

Developing Brains-
Ideas for Parenting and Education
From the New Brain Science
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**What Does Brain Development Research “Think” About
Early Childhood Education and Care?**

Introduction

Karen Stephens wrote an article on brain research for the Child Care Information Exchange¹ in which she talked about the new brain research. The article was so well organized that many of her basic concepts will be utilized in this paper (along with other concepts) to elaborate on how information about the brain relates to early childhood education and child development theory and established practices, to which she makes reference at the end of her article.

In this article, I will explore some of the concepts of brain development and relate them to contemporary and historical theory, principles, and practices in early childhood education. It is clear that some of our field's founders constructed teaching practices and principles that today we understand are supportive of healthy brain development in young children.

Applications of brain development concepts to early childhood practices

The following statements in ***bold italics*** are the concepts of brain development that Stephens highlighted in her article² followed by applications to theory, research, and accepted practices in the fields of child development and early childhood education - both historical and contemporary.

¹ Stephens, Karen. “Primed for Learning: The Young Child’s Mind.” Child Care Information Exchange. March/April 1999, 44-48.

² Stephens, op. cit., 45-48 (in ***bold italics***).

1. *Strong, secure attachments promote brain development.*

The first year of life is critical for "establishing secure bonds of attachment" and when this happens, "hormones are secreted that induce relaxation and a sense of well being. Strong attachment develops when caregivers are consistent and predictable."³

Locke (over 300 years ago) as well as Pestalozzi and Owen in the 19th century said that respectful social relationships are important in learning and that teachers should be caring and non-punitive.

The Ruggles Street Nursery Training School (founded by Abigail Eliot in the 1920s) developed an educational philosophy in 1944, called "Fundamental Principles." "Underlying these *principles* was an abiding interest in and respect for the relationship between teacher and child. Lawrence Frank [also]...emphasized the warmth of a teacher-child relationship as the single most important factor in a child's learning process."⁴

Very recently, the National Association for the Education of Young Children (NAEYC) developed some "mental models" for helping early childhood educators employ Developmentally Appropriate Practices. In these models, it is stated that learning is *dependent* on establishing nurturing relationships between the adults and children.⁵

2. *The brain is impressionable.*

Experience shapes the structure of the brain and creates and maintains connections between neurons, especially during the first 5 years of life. This refers to the brain's *plasticity*, especially in childhood. **What** we teach and **how** we teach are equally important.

Stephens reminds us that the brain "responds to positive nurturing and experience. Likewise, it reacts to negative experiences."⁶ According to Feeney et. al., "programs, regardless of what they are called or where they

³ Ibid. 46.

⁴ Braun, Samuel J. and Esther P. Edwards. History and Theory of Early Childhood Education. Worthington, Ohio: Charles A. Jones, Pub. Co., 1972, 103.

⁵ NAEYC. Leading Edge.

⁶ Stephens, op. cit., ibid.

are housed, provide care and education. People who work with young children, regardless of their job title or the age of the children, *nurture* and *teach*. They ensure children's well-being and help them to learn. This duality distinguishes early childhood education programs and educators from other educators and schools. The term *early childhood education and care* emphasizes the dual focus on learning and care."⁷

More specifically, early childhood teacher-caregivers must be aware of cultural differences in communication and caregiving, as **how** we teach may not be congruent with the family's style. Early childhood teachers tend to emphasize such things as self-help skills and direct verbal communication. For some families, interdependence is a strong value, and self-help in very young children is not encouraged. For some families, more meaning is communicated through the context (relationships, body language and pauses, for example).⁸ This incongruence between home and school may limit the benefits the child might receive in school and it may weaken the influence of the home culture on the child's development and learning.

3. *The brain is resilient.*

"To an amazing degree, the brain can compensate when a portion of it is injured or under-stimulated. 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."⁹

Several longitudinal research studies have been done which have demonstrated that high-quality preschool programs for children whose families have a very low income "can lead to improvements in their intellectual and scholastic performance."¹⁰ In terms of children with special

⁷ Feeney, Stephanie, Doris Christensen and Eva Moravcik. Who Am I in the Lives of Children? An Introduction to Teaching Young Children. 5th edition. Englewood Cliffs: Merrill, 1996, 6.

