Introduction to MESS®

Marvelous Explorations Through Science and Stories

Marvelous Explorations through Science and Stories

This Teacher's Guide was developed by the
Center for Informal Science Education at the
Florida Museum of Natural History/University of Florida under
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Introduction to MESS

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Welcome to Marvelous Explorations Through Science and Stories

Marvelous Explorations Through Science and Stories or *MESS*® is an early childhood curriculum enhancement designed to help teachers and parents support children's early science explorations. This guide describes how to use *MESS* to support young children's early science learning. It also explains why science is an important part of children's early experiences, how *MESS* approaches science, and how to use the *MESS* framework to enrich science exploration.

MESS is organized around a series of topical guides:

My Body/My Senses
Investigating Water
Our Natural World
Physical Science
Kitchen Science
Animals 1: Fur, Fins, Feathers, and More
Animals 2: Insects and Spiders
Prehistoric Life
Plant Life

Each guide includes background information, descriptions of learning experiences for the classroom and at home, and recommendations for books and other materials to support science learning.

MESS was developed by the Florida Museum of Natural History at the University of Florida in partnership with local Head Start programs and public libraries. Funded by the Administration for Children & Families, as a Head Start Innovation and Improvement Project in 2004, the guides and supporting materials are available as a free resource on the Early Childhood Learning and Knowledge Center or ECLKC (http://eclkc.ohs.acf.hhs.gov/hslc).


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Why focus on science in early childhood?

From the first days of life, children are motivated to make sense of the world around them. As they observe and explore, young children begin to develop a basic understanding of how the world works. They come to understand, for example, that objects do not simply disappear into thin air, animals have different kinds of insides than machines, living things grow, and that children's own actions can produce effects. These basic concepts form the foundation for more sophisticated scientific understandings.

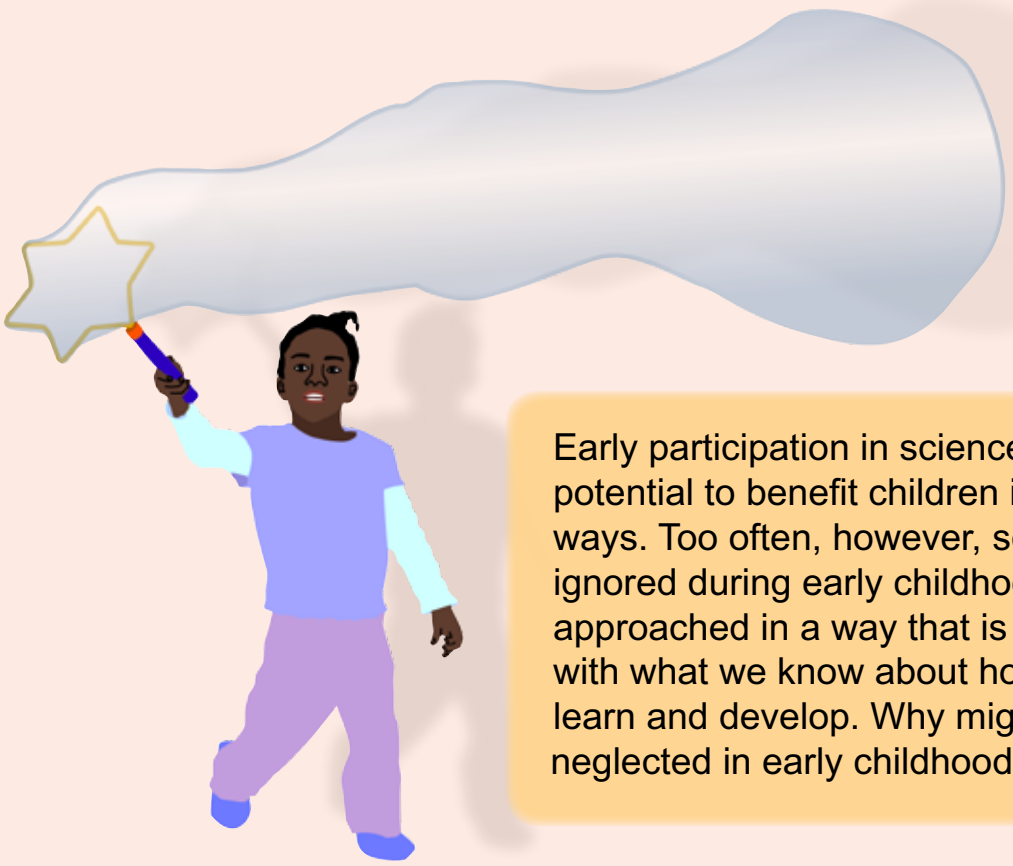
Children's early exploration of science ideas involves important thinking skills such as observing, asking questions, comparing and contrasting (classifying), investigating, predicting, and communicating thoughts and discoveries with others. These skills are useful in many situations outside of science. We employ these skills when we read, and as we navigate the social world, and master technological tools, to give just a few examples.

The value of science experiences in early childhood extends far beyond learning science concepts and skills, however. The following illustrate the ways science explorations can foster competencies across all domains of development.

- Because science builds upon children's existing interests, it can promote positive attitudes toward learning and dispositions that have long-lasting impact on success in school and beyond. These dispositions include curiosity, persistence in solving problems, and motivation to learn more.
- Science supports the development of social and emotional skills. During explorations, children learn to share materials, work together, wait their turns, and participate in discussions.
- The social nature of science encourages the development of children's language and literacy skills. "Science talk" involves sophisticated vocabulary, extended conversations, and discussions beyond the immediate "here and now." These have all been associated with vocabulary development and later reading comprehension.

- Science investigations can directly foster children's early literacy development. Representing children's observations, predictions, and explanations on charts and graphs shows children their ideas are valued while promoting a growing awareness of print. And asking children to represent their ideas and discoveries in drawings and journals encourages the development of early writing skills while deepening science understanding. Of course, books and other informational resources are essential tools for science. These resources can inspire investigations and answer questions while nurturing children's appreciation for books.

