

Early Experiences Build the Brain - Foundations of School Readiness

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Brain Development

Science has shown that the relationships with the important people in a baby's life literally shape and form the architecture of the infant's brain.ⁱ Deceptively simple, moment-to-moment interactions with responsive caregivers build the brain, creating or strengthening it one connection at a time. By the time children are 2 years old, the structures of their brain that will influence later learning are mostly formed.ⁱⁱ This means that the most important brain growth and development, the kind that will physically form the brain, begins long before a child ever picks up a pencil, reads a book, or goes to school.ⁱⁱⁱ

We now know that when brain architecture has a strong foundation in the early years, infants and toddlers are more likely to be robust learners throughout their lives. In this News You Can Use, we explore how the connections within the brain are created and made strong, the negative impact of chronic stress at an early age, and how caring adults can help even in difficult situations.

Building Connections

Although the brain looks like a gray blob, it is, in fact, made up of billions of cells called **neurons** that make electrical connections with each other. Each new experience, each piece of information releases chemicals called **hormones** that create a new connection, or **synapse**, in the brain. More connections are formed in the brain prenatally and in the first few years of life than at any other time. After early childhood, the connections that are not used as frequently will be **pruned**, or removed, to allow for more useful connections to grow stronger. Sometimes this process is referred to as "use it or lose it," since the parts of your brain you use the most become stronger while the parts you use less die off.

Two-month-old Elijah is crying. His father, Daniel, goes to him and says, "Ohh, what's going on, little one?" When Elijah sees his father's face and hears his voice, he immediately begins to calm down. At 2 months old, he already knows that when he cries, his father responds.



For newborns and young infants, most of their emotional experiences happen in moments of interaction with their caregivers. Newborn and caregiver interactions usually occur around activities such as comforting, feeding, and holding.^{iv} As Elijah is calmed, hormones are released that help him be more alert and able to learn.^v The synapses in the brain that respond to and expect caring behavior from others will grow strong. This allows Elijah to feel safe and fully able to learn about the many interesting things in the world. Repeated over and over again during Elijah's first years of life, moments like these will build the neural connections that will support learning for the rest of his life.



Serve and Return

Two-month-old Amelia begins a "conversation" with her mother. She babbles, makes faces, gestures, and eventually cries when she has had enough. Her mother responds by echoing the sounds she makes, mirroring her facial expressions, and comforting her when she cries.

Thirteen-month-old Ethan brings his teacher a toy tiger. He hands her the tiger and she says, "Thank you." Ethan then holds his hand out and she gives the tiger back. He says, "Da du." They repeat this exchange half a dozen times before Ethan goes to find a new toy and they start again.

Thirty-month-old Miguel is playing in the backyard. When he reaches the crest of a small hill, he turns to his family child care provider and shouts "Look at me!!" She looks at him and says, "You climbed to the top of the hill. Now what will you do?" He grins and says, "Roll!" After he rolls down the hill, he runs to her and touches her shoulder. She smiles at him and he runs off again.

These vignettes illustrate typical interactions throughout the day of an infant or toddler. Each vignette provides an example of a common quality in relationships that is often repeated over and over again called "**serve and return.**"^{vi} Although the kind of exchanges that occur might be different depending on a child's age, each infant or toddler reaches out to a trusted adult who then responds. The adult's response acknowledges the child's intention or need and also encourages further interactions. Amelia is only 2 months old, yet she is able to engage her mother's attention, bring out her mother's smile, and elicit comfort. Ethan is engaged in a give-and-take game with his teacher. Miguel is much more independent but still checks with his caregiver as a secure base. These serve-and-return interactions build and strengthen neural connections that support feelings of safety and being an effective communicator. These strong connections build a foundation for all later learning.

Toxic Stress and the Brain

Jonah, a 2-year-old who grew up in a chronically stressful environment, is playing with some blocks. Aiden comes over to join his play. As Aiden picks up a block, Jonah reacts impulsively by hitting and attempting to bite Aiden. The strongest connections in Jonah's brain, those that warn him of danger, react first. He strikes Aiden to protect himself and his belongings.



When infants and toddlers are regularly ignored, frequently experience violence, or spend much of their time in highly stressful environments, they are considered to be exposed to **toxic stress**.^{vii} While normal life stressors are not dangerous, and can even be healthy for a developing brain, toxic stress occurs when the body's response system to stress is activated much of the time. Our bodies produce a hormone called **cortisol** as part of the natural reaction to stress. In moderation, cortisol can contribute to a healthy brain structure. In extreme situations where a young child is feeling stressed much of the time, constant exposure to cortisol can alter the way the brain might otherwise develop. For example, a baby exposed to chronic stress is more likely to develop strong connections in the areas of her brain that are on alert for danger. Their brains may expect the world to be a dangerous place. When these babies are older, their brains interpret neutral events as more negative.^{viii} When they become children and adults, their brains may spend more energy figuring out if they are in danger and have less attention for things their peers are focused on and learning.