⁸ Gonzalez-Mena, Janet, Foundations of Early Childhood Education: Teaching Children in a Diverse Society. 3rd edition. McGraw-Hill: Boston, 2005, 242-45.

⁹ Stephens, op. cit., 46.

¹⁰ Schweinhart, Lawrence J., David P. Weikart, and Mary B. Larner. "Consequences of Three Preschool Curriculum Models through Age 15." Early Childhood Research Quarterly. Vol. 1 (1986), 41.

needs, "increased attention and funding for early intervention over the last [15 years] are a reflection of a considerable body of research, an improved level of public awareness, and advocacy efforts by many parents and professionals."¹¹

4. *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."¹²

Margaret McMillan, founder of the nursery school movement in the early part of the 20th century, emphasized the importance of children's physical and emotional health in the early years. John Dewey said that the emotions are the "reflex of actions," and that emotions without actions produce an unhealthy state of mind which can lead to "sentimentalism."

5. *Brain development is interrelated; growth in one area affects growth in another.*

"Advances in one area of development trigger advances 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."¹³

"Play supports the development of the *whole child* - a person able to sense, move, think, relate to others, communicate, and create."¹⁴ The NAEYC position holds that "children's play is a primary vehicle for and indicator of their mental growth.... Therefore, child-initiated, child-directed, teacher-

¹¹ Feeney, et. al.,(1996), op.cit., 55.

¹² Stephens, op. cit. 46.

¹³ Stephens, ibid.

¹⁴ Feeney, et.al., (1996), 125.

supported play is an essential component of developmentally appropriate practice."¹⁵

Free play periods (as advocated by Robert Owen and Maria Montessori in the 19th century¹⁶) have become the heart of the young child's day in early childhood programs, and during this time, children freely choose their activities from an array of learning or activity centers within the classroom. Examples of typical learning centers include: art, dramatic play, sensory table, books/library, table toys, blocks, writing, science, and music.

6. *Our brain is a social brain.*

"Attentive, loving responsiveness to children is critical.... 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."¹⁷

In addition, it seems that "in infancy, initial regulation of emotional reactivity seems to influence hemispheric organization of the brain."¹⁸ The right hemisphere matures earlier than the left hemisphere and it plays a "crucial role in emotional reactivity and communication. The development of these skills is required during infancy, before the child develops linguistic abilities."¹⁹ The right side of the brain is also involved in the processing of "novel stimuli" and is essential for learning language (new words) and some emotional coping strategies. The right hemisphere is also involved in human bonding and attachment behavior.

¹⁵ Willer, Barbara, "A Conceptual Framework for Early Childhood Professional Development: NAEYC Position Statement, Adopted November 1993," in The Early Childhood Career Lattice: Perspectives on Professional Development, ed., Julienne Johnson and Janet B. McCracken. Washington, D.C. National Association for the Education of Young Children, 1994, 3.

¹⁶ Feeney, et. al., Who Am I in the Lives of Children? An Introduction to Teaching Young Children, 6th edition. Upper Saddle River, New Jersey: Merrill, 2001, 69.

¹⁷ Stephens, op. cit., 46.

¹⁸ Galderisi, Silvana and Armida Mucci, "Emotions, Brain Development, and Psychopathology Vulnerability." *CNS Spectrums* 2000; 5 (8): 44-48.

http://www.cme-reviews.com/CMEReviews/emotions/CNS800_Galderisi.html

¹⁹ Ibid.

"A poor attachment relationship might create an unbalanced right/left hemisphere development, which in turn might play an important role in vulnerability to psychopathology. Hemispheric organization abnormalities have been found in several psychiatric disorders, such as schizophrenia, mania, and autism, as well as in individuals at risk for psychiatric disorders."²⁰ There are reports of right hemisphere dysfunction in children who have: nonverbal learning disabilities, an inability to adapt to new situations, difficulties in peer relationships; and extreme shyness. In addition, it "has been found that an underactivation of the right and/or hyperactivation of the left brain is associated with a high degree of physical health complaints... and panic disorder."²¹ In summary, "abnormal patterns of hemispheric activation have been reported in association with insecure attachment and/or poor parental care."²²