- Mathematical activities such as looking for patterns, sorting, counting and measuring are natural components of many science explorations. And practice using science tools such as magnifying lenses helps develop fine motor coordination.



Early participation in science has the potential to benefit children in so many ways. Too often, however, science is ignored during early childhood, or it is approached in a way that is incompatible with what we know about how young children learn and develop. Why might science be neglected in early childhood settings?

What are some obstacles to good science in early childhood classrooms?

Most teachers report they enjoy doing science with young children. If so, why is it often difficult to find good science in early childhood classrooms?

Teachers cite three obstacles that make it difficult for them to do science as often or as well as they would like. These factors are:

- lack of comfort and uncertainty
- lack of time
- lack of resources

Some teachers feel limited by their own science backgrounds. They worry they might mislead children, or make mistakes. Others are uncertain about how to go about doing science with young children. They wonder—can my children really understand science? What are important concepts to explore? How will I manage the classroom if the children become too excited?

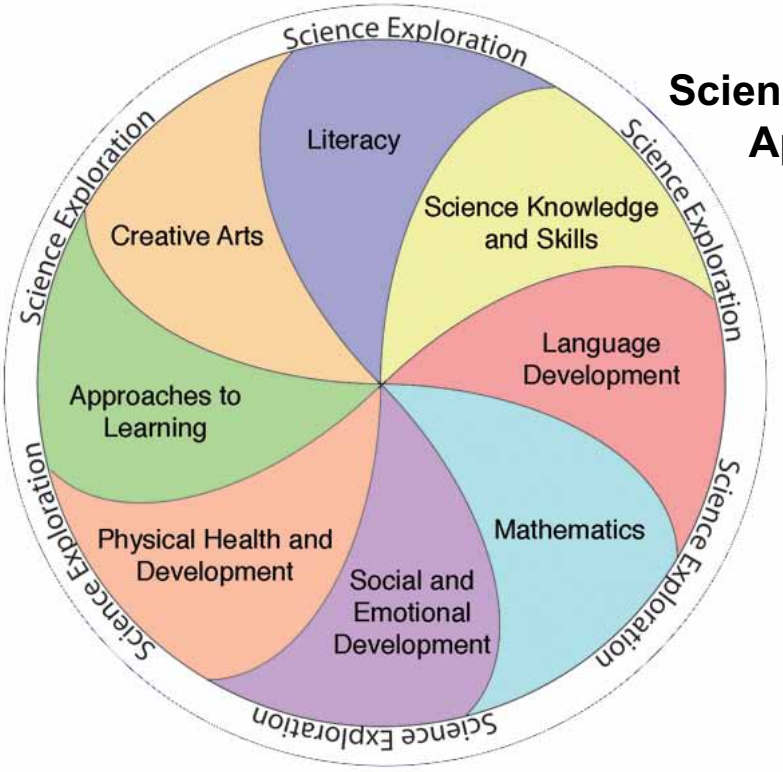
Another obstacle teachers report is a lack of time. Teachers question how they can fit science into a schedule already full of literacy and math experiences. Others are concerned that greater focus on academic content will reduce the time allocated for play.

And many teachers fear they cannot do science well because they lack the necessary supplies and books. This fear may be growing as early education supply companies increase their "science" offerings, including costly prepackaged kits.

How can MESS help?

MESS is designed to increase teacher comfort with science. Each *MESS* guide begins with a "Teacher Background" section that reviews the important science ideas relevant to the topic at hand. The guides also target important science ideas and vocabulary, and suggest ways to design developmentally appropriate learning experiences. Together, these features help teachers gain confidence as they discover science along with their children.

MESS also helps teachers make the most of their time with the children by embedding language, literacy, and mathematics in rich, collaborative explorations that build on children's interests. This science-centered approach to early learning supports learning and development across all domains.



Science-Centered Approach

And *MESS* recommends cost-effective resources to support children's early science explorations. These recommendations are based on extensive classroom observations and teacher feedback.

How does MESS approach science in early childhood?

The goal of *MESS* is to foster curiosity, build foundational knowledge, and develop basic scientific thinking skills (not teach facts!). *MESS* is based on three principles:

- children learn best under the guidance of caring adults;
- language, print, and other forms of representation are critical in the development of early science understanding; and
- young children build understanding of science ideas and grow proficient at using science skills when given the opportunity to explore deeply and over time.

Let's explore these in more depth.

In *MESS,* adults:

- carefully select and prepare materials
- thoughtfully design learning experiences
- guide children's explorations
- engage children in lots of conversation
- model curiosity and enthusiasm

The Role of Adults. Children are most likely to develop deep understanding of science ideas and use science skills proficiently when adults intentionally create learning environments that support the development of those ideas and skills. These environments include materials and resources that inspire children's curiosity and ample opportunities to explore big science ideas in depth and over time. Critical to this environment are adults who value children's thinking, understand how to effectively guide children's explorations, and are themselves curious about the world and eager to make discoveries with children.

Language and Literacy in Science. As we build understanding of the world, we increasingly represent that knowledge via language. We use language to store and organize information in memory, and to help recall that information

later. Adults are key in helping children represent their growing understanding of the world using words. Adults introduce vocabulary that helps young children both deepen and refine their concepts. Effective question-asking encourages children to represent their own ideas using oral language which further enriches understanding.

During the early years, children also can represent their ideas using drawings and three-dimensional models (e.g., forming an insect out of clay). These efforts to make their thinking visible deepen children's understanding, while supporting conversation among peers and with adults. And children begin to represent speech with scribbles. These early attempts at writing lay the foundation for later literacy.

Books and other forms of print media are essential to children's early science learning. Many scientific ideas and processes cannot be directly experienced, or unfold over time. Consider, for example, learning about the insides of things, or the life cycle of plants and animals.

