

Comparing and Contrasting

Once children have had time to investigate, they need time to think about their observations and the data they have collected. You can help children do this by encouraging them to compare and contrast the objects and events in their world and helping them notice





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similarities and differences. For example, you could ask them “How are those two birds the same and/or different?” and “How is the weather different today from what it was like yesterday?” Encourage children to sort, categorize, and sequence items or objects based on a variety of characteristics. For example, invite them to organize a collection of rocks by size from the playground: What size is the most common? Where did the biggest ones come from? the smallest?

Identifying Patterns and Relationships

Identifying patterns and relationships is a first step in helping children make generalizations about the world and how it works. It is one way they begin to develop their own ideas and theories. You can help children do this by drawing their attention to relationships between things or events that occur over time, and encouraging them to think about cause and effect. For example, you can ask “What are some things about the weather in summer that are different from the weather in winter?” Invite them to notice cause and effect in the natural environment by asking questions like “Why do you think the squirrels seem to prefer this tree?”

Developing Ideas

Developing ideas is a critical ability and in order to do this regularly, children need to feel confident that what is valued is not whether or not they are “correct.” One of the most important understandings to support in young children is that science ideas are based on evidence from observations and explorations. You can support children in developing ideas based on evidence by encouraging them to make observations and then asking “What do you think about that?” You can also express an authentic interest in their ideas by asking “Why do you think so?” or “Why don’t you think so?”

Communicating and Collaborating

Listening to the ideas of others, defending their own ideas, and working together are important science inquiry skills that children can learn as they work with other children and adults. You can help children express their ideas by inviting them to talk about, show, demonstrate, or draw what they mean. You can support these skills by joining in children’s investigations and sharing your own observations and ideas; you can also model a willingness to listen to those of others by asking questions like “What do you think about that?” or making comments like “Let’s find out what _____ thinks about that.”





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Respecting the Environment

Science explorations provide a wonderful context for helping children develop respect and concern for the outdoor environment and the living things that inhabit it.

As children get outside and observe birds finding food, examine flowers and the creatures that use them, and find nuts hidden by squirrels, they are introduced to the idea that all living creatures depend on their environments to meet their needs for food, water, and shelter. This helps children begin to understand that the earth, as home to all kinds of living things, including humans, needs to be cherished and protected.

When you and your children are outside, encourage them to treat the environment and all the living things in the natural world with care and respect. Help them understand that if we disturb the outdoors too much, living things may not survive. When you are exploring, teach children to observe and learn from animals and plants in their natural environment. If you do take in a leaf or branch for study, collect these items from the ground rather than disturbing the living plant. If you remove animals for study, return them to their environment as soon as you have finished observing them.

“ [T]rue scientific inquiry is imbued with excitement, creativity, and wonder—fostering children’s appreciation of the world they live in, both its beauty and its complexities.”

—Karen Worth and Sharon Grollman, Education Development Center, Inc.*

*In *Worms, Shadows, and Whirlpools*. Portsmouth, NH: Heinemann, 2003, p. 21.





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The Cat in the Hat's

Top Ten Tips for Engaging Young Children in Science

1. Nurture children's sense of wonder and excitement about the natural world.

Children are naturally curious about the world around them. You can cultivate and support this trait by noticing what they think and wonder about, joining in as they ask questions, and drawing their attention to interesting things that you observe in and out of the classroom. Ask questions like “Did you notice . . . ?” and “What do you think about . . . ?” and model your own curiosity with comments like “I wonder how . . . ” and “I wonder why . . .”

2. **Get children actively involved in science inquiry.** Children need lots of opportunities to act and think like scientists. You can encourage children's active observation and exploration by choosing topics of study that invite direct investigation of the materials, objects, and events in the natural world. If children are interested in animals, for example, engage them in observing and exploring the snails, worms, salamanders, or other critters that live around your school. Over time you can support them to make predictions and plan investigations, collect and record information, and develop and discuss their ideas and theories by investigating specific questions like “What do we need for a snail habitat?” or “How do worms move?” Actively engage children in thinking about what they are doing, by asking “Why do you think so?” and “How can we find out?”