The great news is that you can reduce the impact of toxic stress experienced by babies and young children. The loving, nurturing relationship that parents, family members, and teachers provide can act as a buffer to the effects of toxic stress. Consistent adult support can help a young child come through such difficulties with a brain that is still fully able to learn.

Conclusion

Parents, families, teachers, home visitors, policy makers, and anyone who works with or for infants and toddlers who have a solid understanding of how young brains develop and grow can make informed choices in their work for infants and toddlers. Adults who have the knowledge and skills to provide responsive interactions will help to shape the physical architecture of a child's brain so that he or she will be fully able to learn now, in school, and beyond.

Words You Can Use:

Cortisol – Cortisol is the name of the hormone, or chemical, released when someone is experiencing a situation that feels stressful to them. In small doses, cortisol is actually helpful to a developing brain. In extreme circumstances, too much cortisone can adversely affect brain architecture.

Hormones – Hormones are chemicals that the body creates as a way to send “messages” or information throughout the nervous system. Some hormones are specific to positive feelings, and some are specific to stressful feelings.

Neurons^{ix} – Neurons are cells that are specific to the nervous system. Their job is to carry information in the form of chemicals.

Pruning^x – Pruning occurs as people age and the brain figures out which connections are most important, those that are used most frequently, and which connections are not. The less frequently used connections will be “pruned” or die off, leaving more room for the stronger connections to continue to grow.

Synapse^{xi} – A synapse is the space between two neurons where “messages” are sent through hormones.

Serve and return^{xii} – Serve and return is a way to describe the types of interactions that are most helpful for infants and toddlers’ early learning and brain development. This describes the type of responsive interaction where a child reaches out through vocalizations, gestures, or facial expressions and an adult responds appropriately to the child. This may be repeated many times and, for newborns and young infants, occurs most frequently during routines.

Toxic stress – Toxic stress is the term used to describe the amount of stress that causes so much cortisol to be created and released in the body that it can cause damage to the architecture of the brain. The impact of toxic stress can be lessened when a baby or young child has at least one stable, secure relationship.

ⁱNational Scientific Council on the Developing Child, “Young Children Develop in an Environment of Relationships,” Working Paper No. 1 (2004). Retrieved from www.developingchild.net.

ⁱⁱJ. Ronald Lally, “School Readiness Begins in Infancy: Social Interactions During the First Two Years of Life Provide the Foundation for Learning,” *Phi Delta Kappan* 92 (November 2010): 17–21.

ⁱⁱⁱNational Scientific Council on the Developing Child, “The Timing and Quality of Early Experiences Combine to Shape Brain Architecture,” Working Paper No. 5 (2007). Retrieved from www.developingchild.net.

^{iv}National Scientific Council on the Developing Child, “Children’s Emotional Development Is Built Into the Architecture of Their Brains,” Working Paper No. 2 (2004). Retrieved from www.developingchild.net.

^vNational Scientific Council on the Developing Child, “InBrief: The Science of Early Childhood Development,” InBrief Series, retrieved from www.developingchild.net.

^{vi}Ibid.

^{vii}Ibid.

^{viii}Jonathan Cohn, “The Two Year Window: The New Science of Babies and Brains—and How It Could Revolutionize the Fight Against Poverty,” *The New Republic* 242 (December 2011): 10–13. Retrieved from <http://www.developingchild.net>.

^{ix}Eric H. Chudler, “Neuroscience for Kids,” National Center for Research Resources (November 29, 2011).

<http://faculty.washington.edu/chudler/neurok.html>

^x<http://faculty.washington.edu/chudler/neurok.html>.

^{xi}<http://faculty.washington.edu/chudler/neurok.html>.

^{xii}National Scientific Council on the Developing Child, “InBrief.”

Approaches Toward Learning – Foundations of School Readiness Part 1

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The world is catching on to what parents, teachers, and home visitors have known for a long time. Babies are always learning! Long before infants and toddlers can ask questions aloud, they are creating them in their minds and seeking answers. We also know that everyday experiences and interactions with caring adults are essential for healthy development and contribute to infants' and toddlers' understanding of how the world works. Put another way, we help infants and toddlers develop "skills, knowledge, and attitudes necessary for success in school and for later learning and life."ⁱ Yes, adults help infants and toddlers get ready for school and in some very important ways! Although it is fairly new to use the term *school readiness* with such young children, research has shown that both brain development and skills that form the foundation of all later learning are developed in the first few

years of life.ⁱⁱ This *News You Can Use* three-part series will focus on some of those important foundational skills found in the approaches toward learning domain. Part 1 introduces approaches toward learning and highlights self-regulation, an important skill that helps infants and toddlers use learning approaches effectively.

