

More than Sensory: Water Investigations with Infants and Toddlers

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WHY WATER INVESTIGATIONS WITH YOUNG CHILDREN?

Water provides endless delight for infants and toddlers as they participate in a playful sensory experience that can be a powerful brain-building opportunity. Play primes the development of the neural pathways housed in the brain's cortex that forms our physical, social-emotional, and cognitive capabilities (National Institute for Play, 2023). When educators use daily observations of young children's actions to select materials based on their interests, both infants and toddlers are enabled to demonstrate sustained attention, the ability to solve complex problems that they pose for themselves, and have a meaningful reason to communicate what they have discovered. This is inquiry learning and teaching.



Take the time to play with materials yourselves. Educators who engage in adult play with the same materials they will introduce to infants and toddlers will be better prepared to scaffold their learning and determine when items should be added or removed. Considering the adult-child ratio as well as the materials before implementing any water exploration helps to ensure that it is safe for non-mobile infants as well as active toddlers.

HOW DO INFANTS AND TODDLERS ENGAGE IN INQUIRY LEARNING?

The *Infant Toddler Inquiry Learning Model* is a way to think about how very young children best learn through exploratory experiences as they engage with the world. When adults observe and think about children's actions as they explore, they can more clearly understand how to support their learning. Ample time and supportive adult interactions encourage children to solve the problems they find, without the adults providing problems or solutions.

Infant Toddler Inquiry Learning Model



WONDER

- Investigate materials
- Use familiar strategies to explore physical characteristics of materials

RESOLVE

- Satisfaction with the exploration and actions taken
- Acceptance of a solution to the identified problem
- Repetition of the successful activity
- Demonstration for others

STRATEGIZE

- Discover or create a problem to be solved
- Combine old or new strategies to investigate materials and their interaction
- Create
- Observe how materials and actions work or don't work
- Try again

Infants and toddlers move freely **among wonder, resolve, and strategize** as they engage with open-ended materials such as those used in water play. As they handle and explore these materials, they construct physical and logical-mathematical knowledge and reflect on what they have experienced. They decide whether to repeat an action or try new strategies. They may stop to think for a while, or leave the investigation. If the child has not accepted the solution to a problem, revisiting that problem with new strategies or new materials extends the inquiry process until the child reaches a resolution that is acceptable to them, (even if the adult recognizes the child's resolution as incorrect) or until the child's resolution is to leave the problem behind. This model describes a kind of *free inquiry* that is not linear, indicated by the overlapping circles in the model.

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THE IMPORTANCE OF UNDERSTANDING SCHEMA BEHAVIOR



Schemas are sometimes described as patterns of action that we can observe in young children when they are exploring and trying to figure out how the world works. As they **wonder** about and investigate materials that have been introduced to them based on their interests, they may use the same **strategy** on a variety of objects. As they become familiar with the materials, they may develop **new strategies** and combine these with strategies that they have used previously. They may create a new problem and investigate further. They come up with their own theories about how things work and continue to test them which may lead to **resolution**. Sometimes they discover exceptions to the rules that they have established with their working theories. This supports our ideas about how infants and toddlers engage in inquiry.

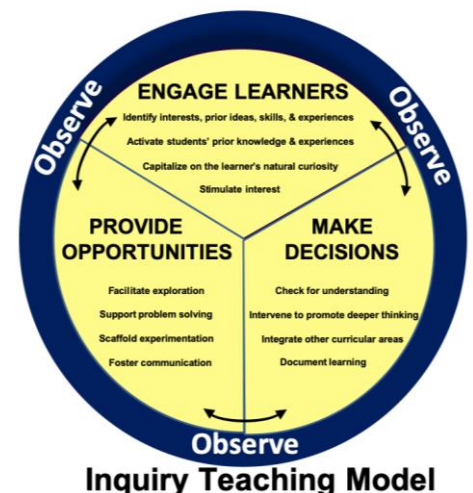
Schema play provides the building blocks of children's play and learning. It is how our children make sense of the world. Piaget described schemas as "threads of thought" and said that when children learn to perform a specific action they are compelled to repeat it. When they engage in this repetition they begin to organize and process their thoughts and actions. Children learn to make sense of the world and how it works as they engage in these water activities again, and again, and again! Athey (1990) suggested that when this repeatable behavior is assimilated and coordinated it leads to higher-level and more powerful schemas. Even adults engage in schema behavior when they make a sandwich, construct furniture without reading the directions, or engage in everyday tasks such as making a bed.