3. **Make time for science exploration.** Children learn best when science is connected to their everyday lives and integrated into daily classroom experiences. Include science activities as a regular part of your daily classroom curriculum. For example, you can include science in the daily weather routine: Take children outdoors to observe the weather by using all their senses, help them record the daily weather on a classroom chart, and encourage them to look for patterns in the weather during specific months or seasons. You can plan natural science explorations such as observing insects, collecting and examining leaves, or observing and measuring growth of indoor and outdoor plants. You can also take advantage of field trips and build a long-term science exploration around them. Going to an apple orchard is a great stimulus for an investigation of trees, for example.





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- 4. Provide materials and tools for science exploration.** In order to do science, children need materials and tools that focus their attention on the science related to their activities. Provide the tools they need to observe more closely, to take measurements, and to record what they find out by drawing, charting, or graphing. For example, for a plant investigation, provide small containers for collecting leaves, seeds, and other plant parts; magnifiers for looking at them closely; and paper and crayons or colored pencils for drawing them.
- 5. Have science talks with children.** When children have opportunities to talk with one another about what they are doing, observing, and finding out, they can share, compare, and contrast their experiences and ideas. These conversations can raise group questions and connect what children are doing and learning to relevant science concepts. For example, as children talk about their insect observations, they may notice that the insects each of them is observing all have six legs. This prompts a question (Do all insects have six legs?) that leads to further investigation and introduces children to the idea that insects share certain physical characteristics. Engage children in small- and large-group conversations about their explorations, observations, and discoveries. Encourage them to discuss their experiences and ideas with one another by asking questions like “Did anyone else notice that?” and “Does anyone have a different idea?”
- 6. Help children represent and document their science discoveries.** Children think more about their experiences with the animals, plants, objects, and events in the natural world when they have opportunities to represent them by drawing, painting, or making 3-D models that show what they have been doing, noticing, and learning. For example, children can use black or brown markers to draw the ants they observe at an anthill. Representation is an important science inquiry skill that also helps children share their learning and ideas with others in science talks or on classroom documentation panels. You can help children document their explorations by taking photographs that allow them to recall and revisit their explorations. Photographs of a playground tree over time, for example, will help children think about how the tree has changed through the seasons. Movement and drama can also highlight what children have observed. They can use their bodies to imitate the movements of a wriggling worm or a creeping snail, or dramatize walking outside on a sunny day, a rainy day, or a snowy day.





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- 7. Provide connected, focused science experiences over time.** Children develop an understanding of a science concept when they are able to experience it from many different perspectives. For example, children need to observe and investigate many different kinds of plants before they can understand that most plants have similar basic needs. Conduct extended investigations with children and sequence the activities from more general to more specific. For example, first help children learn about plant growth by taking a neighborhood nature walk and observing different kinds of plants outdoors. Next plant seeds and watch them grow and develop. Try planting seeds in moist soil and dry soil and observe which ones sprout. Then follow up by examining the stems, roots, and other parts of different plants.
- 8. Encourage children to use the tools of language and literacy to enhance their science explorations.** As children communicate, collect and record data, and represent, they are using language and specific literacy skills in purposeful ways, making science a great context for supporting children's language and literacy development. Encourage children to use interesting language to share their observations and discoveries during explorations and science talks. Introduce and use challenging vocabulary during explorations—or use pictures and photos as props—so children attach meaning to the words. Put words with picture cues on charts of children's observations so they can “read” and interpret them, and invite children to participate in adding information to the charts by drawing or writing. Take children's dictation as they describe their observations, and read it back to them. Provide a variety of books, including non-fiction, that connect to children's explorations.
- 9. Encourage children to use the tools of math to enhance their science explorations.** As children collect and record data, make measurements, and organize their data on charts and graphs, they are using and practicing number and math skills. You can support their practicing of math skills by being sure that these skills are used where appropriate to enhance the science exploration. For example, you can suggest that they organize their collections based on different characteristics, such as sorting leaves by shape or rocks by color. You can then help them transfer this information to a large graph on which each block represents one item of that shape or color. You can provide non-standard measurement tools like pieces of yarn or small snapping blocks for them to measure a plant's growth over time and record these data in a journal.





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- 10. Extend children's science learning through adventures.** Children learn more from field trips and other classroom adventures when they are connected to classroom explorations. When you plan field trips you can also plan relevant science explorations that build on children's interest in and enthusiasm for the trip. For example, a trip to the aquarium is a great way to launch or enrich an investigation of fish and other animals that live in or near water. You can also plan big or small adventures that will enhance children's classroom explorations. A walk in the woods will kick off or extend plant explorations and provide a new perspective for thinking about plants and their characteristics.

