

Infant and Toddler Problem Solving with Chutes & Silos™

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PURPOSE OF CHUTES & SILOS™ EXPERIENCES

Chutes & Silos™ is a physical science experience involving clear acrylic tubes and a variety of objects (balls, blocks, and found objects) that infants and toddlers can investigate. It appeals to children's interests, supports their desire to figure out how the physical world works, and invites them to modify the materials' uses to make something interesting happen. While investigating these materials, children engage in both problem solving and spatial reasoning.

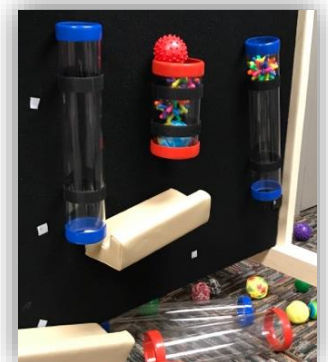
Infants and toddlers need time and opportunities with engaging materials in order to make sense of the world. They "have the capacity to become deeply engaged" (Lewin-Benham, 2010). Within their exploration, they repeat actions many times in order to understand. Open-ended materials like those within Chutes & Silos™ are important because they allow many approaches and stimulate long engagement. "The research is clear: when we say children are 'born scientists,' we're not just being cute; they really are active scientists, right now, systematically and intentionally exploring their environments, even from the day they are born" (McClure, 2017).

While science exploration might come naturally to most infants and toddlers, there are huge intellectual benefits when adults nurture the natural scientist. Adults deepen STEM learning when they support young children's pursuit of new understandings, foster excitement for learning, and engage them in experiences that stimulate their brains and grow their sensory and motor systems. Adults can build and expand on young children's scientific interest when they 1) are aware of children's developmental levels and previous experiences; 2) have investigated the materials before introducing them to children; 3) allow time for infants' and toddlers' exploration and problem solving; and 4) interact with them as they in investigate carefully selected materials (see chart on page 3).

MATERIALS TO CONSIDER INCLUDING IN CHUTES & SILOS™ EXPERIENCES

- Clear, plastic tubes (sturdy tubes, not flexible) of various diameters (2"-3 1/2") and lengths (12"-36")
<http://www.safespaceconcepts.com>
- Blocks of various sizes (some that will fit into the tubes and some that will not)
- Balls of various sizes and materials (some that will fit into the tubes and some that will not)
- Opaque tubes of various diameters and lengths that can be found at newspaper printers (paper towel or toilet paper tubing is not sturdy enough for this project).
- Colored scarves
- Materials from the classroom that children bring to the center (block people, bean bags, stuffed animals, loose parts)

Check the blocks and balls using a choke tube before you give them to the children. Make sure they do not fit into the choke tube. If a choke tube is not available, the adult may use a paper towel tube to check the size.



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WHAT DO INFANTS AND TODDLERS DO WITH CHUTES & SILOS™?

Chutes & Silos™ experiences help young children investigate the physical properties of objects and build the basis for inquiry, analysis, and logical thought. Infants and toddlers learn when they **produce** an action with objects (such as the materials within Chutes & Silos™), the result of their action is **immediate** and **observable**, and there is something for the infant and toddler to **vary**. Young children will grasp the objects, mouth them, bang them together, toss them, swing the tubes (sometimes swinging to hit the ball or block), and use the tubes to catch balls and blocks. With these materials, infants and toddlers will have opportunities to compare objects, explore space, use objects as tools, track objects in space, look for missing objects, and construct relationships that build a foundation for later physical science concepts.

All of these actions allow the infant or toddler to construct relationships about weight, distance, and space as well as demonstrating initiative, curiosity, and a surprising attention span. Some children will think of surprising ways to use the tubes, balls, and blocks. They may stand the tube on end and pack it with the balls and blocks and then observe what happens when they lift the tube. Some may try to capture balls with one end of the tube or use a tube that is small in diameter to plunge balls or scarves inside a wide tube. Educators can enhance the experience when they use questions and comments that reflect what is happening and offer new challenges or problems to solve. Infants and toddlers will have their own questions to investigate and will inspire one another to solve problems.