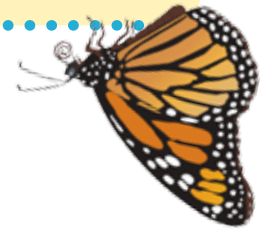
In *MESS,* science experiences include:

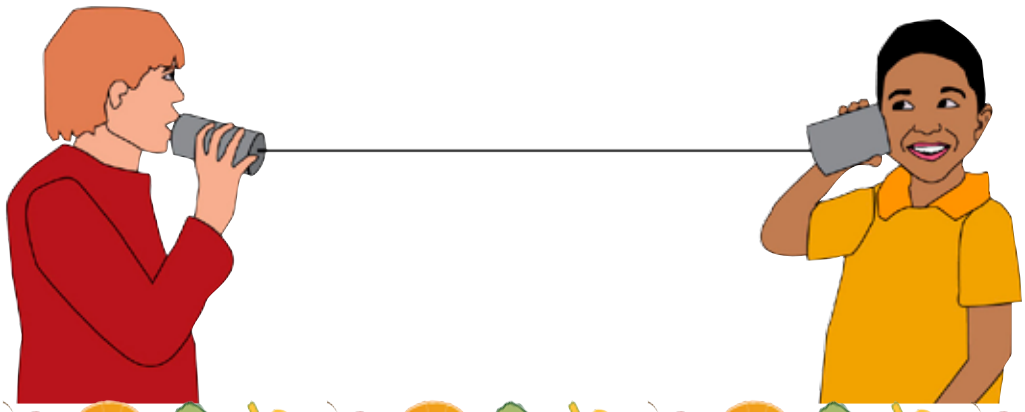
- extensive use of oral language
- books and other print materials at the beginning, during, and/or at the end
- children's representational activities such as drawing, model making, and journaling

Exploring Science in Depth and Over Time. A basic principle of learning is that we most readily master information and skills that we use time and time again. Each *MESS* guide includes 12 to 16 related learning experiences, many with suggestions to further extend learning. The *MESS* topics support study over a period of at least several weeks. This allows teachers and children to focus in depth on important science concepts, link those concepts together, and provide opportunities for children to review and practice using new knowledge and skills before beginning another area of inquiry. Moreover, foundational science ideas (e.g., growth, variation) recur in different guides, and different topics utilize many of the same science tools and thinking skills. This helps children develop conceptual understanding and grow increasingly proficient at using science tools and thinking skills.

In *MESS,* children:

- explore related science ideas over a period of several weeks
- revisit core science ideas in different contexts
- practice using science tools and thinking skills





The *MESS* approach to early childhood science contrasts with what we often observe in classrooms. The following describes some common approaches to science in the early years—and their limitations.

Less Effective Approaches

Magic Show Science. Sometimes teachers select science experiences from what they remember from science class or visits to science centers. Often, this results in children observing adults perform experiments or demonstrations such as mixing chemicals. While these experiences may be entertaining and memorable, they are unlikely to build foundational knowledge because the science concepts are beyond the grasp of young children. Demonstrations also suggest that—to be interesting—science must be super exciting and involve special equipment. The best science in early childhood emerges from the questions children ask as they interact with the world around them.

Science as Arts and Crafts. Teachers who feel uncomfortable doing science, but nonetheless want to expose children to important science content sometimes elect to to do arts and crafts activities with science themes. For example, children might build butterflies from coffee filters, glue craft feathers to an outline of a bird, or create a collage of “things with wheels” from magazine photos. While these activities can be used to reinforce what children learn in actual science investigations such as observing live butterflies, exploring real feathers, or experimenting with wheeled toys, alone they provide little opportunity to use scientific thinking skills.

Less Effective Approaches

Hodge Podge Science. In other settings, children do have the opportunity to engage in hands-on science investigations, but these opportunities are scheduled weekly or monthly, with topics changing frequently. For example, one week children might sprout lima beans, the following week they might mix colors, and the next they might experiment with floating and sinking. This piecemeal approach does not allow children to explore science ideas in depth, and the lack of review makes it difficult for children to build understanding.

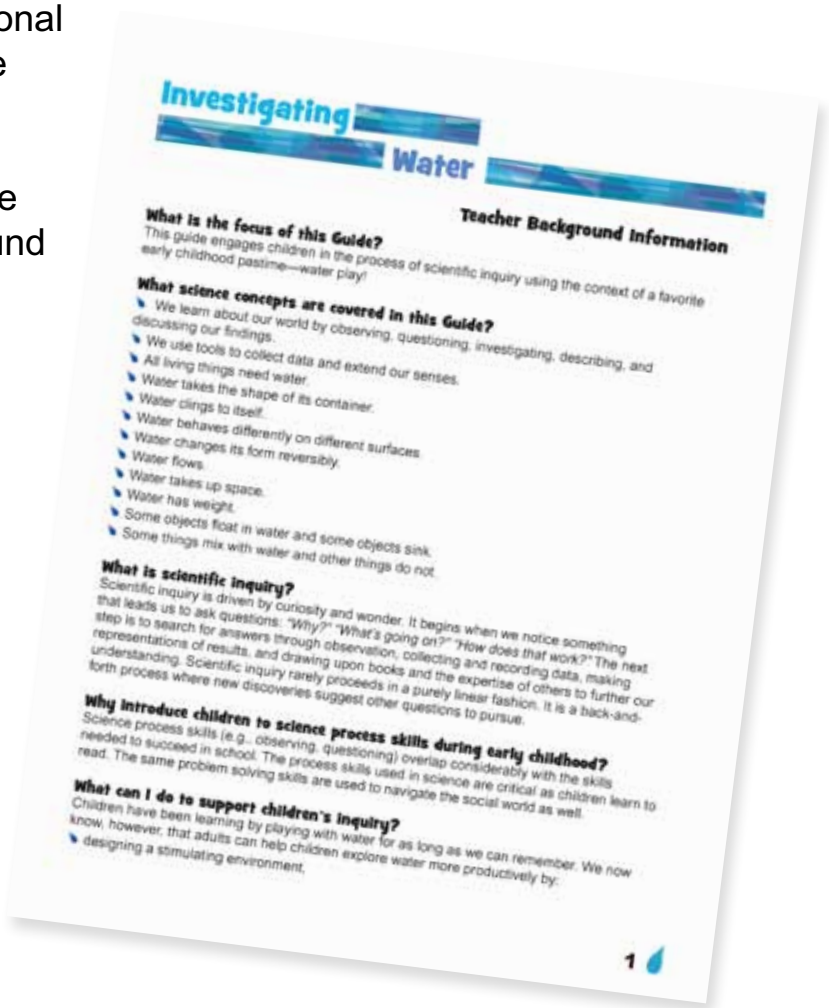
Science Center = Science. Almost all early childhood settings have a science or discovery area with items such as rocks, magnets, and measuring tools. In some settings, science is largely limited to these centers which children explore with little adult support or guidance. This is unfortunate because young children learn best when their initial explorations are under the guidance of caring adults. After children have been introduced to materials and learned how to explore and reflect on their actions, science and discovery areas are wonderful ways for children to build understanding and practice scientific thinking skills. But for these centers to be effective resources, they need to be just one part of a broader approach to science.

