

Primed for Learning: The Young Child's Mind

Are the kids running circles around you? Are you constantly on your mental toes trying to anticipate what little ones will get into or come up with next? Well, don't take it personally. It's just a matter of nature. Young minds are engineered to work twice as fast as adult's. YIKES! No wonder you're exhausted!

► Sifting Through Brain Breakthroughs . . . and the Baloney

I've waded through an explosion of brain research literature. Some of it was beyond my technical needs. A neuroscientist, I'm not! But I plodded on to find a gold mine of knowledge.

When hearing implications of brain studies, be a wise and thoughtful consumer. Inaccurate — or misapplied— information can harm children rather than help them. Don't accept everything you hear as absolute, final fact. For instance, actively learning

to play music builds brain power; passively listening to music does not. Brain research is an emerging field, still in its infancy. New revelations, classifications, and implications surface regularly. Be moderately skeptical. Don't succumb to fads that supposedly stem from research. Follow your intuition and common sense.

Pay closest attention to information that triggers your "aha!" response. When brain research rings true, you'll feel it. After all, the human species has evolved to ensure survival of our young. *How wonderful that science now bears out that many instinctual parenting and caregiving responses are indeed the best ones!*

► The Brain at Birth

At conception, children become a mix of each parent's genes. The time before birth (prenatal) is the most rapid period of human development, especially the brain's. Genetic groundwork to support a lifetime of experience is being laid.

For sound development, the prenatal infant (fetus) needs healthy genes from parents. Its brain growth is dependent upon good care, such as maternal attention to health, nutrition, and stress management.

Even at this early stage of life, children are affected by experience. The developing brain is especially vulnerable to insults that can hamper, distort, or depress its growth. Insults include poor maternal physical and mental health and malnutrition, as well as maternal smoking, alcohol consumption, and drug use.

The infant brain comes equipped with about 100 billion nerve cells, called neurons. An axon connects one neuron to another. Ends of axons have fibers called den-

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drites which receive and transfer information from one cell to another. It is like achieving a telephone connection that allows information to be relayed from one neuron to another. When information comes together between neurons, it's called a synapse. All those synapses are firing two and a half times faster than ours. That's what primes children to be our most vigorous learners.

The number of brain cells (neurons) a child is born with doesn't change throughout life. What changes, and therefore allows learning and growth to take place, is the *connections* between brain neurons. Brain "wiring" is made up of neuron networks. The brain's ability to acquire, apply, and benefit from information depends upon neural connections. Thus the challenge, the work of early childhood, is to make sense of the world — to make the connection.

Some fundamental "survival" connections are established, or "hard-wired," *before* birth. That "hard-wiring" is inherited from genes and controls involuntary body functions like breathing and heart beat. This neuron activity takes place in the brain's interior, near the brain stem.

At birth, about 25% of neurons are networked, or connected together so information can flow between them. Gradually, brain development spreads throughout the brain, with higher order reasoning and thinking developing last. This development is completed during early adolescence. Portions of the brain governing these skills are located just beneath the protective skull. (Thus, Dr. Judy Helm reminds us of the importance of preventing brain injury through religious use of car safety restraints and bike helmets!)

► The Brain After Birth

Following birth, rapid brain construction continues, neurons being the building blocks. Bridges between neurons, information pathways, are created to allow the brain to absorb and process increasing amounts of sensory information. At birth, there remains 75% of the brain that can be influenced by environmental factors in combination with genetic inheritance. *Capacity for such intricate, refined brain development means mom, dad, and the rest of us can have a great impact on nurturing kids' learning potential.* What a privilege! Oh what a responsibility!

During early childhood, children develop many more synapses than they need as adults. By the time the wiring process is complete, a single neuron can be connected to as many as 15,000 others! The synapses (or telephone connections) that aren't used regularly don't become ingrained in the brain, and are then *pruned* back. This process of pruning back accelerates *after* the first

ten years of life. So the task of early childhood is to gather, gather, gather information. In the second decade of life, information storage is streamlined.