Eric Erikson's theory of Psychosocial Development describes eight developmental stages covering the entire life span. "Each state is characterized by a particular challenge, or developmental crisis, that is central to the stage of life in question and must be resolved.... In this theory, the resolution of each developmental crisis depends on the interaction of the individual's characteristics and the support provided by the social environment."²³ The first four stages in Erikson's theory are: Trust vs. Mistrust (B-1 year); Autonomy vs. Shame and Doubt (1-3 years); Initiative vs. Guilt (3-6 years); and, Industry vs. Inferiority (7-11 years).²⁴

Freidrich Froebel, John Dewey, and Lev Vygotsky all wrote of the process of learning occurring through social interaction (co-construction) and of the classroom being an "embryonic social community."

²⁰ Ibid.

²¹ Ibid.

²² Ibid.

²³ Berger, Kathleen, The Developing Person Through the Life Span, 4th edition, New York: Worth Pub., 1998, 32.

²⁴ Ibid. 33.

7. There are "windows of opportunity" when a child's brain is primed to absorb specific types of knowledge and acquire specific skills more easily.

The NAEYC revised its *Position Statement on Developmentally Appropriate Practice in Early Childhood Programs Serving Children from Birth to Age 8* in July, 1996. The position statement defines developmentally appropriate practice (D.A.P.) as the "outcome of a process of teacher decision making that draws on at least three critical, interrelated bodies of knowledge. One of these is *What is known about child development and learning* - knowledge of age-related human characteristics that permits general predictions within an age range about what activities, materials, interactions, or experiences will be safe, healthy, interesting, achievable, and also challenging to children."²⁵

Teachers must become knowledgeable of basic brain development in young children so that their teaching/learning methods support healthy brain development and the behaviors that go with it.

8. Children rely heavily on learning through imitation.

"By our actions we are teaching children the ways of the world."²⁶ Recent research in brain structure and development has "discovered" the presence of multiple networks of "mirror" neurons in the cortex of the brain.²⁷ In animal studies, researchers have found that these cells are specialized to "respond equally when we perform an action and when we witness someone else perform the same action" - in other words, **imitation**.²⁸ In addition to imitation, researchers speculate that these mirror neurons are involved in such behaviors as empathy, language and communication, social interaction, and the ability to read others' intentions.²⁹

²⁵ Bredekamp, Sue and Carol Copple, Eds. Developmentally Appropriate Practice in Early Childhood Programs. Revised Ed. Washington, D.C.: NAEYC, 1997, vii.

²⁶ Stephens, op. cit., 46.

²⁷ Bower, B., "Mirror Cells' Fading Spark." Science News. Vol. 168, No. 24, Dec. 10, 2005, 373. "Mirror Neurons," Feature Section. Monitor on Psychology. October 2005, 48-56.

²⁸ Winerman, Lea, "The Mind's Mirror." Monitor on Psychology. October 2005, 49.

²⁹ "Mirror Neurons," Feature Section, op. cit.

The Montessori method of teaching relies heavily on teaching by precise demonstration, as do many cultures. A second body of knowledge basic to D.A.P. includes "*knowledge of the social and cultural contexts in which children live* to ensure that learning experiences are meaningful, relevant, and respectful for the participating children and their families."³⁰

Utilizing a variety of teaching-learning methods helps to insure that the school context will feel familiar and support each child's home culture. Janet Gonzalez-Mena devotes a whole chapter to the topic of the teacher as a role model for children³¹ in her foundations text for Early Childhood Teachers. She bases this concept on the work of Bandura (Social Cognitive Theory) that states that children learn by copying models.³² Gonzalez-Mena discusses the teacher as a model in terms of: methods of nonviolent problem solving; self-esteem, including virtue, power, significance, and competence; equity in areas such as ethnicity, culture, abilities, gender, and perceived "race"; and, learning, development, and cognition.³³

9. Children learn best when experiences closely match their current level of knowledge and competency.

"Too large of gaps between what children know, and what we expose them to, or try to teach them, leads to frustration and stress."³⁴ Vygotsky cautions us to teach to the Zone of Proximal Development (that place between what the child can do independently and what they can do with assistance).

