Early Brain Development Research

“What you teach birth to three will be what matters most to me.” Pam Schiller, Ph.D.

The first three years of life lay the foundation for lifelong learning. The child’s brain is busy wiring the foundation for vision, emotional stability, social interactions, language development, motor development, thinking skills, and much more. By age three, a child’s brain has achieved 80% of its wiring foundation.

Thanks to expanding neuroscience research, we are able to use scans to actually observe the human brain while it is under construction. This research demonstrates the explosive growth of the brain during the first three years of life.

Five Key Findings

The first findings from the advancement of technology in the neuroscience field made their way into the early childhood profession in 1996 in Rethinking the Brain: New Insights into Early Development published by the Families and Work Institute. This publication examined five major findings and their relevance to the development of young children and to those who work with young children.

Finding 1: The brain of a three-year-old child is two and a half times more active than an adult’s brain.

Infants are born with a limited amount of neurological wiring. Their vision is rudimentarily wired, as is their hearing and other senses. Nothing is wired in the higher region of the brain known as the cerebellum. The hardware is in place and ready to wire but requires “earthly” experiences and human interactions for the cells to forge the neurological networks that will become the foundation for thinking and reasoning, language, physical movement, and social and emotional behaviors. During the first three years of life, a child builds an estimated 1,000 trillion synapses through the experiences she encounters.

Finding 2: Brain development is contingent on a complex interplay between genes and the environment.

One of the most dramatic findings from medical research is the significant role the environment plays in the structure and capacity of the brain. Scientists agree that human development is shaped by both nature (biology) and nurture (experience) (National Research Council, 2000). Many researchers (Goldman, 2006; Ramey and Ramey, 1999; Sousa, 2007) believe that the environment plays the more substantial role in development. For example, a child may be born with musical talent but if that talent is not nurtured, the talent will never fully develop. Daniel Goldman (2006) says “Seventy percent of what is given to us genetically is brought to fruition by our environmental experiences.” The richer the environment and the more intentional and purposeful the interactions and experiences, the greater the number of neurological connections children are able to forge.

Because a nurturing environment is a critical factor in infant and toddler development, it is important for caregivers to be aware of their responsibility for nurturing the development and learning the infants and toddlers in their care. Infants and toddlers need warm and responsive relationships, a safe environment, and knowledgeable caregivers in order to thrive.

Finding 3: Experiences wire the brain. Repetition strengthens the wiring.

The primary task of the brain during early childhood is to connect brain cells (neurons). Every neuron has an axon, which sends information out to other neurons, and several dendrites, which receive information from the other cells. As axons hook up with dendrites, trillions of connections, called synapses, are formed. Everything we learn is stored in communities of neurons. Experience forges the connections and repetition strengthens them.

Finding 4: Brain development is non-linear (Families and Work Institute, 1996).

There are fertile times when the brain is able to wire specific skills at an optimum level. These fertile times are
called “Windows of Opportunity.” The windows are scientific; they are open from birth to puberty. The open windows of opportunity are the same for all children no matter where they are born or the conditions under which they are born (premature, developmentally-delayed, or typically-developing). Positive experiences during open (fertile) windows result in positive outcomes. Negative experiences during open windows result in negative outcomes.

For example, emotional intelligence begins to wire soon after birth. The foundation of emotional intelligence, trust, is wired during the first 14 months of life. If an infant experiences a warm, loving environment where his needs are met on a regular basis, the wiring for trust is formed. If an infant experiences a hostile world where his needs are seldom if ever met, the wiring for mistrust will be formed. One way or another, the brain will go about its work of wiring.

The brain has a high level of plasticity during the first ten to twelve years of life and during this time wiring and rewiring are regular occurrences. However, when something is wired and that wiring is reinforced with repeated experiences, it becomes more difficult to change. For example, some researchers feel that if children don’t have positive experiences during the first few years of life that lead to the wiring for trust and impulse control, by the time they are three or four, chances are slim that they can ever gain this essential ability at an optimum level.

**Finding 5: Early relationships affect wiring.**

Young children depend on adults (parents, teachers, caregivers). They are biologically wired to speak, think, feel, interact, and to be mobile. However, they depend on human interaction to learn these skills. As early as four months old, the cells that will wire for social interaction and empathy (spindle cells and mirror neurons) are already positioning and preparing for their role in a child’s social and emotional intelligence. According to Daniel Goleman (2006), how prolific they are depends on environmental factors, such as a loving atmosphere (for the better) and stress (for worse).

Based on these five key findings in brain development research, infant-toddler curriculum should offer caregivers support to take on this all-important job of building and strengthening essential brain connections and wiring in the first three years of life.


**Developmental Domains**

The second powerful cornerstone upon which infant-toddler curriculum can be built is the organization of activities into key developmental domains:

- Language Development
- Cognitive Development
- Social Emotional Development
- Physical Development
- Approaches toward Learning

Learning experiences should encourage caregivers to include one activity to support each domain for each child every day. This is the most effective way to move children forward in their development.

Positive Behavior Intervention and Support

A third cornerstone upon which infant-toddler curriculum should be built is a positive behavior intervention and support program, such as Second Step or Conscious Discipline®. Conscious Discipline, by Dr. Becky Bailey, is a comprehensive classroom management and social-emotional program that creates a learning environment where children feel safe and loved. From this foundation to safety and caring children begin learning how to manage their emotions and interact appropriately with their peers. Dr. Bailey says, “Self-regulation is the key to school readiness and more powerful than IQ as a predictor of academic achievement.”

Each morning, “Starting the Day” activities encourage children to participate in “brain smart” activities that set the tone for their emotional well-being and challenge them to focus on pro-social skills. Dr. Bailey’s “Brain Smart Way to Start the Day” includes four parts.

**Unite:** Children sing a song or two.

**Calm:** Children perform a de-stressing activity.

**Connect:** Children acknowledge their friends who are absent. With the help of a puppet, they wish their friends well and also welcome back friends who have been absent. In the second part of the connect activity, children work with a partner to learn how to be gentle, make eye contact, and stay in their body space.

**Build Community:** Children are challenged to commit to being a responsible member of the class by focusing on specific social skills, such as using kind words, helpful hands, their big voice, and listening ears. During this part of the “Starting the Day” routine children place their name and photo in the Safekeeper box to symbolize the classroom as a safe place for children.


Intentionality

A fourth infant-toddler curriculum cornerstone is acting with intention. An *intentional caregiver* focuses on activities with specific outcomes or goals in mind for children’s development and learning. To be intentional is to act purposefully, with a goal in mind and a plan for accomplishing it (Epstein, 2007).

Caregivers should be encouraged to focus on developmental domains and follow the timetables in the Windows of Opportunity. Activities should include both child-directed and caregiver-directed formats so that caregivers become proficient in this balance. Everything a caregiver implements (songs, stories, finger plays, indoor and outdoor activities) should be clearly purposeful.