Brain research confirms that this repetition is essential in neural growth and learning (Conkbayir, 2017). When children are exploring schemas, they are growing brain connections as they build understandings of abstract ideas, patterns, and concepts (Curtis & Jaboneta, 2019, p.7). Understanding these "patterns of repeatable behavior" (Athey, 1990, 37) can help adults support and extend what children do naturally as schemas influence children's development in mathematics, scientific thinking, mark making, and storytelling (Nutbrown, 2011, 2015). Researchers caution adults to be respectful and recognize the learning and thinking in children's work. When children are offered an inquiry-based curriculum, adults can identify and support their schemas by providing open-ended materials and using selective intervention to support their play. They can extend the learning by adding new materials, rearranging or modifying the environment, and by providing adult interactions that encourage rather than inhibit the schema behavior (Meade & Cubey, 2008). STEM investigations support schema behavior by providing the perfect context for inquiry learning. **Water play is just such a STEM investigation.**

THE TEACHER'S ROLE

Children are born wanting to learn or engage in inquiry. The Inquiry Teaching Model (Counsell et al., 2016) describes how teachers of young children can support their inquiry. Educators can use **observations** to **engage learners**, **provide opportunities**, and **make decisions**.

Adults begin the inquiry teaching process when they **observe** carefully and continuously. Watching children as they play is the best way to begin to understand the schemas that support their learning, and to plan the next steps in learning experiences that match their needs. When educators identify the schema that children are interested in, they can offer the kind of materials that will help them get the most from the experience. While infants and toddlers engage willingly with any new materials, educators can be intentional by providing materials that invite exploration and encourage learning. Young infants are limited in their ability to explore unless educators place materials within view or reach, while toddlers will use their developing motor skills to explore materials that are available. Educator observation will support understanding of the limits of engagement so they can provide new materials, make comments, or ask questions that stimulate additional explorations. Even though infants and toddlers may not be able to verbalize questions they have, they do generate questions as they grapple with understanding how the world works (Greenfield et al., 2017). Careful observations can direct adults to understanding what an infant's or toddler's specific questions may be.



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DESIGNING AN INFANT TODDLER WATERWORKS EXPERIENCE

When: Waterplay is an experience that children (and adults) of all ages find appealing. It is first and foremost a sensory experience that can be both soothing and stimulating. Some educators avoid this kind of sensory play because of the mess and the cleanup time. In our experience, water play can be manageable in infant or toddler classrooms when it is planned with the feeding and changing schedules in mind. For example, changing times can be planned for after water play so that wet clothes and wet diapers can be dealt with at the same time. Timing water play for older infants during napping time for the youngest children will allow the educator to differentiate with materials and tubs that are just right for the older infants. As these children are ready to move to a new center, younger infants who are awake can be invited to investigate water with materials that meet their needs. Consulting parents about children's prior experiences with water and attending to cultural views about appropriate attire when engaged in water play will help children to feel at ease with water experiences. Educators may want to plan ahead for the order in which they will invite children to the water center based on their knowledge of each child's prior approaches to a new learning experience. Knowledge of the individual learners will also guide the educators in deciding how many children can be at the center at any given time.

Where: Find a place in your classroom that is out of the main traffic areas. With your goal in mind, select the water basin that will best meet the needs for the experience you have planned- dishpans, cookie trays, plastic lunch trays, small wading pools, or water tables that are designed for infants and toddlers can be used with this age group. Place rugs or towels under the table or tub in order to soak up some of the spills. Some classrooms have pads that are especially designed for water centers with an absorbent material on top and a rubber backing. Some pads designed for doorways in public buildings have a similar design and may be less expensive.

What: The selection of materials that will engage infants and toddlers will vary based on their prior experiences with water. Some children will have had many opportunities to play in the tub, splash in a wading pool, or go to a public swimming pool or splash pad. Others may have had few opportunities for water play. Allow for time to splash, dip, drop, displace, plunge, sprinkle, dump and pour. Use your observations to determine when it is time to plan for a more focused water experience. The lists of materials are based on our work with infant and toddler classrooms and our observations of what the children found interesting. You may have other ideas about how to engage children in a STEM experience with water. *And your children may have even more.*

SELECTING MATERIALS

If you are ready for some new challenges in the water center, the selection of materials will be an important consideration when moving water play from a sensory experience to a STEM investigation. Of course, safety must be first and foremost with adult supervision at all times. Plastic materials should be durable and free from sharp edges or cracks and checked regularly to make sure they have not broken down. We have found that well-known brands are more durable and long-lasting than the bargain brands.