This neural network is the brain's infrastructure. Information flows between neurons by way of electrical impulses. Chemicals and hormones, called neurotransmitters, play a role in moving information along.

Some neurotransmitters facilitate learning, others hinder it. Calming hormones, such as serotonin, allow information to be transferred from one neuron to another. Stress hormones, such as cortisol, reduce, slow — or in severe cases — stop the brain's ability to transfer information. When functioning well, neural connections allow information to zip at about 200 mph to different brain centers, which then trigger body functions or responses, such as seeing, hearing, tasting, feeling, and thinking.

The more *connections* between neurons, the greater the brain's ability to take in, process, and *make sense* of information. The more successful connections, the greater the learning capacity. The neuron connections that create information highways develop early in life, *most significantly during the first ten years.* *Brain density* in terms of neural connections, rather than brain size, contributes most to intelligence. Properly stimulated brain circuits become increasingly complex, refined, and detailed. This translates into learning potential for kids!

► Nurturing Brain Growth and Learning Potential

The child's learning process is choreographed by minuscule electrical synapses in the intricate dance of human intelligence. To trigger the ballet, children need a wide range of experiences for the brain to "chew on," meaning to decipher, analyze, and synthesize into meaningful concepts. Unfortunately, the ballet can also be impeded, if not halted. Environmental and personal stress impair brain development and functioning.

Following is what we have learned about the brain and how it works, and does not work. Early results give us clues on how to help children's brains grow and work well. And keep in mind that the practices mentioned are helpful for any age child, but especially those in early childhood, when the brain is primed by nature for learning.

■ **Strong, secure attachments promote brain development.** Infants flourish when responsive

caregivers are head over heels in love with them. Being gently held, cuddled and cradled, hearing soothing language (including songs and lullabies), and frequent loving touch all feed the brain with positive experiences.

The most critical time for establishing secure bonds of attachment is the first year of life. When infants experience a strong attachment, hormones are secreted that induce relaxation and a sense of well-being. Strong attachment develops when caregivers are consistent and predictable.

The ability to trust cannot be formed without a secure attachment. Secure attachment is a prerequisite to positive social adjustment. Familiarity of caregivers creates a comfort zone that literally stimulates release of chemicals and hormones that help a child access memories of experience and apply them to current situations. This is a critical process of learning.

■ **The brain is impressionable.** The brain has “plasticity,” it responds to positive nurturing and experience. Likewise, it reacts to negative experiences. Timing of experience is often critical, especially the first three years of life. Once again, consistent caregiving and secure attachment is vitally important. Without it, children don’t develop well in terms of intellect, *or* their ability to regulate and control emotions.

■ **The brain is resilient.** To an amazing degree, the brain can compensate when a portion of it is injured or understimulated. If *short-term stress* is endured, such as a one-time incident of domestic violence, the brain can bounce back in spite of the experience. *Prolonged exposure to stress* undermines the brain’s natural ability and tendency to rebound and compensate. Such stress would include living in violent neighborhoods, or enduring extreme poverty or persistent malnutrition.

■ **Brain development affects more than intellectual growth.** Brain development and function affects personality, temperament, and children’s ability to regulate emotions. It affects social skills and the ability to function according to moral and ethical codes. Capacity for empathy and remorse stems from early childhood. Warm, supportive, and dependable relationships nurture it. *Consistency of good caregiving in the early years can never be over-emphasized.*

■ **Brain development is interrelated; growth in one area affects growth in another.** Connections,

connections, connections. Their importance heeds us not to teach anything in isolation. Advancements in one area of development trigger advancements in others. For instance, growth in language spurs emotional and social growth. That’s because self-control is more easily maintained when children learn to identify, express, and cope with emotions through language. As young children gradually master language, we have to consistently coach and support them in skills such as tolerance, patience, and peaceful conflict resolution.