Approaches Toward Learning and School Readiness Goals for Infants and Toddlers

The Office of Head Start requires all Head Start programs, including Early Head Start, to write school readiness goals for children who participate in the program [1307.3.(b)(1)(i)-(iii)]. These goals must describe what staff and families believe children should learn as a result of program services so that they are ready for kindergarten. The goals cover five essential domains:

language and literacy development, physical well-being and motor development, cognition and general knowledge, social and emotional development, and *approaches toward learning*. Many of us are familiar with supporting children as they learn to communicate and talk; move their bodies; explore and learn about objects and people in their environments; become attached to important adults in their lives; and begin to develop friendships. What about the "approaches toward learning" domain? The term *approaches toward learning* might be new for many of us, but the approaches may be more familiar than you realize!





What Are Approaches Toward Learning?

The approaches toward learning domain is different than the other domains and presents a different way of thinking about learning. It doesn't focus on **what** skills, concepts, or behaviors children acquire across all the essential domains; it focuses on **how** children acquire them!ⁱⁱⁱ Approaches toward learning refer to learning styles, habits, motivation, and attitudes that reflect the many ways children involve themselves in learning—how they go about developing new skills and concepts. These

approaches are influenced by characteristics that children are born with, such as gender and temperament, and by attitudes and expectations fostered early in life through family, community, and cultural patterns and values.^{iv} Partnering with families to understand and support their children's approaches toward learning in a culturally responsive manner is going to be a very important part of your work!

What are these approaches? They include: attention, curiosity, information gathering, memory, persistence, and problem solving. You can find approaches like these in infant/toddler state early learning guidelines, curriculums, assessment tools, or articles about child development. You will also learn more about them in Part 2 (attention, curiosity, information gathering) and Part 3 (memory, persistence, problem solving) of this series. But as we talk about approaches toward learning in relation to infants and toddlers, we also need to consider *self-regulation*, the ability to "manage powerful emotions and keep one's attention focused."^v Why is self-regulation important and how does it relate to approaches toward learning?

Self-Regulation and Approaches Toward Learning ...

Enrico (2 months old) lies on a soft blanket on the living room floor of his family's apartment. Sonia, his mom, and Reza, the home visitor, sit on either side of him. Reza holds a rattle above him and shakes it to get his attention. For a brief moment, Enrico seems to notice the sound (and Reza), but he startles and begins to cry. "Shhh, shhh, mi niño, shhh, shhh," Sonia whispers over and over again as she leans over and gently rubs Enrico's belly. Enrico's body soon quiets and he calms down. Reza says, "I wonder what will happen if you shake the rattle now?" Sonia takes the rattle, holds it above Enrico, and shakes it. Enrico looks briefly in the direction of the sound and then at his mom's face, waves his arms, and kicks his legs.



We know that all learning for infants and toddlers happens within the context of their relationships with nurturing, responsive adults. Enrico and his mom are already on their way to developing this close bond. Sonia's response to Enrico's need for comfort and security—whispering familiar sounds and words in Spanish, rubbing his back—helps him feel safe; this, in turn, helps him calm down, pay attention, and respond to the rattle shaking. Sonia's response is also helping Enrico learn how to regulate himself—to manage his reactions to sensations inside and outside of his body. Even at 2 months old, Enrico is able to calm himself with his mom's help. Both Sonia and Reza are learning how to support Enrico as they introduce new objects and sounds. Also, this is a great opportunity for them to talk about cultural definitions, values, and practices around self-regulation—how they might be the same or different for each of their cultures!

Research is showing us that children who are able to regulate, or manage, their emotions and behaviors do better in school and have an easier time getting along with peers. In fact, kindergarten teachers say self-regulation is the most important characteristic necessary for school success!^{vi} Children who are able to self-regulate can do things like handle strong emotions, tolerate frustration, control their impulses, follow rules and expectations, pay attention, and delay gratification.^{vii} If children can regulate themselves, they are able to use different learning approaches more effectively. So how can you help infants and toddlers begin to develop this important skill? Here are some ideas:

For infants:^{viii}

- Maintain a calm attitude and presence. Infants are “tuned in” to adults' emotions; your calmness can help infants manage strong emotions, especially when they are not calm!
- Follow their schedules and routines in predictable ways, but make sure to adjust schedules/routines as their needs change.
- Identify, acknowledge, and support self-soothing behaviors: For example, “You found your thumb! Now you feel better with your thumb in your mouth.” “Would you like to hold your blanket? That always seems to make you feel calmer.” Use the child's home language. And make sure to ask families what their children's self-soothing behaviors are and how they support those behaviors. Thumbsucking might be okay for some families but not for others!
- Anticipate infants' needs and respond as soon as you can. If you can't get to a child quickly, use your words to let the child know you've heard him. Describe the child's feelings, what you are doing, and what will happen next in a soothing manner: For example, “Are you hungry? Do you want your bottle? As soon as I put Jamal in his crib, I'll get your bottle and warm it up. Then we'll sit together in our favorite rocker while you drink.”



