

Introduction

Cal arrived at school each day on the bus. It took almost an hour for this kindergartner to get to school from his home in the housing projects on the south side of town. About 16 percent of the students at his school were bussed in.

There were few books in Cal's home, and he never saw anyone in his family read. When he first picked up a book at school, he held it upside down. Stephen was sitting next to Cal in the book corner. He called Cal "stupid" and took the book out of his hands. Stephen turned the book around and shoved it back at him. Cal was shocked but mostly angry. He pushed Stephen to the ground. This time Stephen was the one who was shocked.

These two boys from dissimilar backgrounds had different experiences. Stephen knew how to hold a book. He had seen every member of his family read and had been read to often. Cal knew how to fight. He was always shown that you were weak if you didn't defend yourself.

Their kindergarten teacher had her work cut out for her. By the end of the year, Cal was reading books. Stephen learned to be careful around kids like Cal, but Cal also learned that he didn't have to defend himself physically.

Two critical areas of research in the neurosciences are influencing how we educate our young children. The first significant subject of research is referred to as *plasticity*. Plasticity is the link between nature and nurture. Mental and physical activity stimulates physiological and structural changes in the brain. These changes are mediated by gene expression and facilitate learning (Begley, 2007). In other words, experience changes the brain. The experiences we provide all children will affect their very brain structure. Both Cal's and Stephen's brains changed during their year in kindergarten.

The second area of research is the startling discovery of "mirror neurons." These are networks in the premotor area of the brain that fire when we watch someone else do something. They fire in the same way that they would if we were performing the action ourselves. This implies that when a child watches an adult do something, a network begins firing in the brain. (A simple example of this is our inclination to yawn when someone else does so.) Empathy, language, and social behavior may center on what a child sees. These mirror neurons may be capable of encoding not just the movements, but also the motive behind the movement. Handling books had been modeled for Stephen; his brain was wired for managing books before he got to school. Cal's brain had watched a lot of fighting. His brain was wired differently.

Therefore, the experiences we make available and the modeling we do will affect the brains of our students. The primary reason for this book is to provide the knowledge to create appropriate curricula for our young children. By understanding their developmental phases and brain growth, we can decide what to do in the classroom to meet the children on their level and help them move on to the next. Cognitive development, language development, social development, and physical development are all components of learning.

WHAT IS BEST PRACTICE?

Brain-Compatible Teaching Principles

The brain is the only organ in the body that is shaped through its interaction with the environment. If the brain is the organ that is dedicated to learning and memory, educators need to be familiar with brain-compatible practices and those that are brain antagonistic. Based on what we currently know about the structure and function of the brain, brain-compatible teaching emphasizes the way the brain naturally learns.

In my own personal journey toward brain-based teaching, I practice the following principles as the basis for best practice.

1. **Every brain is totally unique.** There will never be two children in your classroom who learn in exactly the same way. Some of this is genetics, and the rest is experience. Therefore, we must offer a variety of approaches to learning.
2. **Emotions guide our learning.** The emotional brain filters all incoming information. If it is emotionally stimulating, it will be marked for memory. The emotions that our children feel when they enter the classroom also affect how well they will learn. The more positive the emotions are, the more likely the children will learn. The more positive the teacher is, the more likely the students will be positive, because emotions are contagious!
3. **Stress affects learning.** A little bit of stress sends out chemicals to make us more alert and help us remember. Chronic stress or acute stress sends out more chemicals that interfere with learning. Creating an environment that keeps stress levels low might include using soothing music, offering choices, and providing predictability.
4. **There is a brain-body connection.** What our students eat, how much they sleep, whether they exercise, and the amount of movement we offer in the classroom all affect what is happening in their brains.
5. **The brain has multiple memory systems and multiple modalities.** According to neuroscientist Dr. Steve Peterson (2001), these two pieces of information suggest strong recommendations for the classroom. The more systems and modalities we utilize for learning, the stronger the possibility of receiving and retrieving the information. With those unique brains, there are students who have difficulty with one system and do better with another (Sprengr, 2006).