Suggested water containers for investigating water with infants

- Plastic tubs or dishpans
- Cafeteria trays or cake pans
- Small water table made for infants who are sitting and standing
- Small wading pools

Suggested water containers for investigating water with toddlers

- Plastic tubs or dishpans
- Water tables designed for toddler classrooms
- Clear plastic storage tubs such as those made for underbed storage
- Small wading pools

Absorbent materials

- Mats or rugs to be placed under the water container
- Towels (for wrapping around children and for sopping up spills)

Same-sized containers

- Clear plastic containers with lids that are identical (recycled peanut butter jars or small mayonnaise jars, ½ or 1- pint jars from Dollar Store)



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Containers for dumping and filling

- Translucent and transparent beakers or graduated cylinders
- Translucent and transparent plastic containers with lids of varying sizes
- Translucent and transparent measuring cups

Bottles with lids

- Recycled translucent and transparent plastic bottles (ketchup, shampoo, hand soap, lotion that have a variety of lids and that are made of a variety of plastics)
- Squeeze bottles of several sizes and made of different types of plastic
- Plastic eye wash bottles

Containers with holes (choose a variety of these, not all)

- Plastic colanders and slotted spoons of various sizes
- Plastic cheese, spice, or sugar shakers with holes
- Sensory tubes with removable tops and bottoms
- A variety of orchid pots
- Sippy cups
- Plui rain ball toys
- Clear plastic cups with holes drilled in the bottom and sides- a variety of sizes and configurations

Misc. items for investigating water

- Plastic balls of varying sizes and composition including water balls and nerf balls
- Ping pong balls, small whiffle balls, and golf balls
- Plastic fishing bobbers
- Funnels
- Spray bottles
- Sponges of varying sizes
- Plastic water pump that is easy to activate
- Turkey basters
- Eye droppers (some are made especially for young children and are easier to squeeze)
- Plastic "ice cubes" that can be frozen and added to the water table



WE CAUTION YOU TO PAY CLOSE ATTENTION TO THE VARIABLES IN THESE MATERIALS AND TO AVOID ADDING TOO MANY MATERIALS AT ONE TIME!

PUTTING IT ALL TOGETHER

Engaging infants and toddlers in water play provides endless opportunities for them to explore and problem solve. Water experiences should be offered frequently in order to explore all of the possibilities for learning. Learning to recognize the schema behaviors inherent in children's play can help educators to extend the learning and lay the foundation for later understanding. We urge you to think about how water experiences can be a part of your curriculum in order to capitalize on children's interest and to provide them with opportunities with interesting materials that enhance understanding of their world and how it works.

REFERENCES

- Atherton, F., & Nutbrown, C. (2013). *Understanding schemas and young children: From birth to three*. United Kingdom: SAGE.
- Athey, C. (1990). *Extending thought in young children: A parent-teacher partnership*. United Kingdom: SAGE.
- Conkbayir, M. (2017). *Early childhood and neuroscience: Theory, research, and implications for practice*. London: Bloomsbury Academic.
- Counsel, S. et al. (2016). *STEM Learning with young children: Inquiry teaching with ramps and pathways*. New York: Teachers College Press.
- Curtis, D. & Jaboneta, N. (2019). *Children's lively minds: Schema theory made visible*. St. Paul, MN: Redleaf Press.
- Grimmer, T. (2017). *Observing and developing schematic behaviour in young children: A professional's guide for supporting children's learning, play and development*. London, England. Jessica Kingsley Publishers.

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- Louis, S., Beswick, C., & Featherstone, S. (2013). Understanding schemas in young children: Again! Again!. United Kingdom: Bloomsbury Publishing.
- Meade, A., & Cubey, P. (2008). Thinking children: Learning about schemas. United Kingdom: McGraw-Hill Education.
- Nutbrown, C. (2011). Threads of thinking: Schemas and young children's learning. United Kingdom: SAGE.
- VanMeeteren, B., & Peterson, S. (2021). Investigating STEM with infants and toddlers. New York: Teachers College Press.