How are the MESS Teacher's Guides Organized?

Each *MESS* guide is organized in a similar fashion and includes the following:

- Table of contents
- Teacher background information
- Materials list
- Descriptions of 12 or more learning experiences
- Take-home experience information
- Recommended books
- Head Start Domains and Indicators

Teacher Background Information. As noted earlier, this section is designed to increase teacher confidence in doing science with young children. It includes a list of the science concepts that the experiences address. These concepts were identified after extensive review of National Science Education Standards and state science early learning standards.


Investigating Water

Teacher Background Information

What is the focus of this Guide?
This guide engages children in the process of scientific inquiry using the context of a favorite early childhood pastime—water play!

What science concepts are covered in this Guide?
- We learn about our world by observing, questioning, investigating, describing, and discussing our findings.
- We use tools to collect data and extend our senses.
- All living things need water.
- Water takes the shape of its container.
- Water clings to itself.
- Water behaves differently on different surfaces.
- Water changes its form reversibly.
- Water flows.
- Water takes up space.
- Water has weight.
- Some objects float in water and some objects sink.
- Some things mix with water and other things do not.

What is scientific inquiry?
Scientific inquiry is driven by curiosity and wonder. It begins when we notice something that leads us to ask questions: "Why?" "What's going on?" "How does that work?" The next step is to search for answers through observation, collecting and recording data, making representations of results, and drawing upon books and the expertise of others to further our understanding. Scientific inquiry rarely proceeds in a purely linear fashion. It is a back-and-forth process where new discoveries suggest other questions to pursue.

Why introduce children to science process skills during early childhood?
Science process skills (e.g., observing, questioning) overlap considerably with the skills needed to succeed in school. The process skills used in science are critical as children learn to read. The same problem solving skills are used to navigate the social world as well.

What can I do to support children's inquiry?
Children have been learning by playing with water for as long as we can remember. We now know, however, that adults can help children explore water more productively by:
- designing a stimulating environment,

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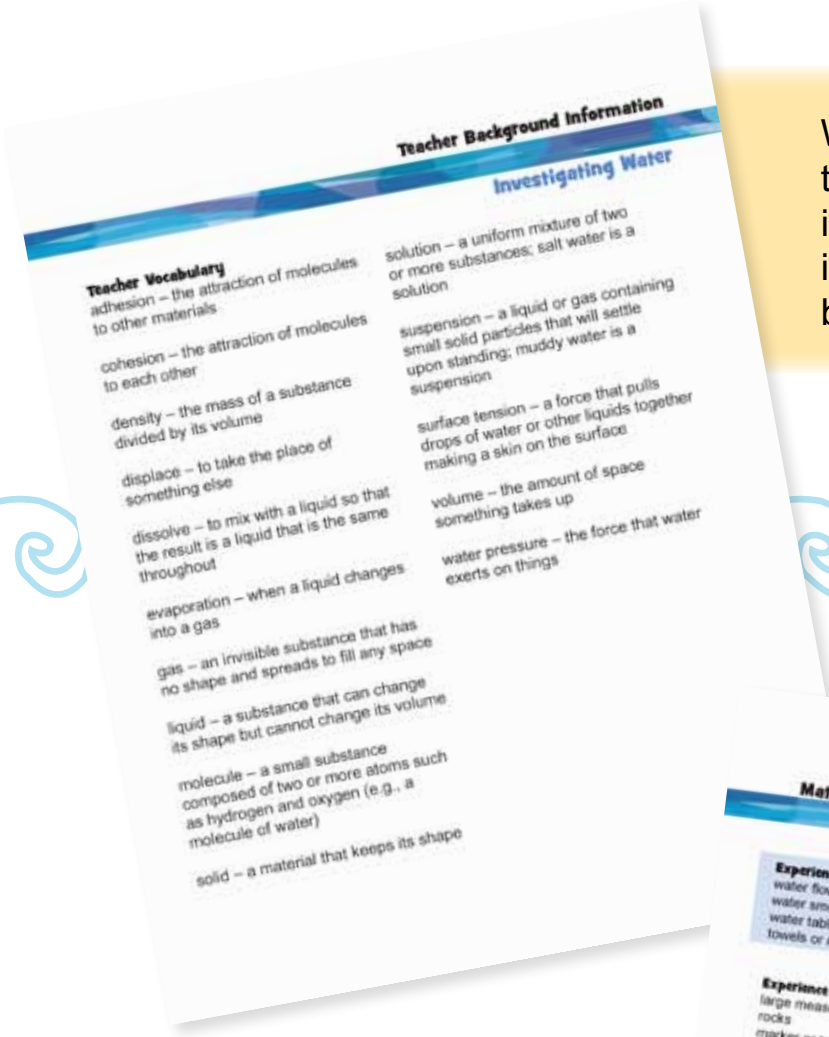
This section provides an overview of the science content covered. The background information also suggests effective strategies for approaching specific topics and, when appropriate, advice on how to explore safely ⚠. The safety recommendations are based on professional practices suggested by NAEYC and other organizations such as the National Science Teachers Association (NSTA).