ADULT SUPPORT IN INFANT AND TODDLER CHUTES & SILOS™ INVESTIGATIONS

By analyzing the difficulty of the experience and considering children's interests, teachers will be prepared to 1) introduce materials with the right amount of challenge; 2) set up the environment to provide multiple opportunities for them to explore the properties and functions of objects; and 3) nurture the development of STEM learning dispositions.

Young infants (4-9 months): Set a few of the materials out and let the infant explore. As the infant engages with the materials, comment on his/her actions and offer simple questions, *"Look how tall that is. I wonder how you got those balls in there?"* or *"You have the block. I wonder if you can hold two blocks?"* Use comments and questions to suggest rather than lead the child into a particular activity. If the infant does not respond to your suggestion, move on to another comment or question. You may also model for the infant as you make comments about what you are doing. *"I put the small blue ball in the tube. It rolled down the tube and onto the floor."* By modeling and commenting on the infants' actions you are helping them label objects and construct their knowledge of the physical world. Be intentional as you add new materials when the infant has fully explored the initial offering. Include some balls or objects that do not fit into the tubes.

Older infants and toddlers (approximately 12-24 months): Set out tubes of different sizes, balls that will go through all of the tubes, and balls that will not go through any of them. Start by making comments or asking productive questions, *"You found a way to make the squishy ball fit inside the skinny tube. I wonder what will happen if you put the big yellow ball into the red tube? You got all of the big balls out of the tube when you tapped it on the floor. Is there another way?"* Add materials as the child continues to engage in play. Be ready to point out the action of the ball, *"What happened to all of these when you tried to put them inside? I wonder if these other balls might work in that one? Is there anything else you would like to try?"*

Older toddlers (approximately 24-36 months): Set out a variety of tubes with blocks, balls, and other objects. Be sure to add objects that fit and others that do not. Toddlers begin to put the objects inside the tubes and observe what happens to the object. They nest tubes and take them apart. They begin to notice similarities and differences in the objects and specifically select items based on their properties. Continue to make comments or ask questions as you add materials, *"I wonder if you can get any more in there? Will the squishy ball work in that tube? I noticed that when Henry used the skinny tube he found some other things that worked. Could I use one of the tubes to try out my idea? Is there anything else you would like to try? That's a problem. I wonder if there is anything you can do to fix that?"* Use selective intervention by observing carefully and documenting the investigation. Some children may simply want you to demonstrate interest in what they are doing. Sometimes narrating what the child is doing is just the right amount of intervention. Be mindful about whose agenda it is and save your intervention for a time when the child is becoming disengaged or disinterested. Interventions can scaffold the child's agenda or derail it.

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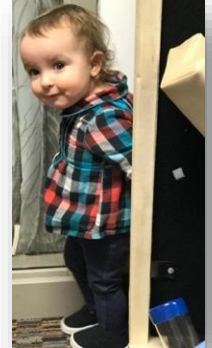