A third body of knowledge that is essential to D.A.P. includes "*what is known about the strengths, interests, and needs of each individual child in the group* to be able to adapt for and be responsive to inevitable individual variation."³⁵

In *My Pedagogic Creed* (1897), John Dewey states: "I believe that the school, as an institution, should simplify existing social life... [and that] as

³⁰ Bredekamp, et. al., op. cit.

³¹ Gonzalez-Mena, Janet, "Chapter 6: The Teacher as Model," op.cit., 135-163.

³² Ibid., 136.

³³ Gonzalez-Mena, op. cit.

³⁴ Stephens, op. cit., 47.

³⁵ Bredekamp, et. al., op. cit.

such simplified social life, the school life should grow gradually out of the home life; that it should take up and continue the activities with which the child is already familiar in the home."³⁶

10. *Children need activity-based, hands-on, sensory experiences to build the brain's pathways.*

This model for early childhood education programs is one which is child-centered/child-initiated and which emphasizes individual and small group activities, rather than whole group experiences. John Dewey and G. Stanley Hall supported the idea that "the brain is handmade."³⁷

Research on the different outcomes of several approaches to early childhood education curriculum found that although various teaching approaches give equal benefit in terms of children's academic success, the open-framework and child-centered approaches to curriculum (as compared to the teacher-directed, programmed-learning model) had significant **social benefits**, with children being rated higher on sociability, cooperation, and academic orientation.³⁸

11. *To become permanent, neural pathways (or learning pathways) must be strengthened through repetition.*

Early childhood educators, such as Lillian Katz, have cautioned against *entertaining* children with too many novel or new experiences or materials. When we encounter something new to us, we are forced into a lower level of functioning, as we have to discover how something works and its' characteristics or qualities. Once the novelty wears off, we are able to begin to use the material or experience at a deeper level, involving creativity, combining, application, and discovery. This supports a *constructivist* theory of development (Piaget and Vygotsky).

³⁶ Braun, Samuel J. and Esther P. Edwards, History and Theory of Early Childhood Education. Worthington, Ohio: Charles Jones, Pub. Co., 1972, 103.

³⁷ Ibid., 162.

³⁸ Schweinhart, et. al., op. cit., 42.

Brain research on memory points out that it is the repetition of something that is critical (typically) for committing learning to long-term memory. Single exposures to information or experiences are not usually remembered, unless they are extremely novel or emotionally charged.

12. Children's innate curiosity of the world, joy of learning, and pride in accomplishment are the perfect motivations for brain development.

Maria Montessori introduced us to the idea of teaching children self-help skills (buttoning, cutting, etc.), so they could function more independently. She also introduced child-sized furniture which brought the physical environment "down to the children's level."

Open-ended materials (the "heart and soul" of early childhood classrooms) that allow for discovery and creativity remain interesting and stimulating to children, such as paints, clay, blocks, sand, water, etc. Feeney cites "identified characteristics that distinguish play from other behaviors," including that play is intrinsically motivated, freely chosen, pleasurable, enjoyable and engaging.³⁹

13. The brain is "programmed" to learn a system of language.

Lev Vygotsky wrote that language is a mental tool and is central to development.

The first two years of life are critical for language development, *in spite of* the child's inability to produce speech in an effective manner. Research has recently provided a response to this situation.

Linda Acredolo and Susan Goodwyn, through personal experience with one of the author's own babies, discovered what they call "Baby Signs"⁴⁰ which are "easy nonverbal gestures" that have agreed upon meaning, such as waving "bye-bye." These baby signs are similar to American Sign Language which is

³⁹ Feeney, Stephanie, Doris Christensen, and Eva Moravcik, Who Am I in the Lives of Children? 6th Ed. Columbus, Ohio: Merrillj-Prentice Hall, 2001, 171-2.