Teacher Background Information

Investigating Water

Teacher Vocabulary

adhesion – the attraction of molecules to other materials

cohesion – the attraction of molecules to each other

density – the mass of a substance divided by its volume

displace – to take the place of something else

dissolve – to mix with a liquid so that the result is a liquid that is the same throughout

evaporation – when a liquid changes into a gas

gas – an invisible substance that has no shape and spreads to fill any space

liquid – a substance that can change its shape but cannot change its volume

molecule – a small substance composed of two or more atoms such as hydrogen and oxygen (e.g., a molecule of water)

solid – a material that keeps its shape

solution – a uniform mixture of two or more substances; salt water is a solution

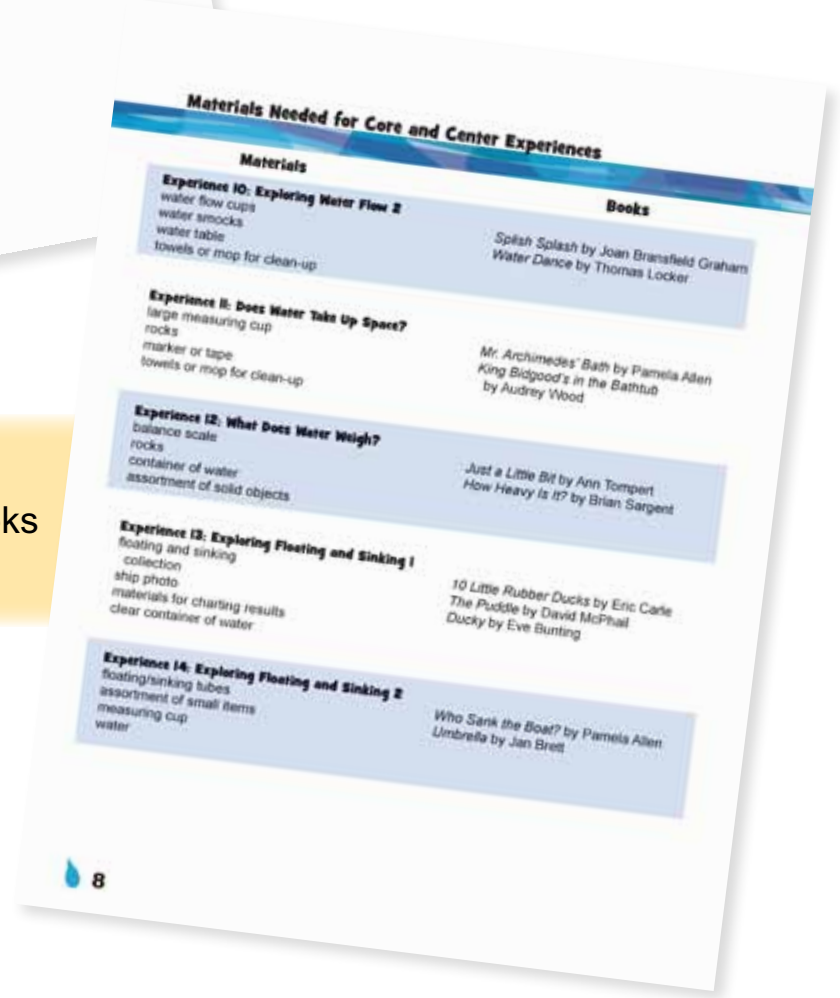
suspension – a liquid or gas containing small solid particles that will settle upon standing; muddy water is a suspension

surface tension – a force that pulls drops of water or other liquids together making a skin on the surface

volume – the amount of space something takes up

water pressure – the force that water exerts on things

We also include definitions needed to understand the background information, as well as other information sources such as books or web sites.



Materials Needed for Core and Center Experiences

	Materials	Books
Experience 10: Exploring Water Flow 2	water flow cups water smocks water table towels or mop for clean-up	*Splish Splash* by Joan Bransfield Graham *Water Dance* by Thomas Locker
Experience 11: Does Water Take Up Space?	large measuring cup rocks marker or tape towels or mop for clean-up	*Mr. Archimedes' Bath* by Pamela Allen *King Bidgood's in the Bathtub* by Audrey Wood
Experience 12: What Does Water Weigh?	balance scale rocks container of water assortment of solid objects	*Just a Little Bit* by Ann Tompert *How Heavy Is It?* by Brian Sargent
Experience 13: Exploring Floating and Sinking 1	floating and sinking collection ship photo materials for charting results clear container of water	*10 Little Rubber Ducks* by Eric Carle *The Puddle* by David McPhail *Ducky* by Eve Bunting
Experience 14: Exploring Floating and Sinking 2	floating/sinking tubes assortment of small items measuring cup water	*Who Sank the Boat?* by Pamela Allen *Umbrella* by Jan Brett

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Materials List. This sections lists recommended materials and books for each experience.

MESS Experiences

The descriptions of each experience include the following components:

Science Concept. This refers to the key science idea or ideas that underlie the experience.

Aim. The aim explains the main point of the experience. You also can think of this as the goal or learning objective. Sometimes the aim targets skills, including science process skills. Other times, the aim focuses on concepts, knowledge, or understandings.

Why is it important to establish an aim?

Identifying an aim or purpose for the activities you select is important for maximizing children's learning. If you have a learning goal in mind, you will be better able to both assess a child's current level of skill or understanding, and provide appropriate support and guidance. By knowing what you want children to gain from an experience, you can better focus children's attention, ask more fruitful questions, and offer more helpful explanations. Of course, it also is important that teachers be willing and able to adjust their learning goals. The ability to adjust instructional goals and support in response to children's needs is a characteristic of a great teacher.

Materials. This list includes the equipment, materials, and supplies needed for the core experience and a related Science Center exploration.

Books. The books listed connect closely to the experience. We recommend these books be used to introduce the experience, elicit and answer children's questions, support Science Center explorations, and wrap-up the experience.

Vocabulary. Here we suggest words to use during the experience.

Approach. The Approach suggests one way to do the experience. The approach includes reminders to review what the children have already learned or to link the experience to children's prior knowledge, ask open-ended questions, and conclude with a review or wrap-up.

Experience 2

Why Is Water Important?

Science Concept
All living things need water.

Aim
Children will learn that water is important for all living things.