PROBLEMS INFANTS AND TODDLERS ENCOUNTER IN CHUTES & SILOS™ AND HOW ADULTS CAN SUPPORT

Age	Examples of Children's Problem Solving	Examples of How Adults can Support Problem Solving
Infants (0-9 months)	Grasps tubes, balls and objects to shake or mouth	Offer child a variety of interesting objects to grasp, shake, or mouth
	Acts bored (fusses) when activity and materials are no longer novel	Offer child a variety of interesting items to explore, but not all at once
	Uses hands and eyes together (such as seeing tubes or balls and reaching towards them)	Provide safe opportunities for child to reach for toys and explore surroundings
	Chooses from Chutes & Silos™ materials, rejecting some and exploring others	Provide a variety of balls, tubes, cubes, and scarves for exploration, but not all at once
	Attempts to get tubes and balls when out of reach	Place tubes, balls, and other materials just within reach and encourage child to reach them
	Looks for ball or tube rolled out of sight	Move materials so they are no longer visible and support child's efforts to look for them
Mobile Infants (6-12 months)	Finds tubes, balls, and objects when they are hidden or out of sight	Make a simple game of hiding objects to find
	Imitates actions remembered from previous play time with tubes and balls	Make comments and ask questions that reflect what the child is doing
	Throws or bounces balls, blows in tubes	Provide materials with common functions such as cups, balls, scarves, block people to use with the tubes
	Imitates adult actions during play with tubes and balls	Model actions with the materials and encourage child to imitate
	Explores tubes and balls and other objects with fingers, hands, and toes	Provide a variety of materials for exploration with the tubes (squishy or squeaky balls, textured blocks, silky scarves)
	Demonstrates understanding of cause and effect by rolling balls back and forth, tipping tubes to roll balls, or placing objects inside the tube	Model cause-and-effect by rolling balls back and forth, tipping tubes to move balls, and putting blocks in and out of the tubes
Toddlers (12-18 months)	Plays simple games (hiding balls and scarves or hiding behind the screen)	Offer new challenges and problems to solve and join in when child initiates
	Takes turns with adult during play or clean up with tubes and balls	Support turn-taking by modeling during play or during clean up
	Works to take tubes apart when they are nested	Provide tubes in a variety of lengths and diameters to encourage stacking, nesting, dumping, and filling
	Explores tubes and materials in a variety of ways- nests, bangs, turns tubes, rolls balls, bats with tubes, dumps and fills	Provide a variety of materials to use with tubes and encourage child to roll, turn, bang, bat, or shake
	Imitates actions of other children or adults in the Chutes & Silos™ center.	Model strategies during play with tubes and encourage child to imitate.
Toddlers (18-24 months)	Plays alongside friend during Chutes & Silos™ play	Play near or with children in the Chutes & Silos™ center in order to anticipate sharing issues and teach age-appropriate conflict resolution
	Uses Chutes & Silos™ materials in increasingly complex ways such as connecting tubes on the Velcro board with one end higher than the other and putting a ball at the top of the first tube	Observe carefully to determine when the child needs more challenge and provide support when learning new skills
	Points to and names body parts while engaged in Chutes & Silos play	Teach fingerplays or simple songs that teach body parts or sing "piggy back" songs about what the child is doing (<i>Your pinky's on the tube; Your pinky's on the tube; Hi-ho the merri-o; Your pinky's on the tube</i>)
	Points to and names materials used in Chutes & Silos™ play	Name the tubes and balls with shape, size, color words and encourage child to use those words when asking or telling about his/her play
Toddlers (24-36 months)	Puts balls in one group, scarves in another, tubes together	Provide interesting toys or household objects that can be sorted, nested, and counted
	Names or points to materials used with tube and balls play	Make comments and ask questions about the child's work with the materials
	Poses problem (such as fitting balls in tube) and attempts to solve	Provide support by making comments or asking productive questions in order to support problem solving
	Helps to clean up tubes and materials after play	Use clean-up as a way to organize and sort materials
	Recalls and tells others about play with tubes and balls	Ask children questions about what they are doing or narrate what is happening during play. Help to reflect on shared events by initiating a conversation and giving clues when needed

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HOW TO EXTEND THE LEARNING

When young children have had multiple experiences with the tubes, balls, and other objects teachers can introduce materials to extend the learning. Wide wooden track, plastic gutters, cardboard tubes, and a variety of objects that children find and want to try out will encourage them to continue with their investigation of force and motion. *Safe Space Concepts* (<http://www.safespaceconcepts.com>) makes a large Velcro board that can be attached to wheels or a wall in the classroom and used with tubes and wedges with attached Velcro. These materials encourage children to continue their investigation of force and motion by providing a stable base for further exploration.

RECOMMENDED RESOURCES

- American Academy of Pediatrics. (2009). *Caring for your baby and young child: birth to age 5*, (5th ed). https://www.cdc.gov/ncbddd/actearly/pdf/checklists/Checklists-with-Tips_Reader_508.pdf
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- Early Childhood National Centers: National Center on Early Childhood Development, Teaching and Learning. (2018) *Understanding STEAM and how children use it*. Retrieved from <https://eclkc.ohs.acf.hhs.gov>.
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- Lewin-Benham, A. (2010). *Infants and toddlers at work: Using Reggio-inspired materials to support brain development*. New York, NY: Teachers College Press.
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- National Scientific Council on the Developing Child. (2004). *Young children develop in an environment of relationships: Working paper no. 1*. Retrieved from <https://developingchild.harvard.edu/resources/wp1/>.
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