■ **Our brain is a social brain.** *Attentive, loving responsiveness to children is critical.* Children need interactions with peers as well as those older and younger. Physical as well as emotional responsiveness to children provides them with social interactions that literally trigger neural connections.

Primary caregivers who are depressed, withdrawn, and generally unresponsive to children don’t stimulate brain connections. In fact, their behavior elicits in children emotional stress and self-doubt, which bring stress hormones into play. That in turn impairs brain function.

■ **There are “windows of opportunity” when a child’s brain is primed to absorb specific types of knowledge and acquire specific skills more easily.** Different brain sectors store different information. Children learn easiest when experience corresponds to areas of the brain undergoing growth. Capitalizing on “windows of opportunity” makes for successful learning. It helps children develop a strong self-image as capable and competent learners.

For instance, we know the first two years of life are critical for language development. During that time, it’s especially important for children’s communications — even babbling — to elicit interest and engagement from caregivers.

And while learning to play a musical instrument is possible at any age, because of the brain’s particular sensitivity to music instruction in early childhood, it is much easier to learn music, even multiple instruments, if instruction begins by age ten.

■ **Children rely heavily on learning through imitation.** By our actions we are teaching children the ways of the world. Through imitation children learn to speak. It’s important to be a good role model of elaborate, clear language. Involve children in daily activities, such as running errands, so they can observe your adult skills and social “know-how.”

■ **Children learn best when experiences closely match their current level of knowledge and compe-**

tency. Children make sense of knowledge layer upon layer. Gradually, they develop concepts and theories of how the world works. This process of children building knowledge, through active investigation, is critical to brain development.

Too large of gaps between what children know, and what we expose them to, or try to teach them, leads to frustration and stress. Expecting children to develop skills in too many areas at once can also create stress. Pushing children to excel at a faster pace, or over-scheduling them in too many structured enrichment lessons at once, is counterproductive. *Nice and easy, step by step is the natural way children are primed to learn.*

When teaching, observe closely to assess current abilities and knowledge. Then build from there. Children's behavior will tell you if you are on the right track. For instance, infants send caregivers nonverbal cues to pace learning and interaction.

Eye contact, facial expression, and body posture reveal when a child is alert, tired, bored, or overstimulated. Preschoolers' attention span, depth of concentration, and enthusiastic interest reveal whether experiences are properly timed. *Ignoring cues or pressuring children to perform is counterproductive.* It simply increases stress reactions which impede learning.

■ **Children need activity-based, hands-on, sensory experiences to build the brain's learning pathways.** Learning is most meaningful when self-initiated. Exploring through trial and error is very motivating. From birth, children find problem solving and exploring cause and effect relationships especially intriguing. Passive, less interactive experiences, such as many hours of daily television and computer play, do NOT build connections effectively.

So Froebel, Montessori, Piaget, Vygotsky, and Dewey were right! Children learn best through play; they learn best by doing. Play materials should be safe and developmentally appropriate. Anything that allows children to explore through their senses feeds the brain, including, but not limited to: playing with paints and play dough; building with blocks and Legos in conjunction with toy cars, people, and animals; playing with sound toys and simple music instruments; dressing up, using dolls, and playing house; using puppets and reading picture books; and messing about in natural elements like sand, dirt, and water.

■ **To become permanent, neural pathways (or learning pathways) must be strengthened through repetition.** Children benefit from repeated experiences so

brain connections become ingrained. "Use it or lose it" could never be more important.

Don't confuse repetition with drill. Drill focuses too narrowly on one skill, such as memorizing flash cards. *Repetition is experiencing the same types of activities as long as children find them moderately challenging, relaxing, and engaging.* Daily ritual activities, such as reading bedtime stories and playing peek-a-boo, are examples of repeated experience that reinforce learning.