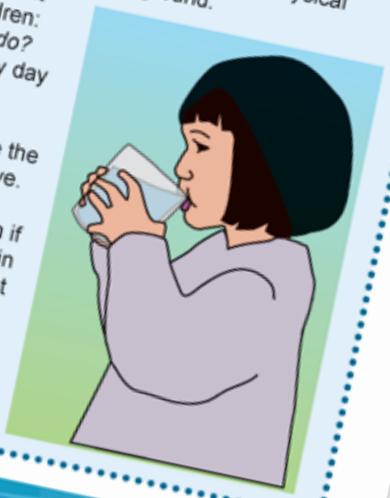
Materials
photos of animals drinking
photos of living and nonliving things

Books
Precious Water by Brigitte Weninger and Anne Möller
The Water Hole by Graeme Base
I Am Water by Jean Marzollo
A Cool Drink of Water by Barbara Kerley
Drinking Water by Mari C. Schuh
Water as a Liquid by Helen Frost

Vocabulary
drink
healthy
living
nonliving
rain
thirsty

Approach

- In advance, review the photo sets so that you can effectively lead the discussion.
- Begin this experience by having the children engage in a vigorous physical activity such as dancing, jumping, or running on the playground.
- Encourage the children to think about what it feels like to be hot and thirsty. Ask the children: *When you are hot and thirsty, what do you do?* Talk about how we need to drink water every day to be healthy.
- Ask the children to share their ideas about other living things that need water. Encourage the children to think about any pets they might have. Show them pictures of animals drinking.
- If the children do not think of plants, ask them if they think plants need water to stay alive. Explain that rain often provides plants with water, but that sometimes we need to water plants to help them stay healthy.
- Using the photos of living and nonliving things, talk about how all living things need water to stay healthy.



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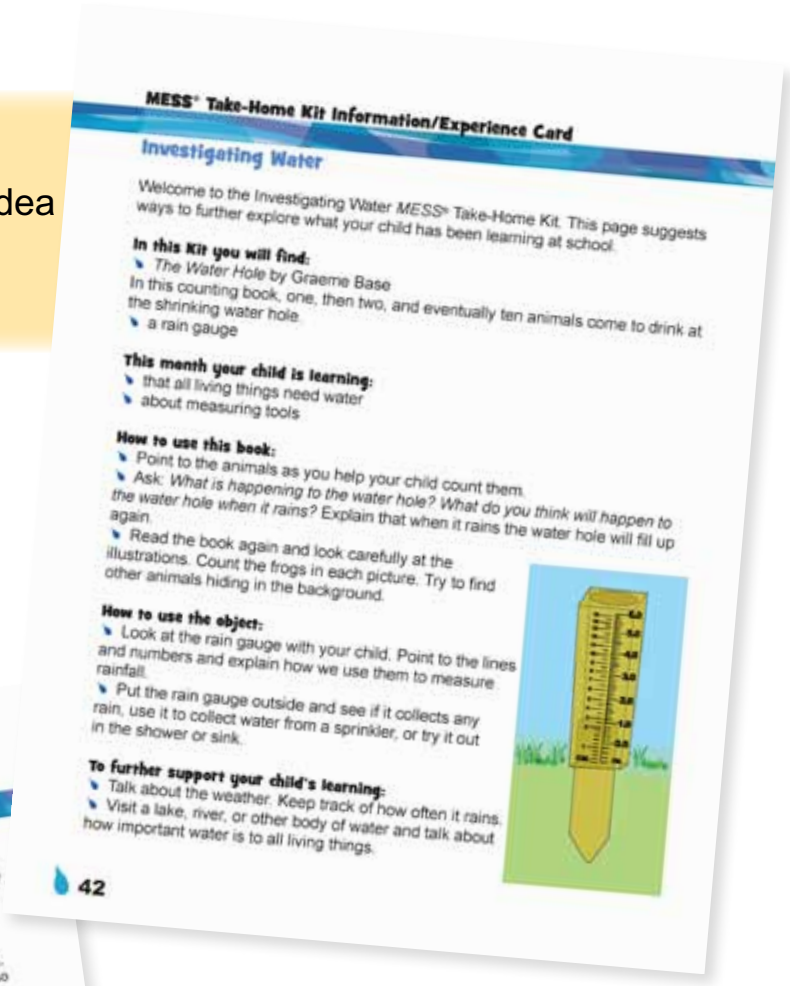
Please note:
We do not intend for teachers to use the Approach as a script! We hope teachers will review the Approach, explore the materials and read the book in advance, and think about how the experience would unfold best in their particular situation.

Extension. The Extensions offer suggestions on ways to follow-up the experience to deepen children's mastery of the targeted science skills or ideas.

Science Center. This section suggests materials to place in a Science Center or Discovery Area for further exploration.

Integrated Experiences. And we suggest ways to integrate the experience across the curriculum.

Take-Home Information/Experience Card. Each Guide also includes an idea for an experience children can do at home with their families.



MESS® Take-Home Kit Information/Experience Card

Investigating Water

Welcome to the Investigating Water *MESS*® Take-Home Kit. This page suggests ways to further explore what your child has been learning at school.

In this kit you will find:
- *The Water Hole* by Graeme Base
  In this counting book, one, then two, and eventually ten animals come to drink at the shrinking water hole.
- a rain gauge

This month your child is learning:
- that all living things need water
- about measuring tools

How to use this book:
- Point to the animals as you help your child count them.
- Ask: *What is happening to the water hole? What do you think will happen to the water hole when it rains?* Explain that when it rains the water hole will fill up again.
- Read the book again and look carefully at the illustrations. Count the frogs in each picture. Try to find other animals hiding in the background.

How to use the object:
- Look at the rain gauge with your child. Point to the lines and numbers and explain how we use them to measure rainfall.
- Put the rain gauge outside and see if it collects any rain, use it to collect water from a sprinkler, or try it out in the shower or sink.

To further support your child's learning:
- Talk about the weather. Keep track of how often it rains.
- Visit a lake, river, or other body of water and talk about how important water is to all living things.