- Stay close when infants are lying or sitting near each other. Gently separate them if they touch each other too roughly. Take their hand and show them how to be gentle. Use clear, simple language to tell them what is acceptable: For example, “Use gentle touches on Kali’s back.”



For toddlers, you can still use the strategies that you use with infants and add the following:^{ix}

- Support transitions between different parts of the daily schedule by preparing them for the transition: “In 5 minutes, it will be time to clean up.” “After we go inside, we’ll have a snack.”
- Give toddlers simple but valid choices: “You may have apple slices or orange slices.”
- With close supervision, allow children time to work through their emotions. Give them words to express their feelings: “If you are mad, tell me. Say ‘No!’ or ‘I’m mad!’ That way, I know what you’re feeling and I can help you.”
- Comment on toddlers’ attempts to handle a challenging situation: “Mei-lin took the pail from you. You didn’t grab it back from her. You used a different pail. That

was a kind way to solve the pail problem!” For older toddlers, you might provide verbal guidance: “There are only two watering cans. But three children want to water our vegetable garden. What can we do about this?”

Conclusion

Approaches toward learning are at the heart of children’s development and they play a very important role in children’s success in school and in life. The ability to self-regulate, a critical skill for school readiness, can affect how young children develop the approaches toward learning characteristics. As you read about Enrico and the strategies for helping infants and toddlers regulate their emotions and behaviors, you might have identified ones you already use, others that are not on the list, and ones you want to try. You might have also thought about engaging families in supporting their children’s ability to self-regulate. Remember—development and learning are rooted in culture; how young children learn to regulate themselves is influenced by their home culture and family expectations. So make a plan! How will you use those strategies in the weeks to come? Then, stay tuned for Parts 2 (attention, curiosity, information-gathering) and 3 (memory, persistence, problem-solving) of this *News You Can Use* series to learn more about approaches toward learning. The more you know, the more intentional you can be in how you help infants and toddlers get ready for school and beyond.

ⁱOffice of Head Start, “Head Start Approach to School Readiness—Overview,” (U.S. Department of Health and Human Services/Administration for Children and Families/Office of Head Start, 2011), accessed July 19, 2012, <http://eclkc.ohs.acf.hhs.gov/hslc/sr/approach>.

ⁱⁱJ. Ronald Lally, “School Readiness Begins in Infancy: Social Interactions During the First Two Years of Life Provide the Foundation for Learning,” *Phi Delta Kappan* 92:3 (November 2010): 17–21, accessed July 19, 2012, http://www.pdkintl.org/kappan/k_v94/17pdk_92_3.pdf; Early Head Start National Resource Center, *News You Can Use Foundations of Learning Series: Brain Development* (in press).

ⁱⁱⁱBright from the Start Georgia Department of Early Care and Learning, *Georgia Early Learning Standards: Birth Through Age 3, 24*, accessed July 19, 2012, <http://decal.ga.gov/documents/attachments/GELSComplete608.pdf>.

^{iv}Department of Education and Early Development and Department of Health and Social Services, *State of Alaska Early Learning Guidelines: A Resource for Parents and Early Educators* (December 2007), 90, accessed July 19, 2012, <http://www.eed.state.ak.us/publications/EarlyLearningGuidelines.pdf>.

^vNational Research Council and Institute of Medicine, *From Neurons to Neighborhoods: The Science of Early Childhood Development*, ed. J. P. Shonkoff and D. A. Phillips (Washington, DC: National Academy Press, 2000), 93.

^{vi}Cate Heroman et al., *Teaching Strategies GOLD Objectives for Development & Learning: Birth Through Kindergarten* (Washington, DC: Teaching Strategies, LLC, 2010), 3.

^{vii}Ibid.

^{viii}Massachusetts Association for the Education of Young Children and Massachusetts Department of Early Education and Care, *Massachusetts Early Learning Guidelines for Infants and Toddlers* (May 2011), 28–29, http://www.eec.state.ma.us/docs1/curriculum/20110519_infant_toddler_early_learning_guidelines.pdf; Cate Heroman et al., *Teaching Strategies*, 7.

^{ix}Massachusetts Association for the Education of Young Children and Massachusetts Department of Early Education and Care, *Massachusetts Early Learning Guidelines for Infants and Toddlers* (May 2011), 97–98, http://www.eec.state.ma.us/docs1/curriculum/20110519_infant_toddler_early_learning_guidelines.pdf.