■ **Children's innate curiosity of the world, joy of learning, and pride in accomplishment is the perfect motivation for brain development.** Threats, punishment, and excessive competition are not effective motivators for long lasting learning since they release stress hormones. In contrast, supportive coaching, collaboration and cooperation, teaching responsibility through respectful consequences, and other types of non-punitive teaching and guidance encourage calm.

Developmental successes inspire intrinsic satisfaction which in turn creates a self-perpetuating spiral of learning and achievement. *Never underestimate the role of joy, pride, and self-respect as a motivator for learning.*

■ **The brain is "programmed" to learn a system of language.** Infants hear a much wider range of sounds than adults. Gradually, they learn to attend only to those most important to their family's native language. This "winnowing" out of sounds takes place during the first *ten months* of life. (This makes a strong case for the importance of hearing tests at birth, and for treating ear ailments without delay.)

Capacity for intricate language is unique to humans; it is especially important in building the brain. The portions of the brain that learn language(s) are most easily activated before age ten. Children enveloped in a rich, loving language environment are given an ideal incubator for brain development.

To facilitate language, speak with children from birth. (They attend to your voice even before birth!) Talk to them about what they are seeing or touching, or what you are doing. Respond to pre-language *conversations* so infants learn their babbling gets a response from a loved one. Read together daily throughout childhood.

As children grow, use open-ended questions to encourage expression of thoughts through words

and sentences. Let them see you using writing tools and give them some to use, too. Build literacy by bringing their attention to meaningful ways language is used in daily life, spoken as well as written. Do this whether in the grocery store, post office, or a restaurant. Take advantage of “teachable moments.”

■ **The brain is geared to recognize and make sense of patterns.** Noticing similarities and differences is how children go about making sense of the world. This is especially true in terms of sight and hearing. Children analyze patterns of sound in order to decipher their native language. From their earliest days, infants prefer patterns of the human face, even drawings.

Give children opportunities to play with patterns through matching games, building with blocks, coloring with crayons, and putting together puzzles. Help guide children’s deductions and associations by encouraging them to observe patterns. How are objects alike and different? Which is bigger, smaller, taller, wider? What happens when seasons change?

■ **Complementary experiences build connections.** The more ways children experience information, the more efficiently they construct knowledge and concepts. This establishes learning pathways so children can access stored memory, thereby increasing odds of repeated success.

To build connections, provide a rich variety of related experiences. *Link new skills and concepts to existing ones.* For instance, when exploring the fall season, go out and pick apples at the orchard. Compare sizes and colors. Sort good apples from rotten ones. Taste fresh apples. Which are sweet? Which are sour? At home, make an apple pie or applesauce together. Plant your own apple tree.

■ **Each child’s brain, and learning preference, is unique.** Over time most kids develop preferred ways for learning. Dr. Howard Gardner’s theory of multiple intelligences addresses this issue. Some children are more visual learners, others are more auditory. Some require a greater degree of learning through body movement, while others excel in musical intelligence. This probably happens when parts of the brain develop more fully than others. You can tune in to a child’s unique strengths and inclinations by watching behavior. Provide experiences accordingly.

► In Conclusion

The debate over whether children develop more due to nature versus nurture is obsolete. Brain

research reveals it’s both! *Genetic birthright and environmental blessings interlace in infinite ways to weave a lasting and visible imprint on children’s developing minds.* That in turn affects their lifelong ability to function in society and create a dignified, fulfilling life.

You and I are the fortunate few who get ringside seats to watch the mysteries of the young brain unfold. We are the trusted few with the responsibility of supporting the process. Savor the experience, and respect your role in nurturing fertile minds primed for learning.

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► Resources

The Brain and the Developing Child Newsletter, Institute for Faculty Development Project on the Brain, Erikson Institute. Call (312) 755-2250.

“Your Child’s Brain,” Prime Time Live Video Segment, January 25, 1995, by Diane Sawyer. To purchase: (800) CALLABC — \$39.95 plus \$3.95 shipping.