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MESS® Recommended Books

Investigating Water

Cobb, Vicki. *I Get Wet*. New York: HarperCollins, 2002. Throughout a book designed to encourage all children to make discoveries, a young boy asks questions and suggests easily performed experiments to demonstrate several properties or water. Supplies needed for the experiments are minimal.

Frost, Helen. *Water as a Liquid*. Minneapolis, MN: Capstone Press, 2000. Using photos and age-appropriate text, this book discusses where water comes from, why it is important, and some of its liquid properties (shape and flow). The small book format limits its use. Also available by the same author: *Water as a Gas*; *Water as a Solid*.

Graham, Joan Bransfield. *Splish Splash*. Boston: Houghton Mifflin, 2004. Short poems within brightly colored graphic designs describe water in its many forms–from crocodile tears to sprinklers and more.

Greenfield, Eloise. *Water, Water*. New York: HarperFestival, 1999. In very simple text and colorful pictures, a young boy describes where he sees water, how it looks and feels, and what it is used for.

Keats, Ezra Jack. *The Snowy Day*. New York: Viking Press, 1962. The wonder of a snowy day is effectively conveyed in text and pictures as young Peter explores making footprints, snowballs (that melt when taken indoors!), snowmen, snow angels, and another day of wonder. Caldecott Award book.

Kerley, Barbara. *A Cool Drink of Water*. Washington, DC: National Geographic Society, 2002. "Everyone, everywhere needs water for life." Minimal text and beautiful National Geographic photographs detail where people all over the world find their water.

Lehn, Barbara. *What Is a Scientist?* Brookfield, CT: Millbrook Press, 1998. Simple text and color photographs describe how scientists work: questioning, observing, reporting, etc. Children demonstrate each of the tasks.

Locker, Thomas. *Water Dance*. New York: Harcourt Brace, 1997. Taken together, Locker's poems and oil illustrations represent the water cycle. Separately, the short pieces show water moving and changing. The number of details in each illustration can be a conversation starter.

London, Jonathan. *Puddles*. New York: Penguin Books, 1997. A young boy and girl experience both the sometimes frightening thunderstorm and joyful explorations of the resulting puddles, baby rivers, mud, and squirming worms. A warm bath and hot chocolate add to the day.

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MESS Recommended Books. Each Guide includes a list of recommended books that includes both those that are directly related to the learning experience and can be easily integrated into the experience, and other, high quality books that may need to be read more selectively.

Head Start Domains and Indicators Associated with Core and Center Experiences

Domain & Indicators	Experience																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T-H
Language Development																	
Demonstrates increasing ability to attend to and understand conversations, stories, songs, poems.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Shows progress in understanding and following simple and multi-step directions.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Understands an increasingly complex and varied vocabulary.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
For Non-English speaking children, progresses in listening to and understanding English.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Develops increasing abilities to understand and use language to communicate information, experiences, ideas, feelings, opinions, needs, questions, and for other varied purposes.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Progresses in abilities to initiate and respond appropriately in conversation and discussions with peers and adults.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Uses an increasingly complex and varied spoken vocabulary.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Progresses in clarity of pronunciation and towards speaking in sentences of increasing length and grammatical complexity.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
For Non-English speaking children, progresses in speaking English.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
LITERACY																	
Shows increasing ability to discriminate and identify sounds in spoken language.																	
Shows growing awareness of the beginning and ending sounds of words.																	
Progresses in recognizing matching sounds and rhymes in familiar words, games, songs, stories and poems.																	
Shows growing ability to hear and discriminate separate syllables in words.																	

Head Start Domains and Indicators. This table links each experience—including Science Center options—and Take-Home experiences with the Domains and Indicators in the Head Start Child Outcomes Framework.

What are keys to using the MESS Teacher's Guides effectively?

MESS was developed in collaboration with teachers. Through field-testing *MESS,* we have learned what teachers do to make *MESS* a successful experience for themselves, their children, and the families.

Advance planning. Teachers who use *MESS* effectively engage in advance planning. These teachers read through the entire guide in advance, making note of materials they have on hand and those they need to acquire—perhaps by visiting the library to obtain books, or asking families or community organizations to save supplies.

Effective teachers also reflect on each learning experience in advance. They compare it to similar activities they may have done in the past, and think about ways they may need to adjust the suggested approach to make the experience work for their children.

These teachers also think about the best setting in which to introduce the experience, and how to distribute it across the day. For example, would it be best to begin a conversation during large group and follow-up with more in-depth exploration in small group or the reverse? Effective teachers build in time for children to reflect on what they have learned.

Effective teachers explore materials before they introduce them to the children. They also read all the books in advance, even if they have read the books before. This way, they are better able guide children's attention and answer questions.

Organization. Teachers who do *MESS* effectively are well-organized. They have established classroom rules, expectations, and routines that minimize behavior problems.

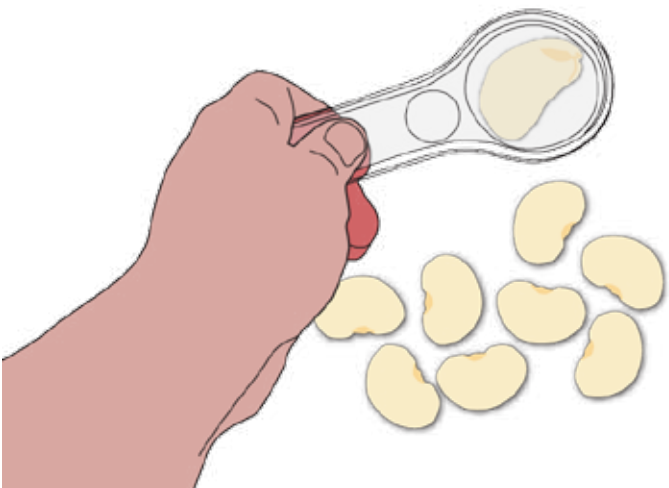
They have all the materials they need on hand before they begin an experience. This further reduces behavior problems as young children easily grow impatient.