⁴⁰ Acredolo, Linda, and Susan Goodwyn, Baby Signs: How to Talk with Your Baby Before Your Baby Can Talk. Chicago: Comtemporary Books, 1996.

used by people who are deaf or hard-of-hearing. The authors suggest introducing and using baby signs with children between about 9 to 30 months of age. This age period is a difficult time when the baby's "desire to communicate outstrips her capacity to say words. By increasing the number of gestures in [the] baby's repertoire, the two of you can *talk* about lots more things than [the] baby's few early words would permit."⁴¹ After 10 years of scholarly research on baby signs, the authors have concluded that adding baby signs to a child's repertoire "not only leads to better communication; it also speeds up the process of learning to talk, stimulates intellectual development, enhances self-esteem, and strengthens the bond between that parent [or caregiver] and infant."⁴² The use of American Sign Language to sign with your baby or toddler will empower them with another useful language!

Baby signs are used at the same time the adult is using verbal speech, thus connecting the sign with the spoken word as well as its meaning. "Baby Signs allow babies to temporarily bypass the sound system and get on with the important business of communication."⁴³ Baby sign also reduces some of the classic frustrations of the toddler period.

A teacher of young toddlers once told me about an incident that happened in her room. She used American Sign Language routinely, as many of the children in her group were not yet using language. One day, she witnessed a little girl in the class gather up a couple of other children to "have a group time"! She led "The Wheels on the Bus" using only sign! She even kept control over her group by using the sign for "sit down"!

The bottom line, though, is that hearing children depend on being in a linguistically rich environment. Babies are born with a universal discrimination ability which allows them to perceive all human language sounds. By 11-12 months of age, babies have lost this universal ability in favor of focusing on the sounds of the language that is around them. Brain wave studies cited in Berk⁴⁴ indicate that at about 5 months of age, babies begin to pay particular attention to "syllable stress patterns" in their home

⁴¹ Ibid., 5.

⁴² Ibid., 6-7.

⁴³ Ibid., 21.

⁴⁴ Berk, op.cit., 141.

language, and by 6-8 months, they begin to ignore or "screen out" those sound not used in their home language.

14. *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."⁴⁵

Maria Montessori developed a set of organized and coordinated materials, which were *didactic*, meaning that they taught something. An example of these sensory materials is the set of puzzles for seriation, where cylinders of graduated diameters fit into holes that are arranged from smallest to largest.

Toy manufacturers have developed games and puzzles based on Montessori's materials, for example, the shape sorters, lotto games, seriation puzzles, pyramid of rings, etc.

15. *Complementary experiences build connections.*

"The more ways children experience information, the more efficiently they construct knowledge and concepts.... To build connections, provide a rich variety of related experiences. *Link new skills and concepts to existing ones.*"⁴⁶

The Project Approach of the Reggio Emilia schools in Italy develops curriculum based on what teachers observe as the children's interests. In starting a project (for example, about trains), the teacher asks the children two questions and records the responses.

1. What do you already know about trains?
2. What do you want to find out?

Based on this information, the teachers (and parents!) then work to find a variety of materials, resources, and links to the parents and the wider

⁴⁵ Stephens, op. cit., 48.

⁴⁶ Ibid.

community that will answer the children's questions based on what they already know.

John Dewey and the progressive education movement of the early 1900s called for integrated study units or the "project method." Margaret McMillan believed that change in children comes from working with the whole family.

16. Each child's brain, and learning preference, is unique.

"Over time most [children] develop preferred ways for learning. Dr. Howard Gardner's theory of multiple intelligences addresses this issue."⁴⁷ Also, varying cultural practices and values that comprise the child's social environment impact how they see the world and behave in it.

Bronfenbrenner's Ecological Systems Theory "views the person as developing within a complex system of relationships affected by multiple levels of the surrounding environment," (such as: family, child care, school, neighborhood, parent's workplace, community health services, and customs).⁴⁸ The endless combinations of multiple environments and relationships interacting with the child's genetic inheritance yield a unique personality and learning style in each individual.

Maria Montessori maintained that change comes through the individual child via the methodology, which uses *self-selection and self-pacing*. This allows the individual child to develop at their own pace and on their own path. The free-play period in child-centered ECE programs is designed to allow the child to express and explore her/his unique self, through self-selection of activities and interaction with peers.

Finally, Developmentally Appropriate Practices support teaching to each individual child's abilities and interests.

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⁴⁷ Ibid.

⁴⁸ Berk, op.cit., 24.