Intentional teaching. Teaching intentionally means teaching with a purpose. Teachers who use *MESS* effectively approach learning experiences with specific goals in mind. These goals may involve science ideas (e.g., there are many kinds of plants), process skills (e.g., comparing and contrasting), or a wide variety of other attitudes, behaviors, or outcomes (e.g., focusing attention, listening respectfully to others, engaging families). Of course, any learning experience can include more than one goal, and it is often appropriate to have different goals for different children.

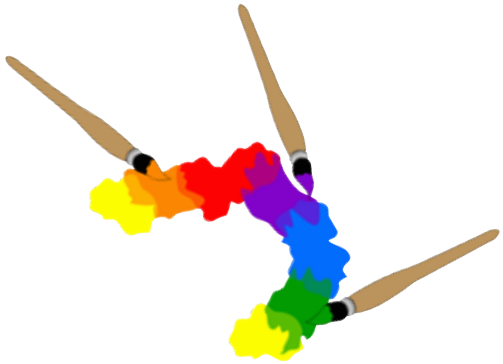
To maximize children's learning, effective teachers listen to and observe them carefully. This helps them guide children's attention, ask questions, and otherwise scaffold children's explorations in ways that foster learning and development.

Share enthusiasm and curiosity.
The teachers who use *MESS* most effectively express enthusiasm and excitement as they share in children's discoveries and learn new things themselves along the way.

Value children's thinking.
Effective teachers are truly interested in how children think and learn. These teachers create an environment in which children explore freely, and feel comfortable taking risks and making mistakes.



Engage families. To fully engage families, effective teachers keep them informed of upcoming projects or topics of study. They place ongoing experiments or science materials where family members can explore them when they drop off or pick up children. These teachers also find ways for families to reinforce at home what children are learning at school by allowing children to take materials home to share, or sending home simple "homework" assignments that involve observation or data collection. Teachers who successfully use *MESS* invite parents to share their expertise in the classroom, and accompany their children on science field trips.



Reflect on their practice. Truly effective teachers are always looking for ways to improve the learning opportunities they create for children and their families. They reflect on their practice every day. They think about what worked, what did not, and possible changes that might help them be more effective in the future. It is most helpful when teachers record these observations so they can refer back to them later.

Another proven strategy that helps teachers become more reflective is to arrange a regular time for teachers to review their experiences with other teachers and staff. Simply describing an event to others can help clarify understanding, while other teachers can be wonderful sources of suggestions and advice. It can be helpful to have a master teacher or other leader guide the discussion while teachers become skilled at observing and reflecting on their teaching.

Teachers who use MESS effectively:

- plan in advance
- are well-organized
- teach intentionally
- share enthusiasm and curiosity
- value children's thinking
- engage families
- reflect on their practice

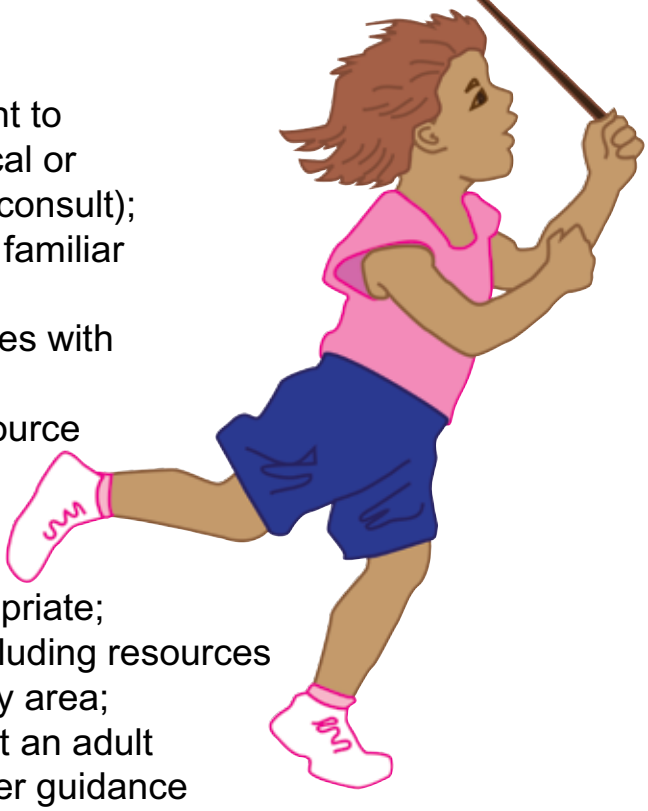
Applying the MESS framework to other science areas

We have developed and field tested guides on nine science topics appropriate for exploration during early childhood—the human body, water, nature, plants, physical science, changing properties of matter, prehistoric life, insects and spiders, and vertebrates.

Weather, cooking, and building are just a few examples of additional science areas that intrigue young children. There are, of course, many others. To help you select appropriate areas to pursue, we encourage you to consider the following questions.

- Is the content something your children have shown interest in?
- Do important science ideas underlie the content?
- Is the content particularly relevant to your community?
- Does the content lend itself to study over a period of days or even weeks?
- Does the content support hands-on exploration and inquiry?
- Can your children understand the basic science involved?
- Are nonfiction and fiction books available?
- Do you have access to materials and resources to support your study?
- Does the content have the potential to engage families?
- Are you and other adults in the classroom curious and enthused about the topic?

If you answered “yes” to the questions, the content is appropriate for exploration.



You can now adapt the *MESS* approach by:

- targeting the science concepts you want to address (your existing curricula and local or state standards are good resources to consult);
- doing background research so you are familiar with the science;
- designing hands-on learning experiences with clearly defined goals or objectives;
- selecting at least one book or print resource to use with the experience;
- incorporating other representational activities (e.g., charting) and including children's drawing and writing as appropriate;
- gathering and organizing materials, including resources to be used in your Science or Discovery area;
- organizing the classroom to ensure that an adult is available to talk with children and offer guidance as they explore;
- developing Take-home activities;
- discussing what children will be learning with their families;
- inviting local experts for classroom visits; and
- investigating community venues such as museums, zoos, and nature centers for field trip possibilities.

Taking these steps will help you lead your children and families down a path of shared scientific discovery with confidence.