6. **The brain seeks meaning and relevance.** It is vital that we teach children that which is important to them. If something does not make sense, the brain will drop it. Showing students how information will be used outside the classroom will help them make sense of it.
7. **The brain learns through experience.** Hands-on activities, role-playing, field trips, and simulations all enhance the learning experience.
8. **The brain is social.** Brains learn best with other brains. Cooperative learning is one of the nine strategies that raise student achievement (Marzano, Pickering, & Pollack, 2001).
9. **The brain learns in patterns.** New information that can be connected to a pattern of stored information is more easily remembered. Pattern recognition is our ability to take in and make sense of our environment. There are patterns in objects, actions, procedures, situations, relationships, and systems. (A young child drinks from a glass. Later she sees a small empty vase and picks it up and tries to drink from it.)
10. **The brain grows through enrichment.** Appropriate challenges, choices, novelty, and feedback all add to the enrichment experience.

Early Childhood Principles

According to the National Association for the Education of Young Children, the following 12 principles inform best practice when dealing with young children (National Association for the Education of Young Children, 1996).

1. **Domains of children's development—physical, social, emotional, and cognitive—are closely related. Development in one domain influences and is influenced by development in other domains.** Curriculum and teaching strategies should be organized in such a way that these domains are included in every aspect. The suggested developmentally appropriate strategies in each chapter of this book are categorized, yet they relate to the other domains as well.
2. **Development occurs in a relatively orderly sequence, with later abilities, skills, and knowledge building on those already acquired.** Just as children walk before they run, there are many readiness skills for reading and math. Children want and need the opportunity to practice their skills past perfection, so these skills become automatic and can be relied upon without much or any conscious processing. In this way, the brain has space and energy to apply new information to the old.
3. **Development proceeds at varying rates from child to child as well as unevenly within different areas of each child's functioning.** Because Jack isn't speaking the way his friend Madonna is doesn't mean that Jack is behind. One must consider gender differences, differences in experience, and what domain Jack is concentrating on. If his brain is busy practicing motor skills, it may not have the time and energy to work on speech. Once he has perfected some of his physical skills, he will work on other domains.

4. **Early experiences have both cumulative and delayed effects on individual children's development; optimal periods exist for certain types of development and learning.** Some children do not have the opportunities that others do. Children from poverty may have delayed development due to poor nutrition, lack of sleep, or lack of role models.
5. **Development proceeds in predictable directions toward greater complexity, organization, and internalization.** The brain develops from back to front. Children start with motor skills and sensory skills, and it is not until the frontal lobe makes enough connections that higher-level thinking takes place.
6. **Development and learning occur in and are influenced by multiple social and cultural contexts.** The brain learns through experience. The physical, emotional, and cognitive environment all influence learning and development. Our students come from varying cultures. It behooves us to learn about and understand these cultures in order to help our students learn and grow.
7. **Children are active learners, drawing on direct physical and social experience as well as culturally transmitted knowledge to construct their own understandings of the world around them.** The brain seeks meaning. That meaning will be based on the brain's background and experiences. Making learning relevant to our students is one of our biggest challenges. What is meaningful to one child may not be meaningful to another.
8. **Development and learning result from interaction of biological maturation and the environment, which includes both the physical and social worlds that children live in.** By making yourself aware of brain biology and brain development you can be better prepared to teach the way your students' brains learn.
9. **Play is an important vehicle for children's social, emotional, and cognitive development as well as a reflection of their development.** Play is included in the developmentally appropriate activities at every level of early childhood. Children learn implicitly through play. Implicit learning is longer lasting than most explicit learning.
10. **Development advances when children have opportunities to practice newly acquired skills as well as when they experience a challenge just beyond the level of their present mastery.** The brain loves repetition and challenge. Teachers must act as coaches as their students meet new challenges. It is through trial and error learning that the brain learns what is important to focus upon.
11. **Children demonstrate different modes of knowing and learning and different ways of representing what they know.** The brain is multimodal. It expresses itself in a multimodal fashion and it receives information through multiple senses.

12. **Children develop and learn best in the context of a community where they are safe and valued, their physical needs are met, and they feel psychologically secure.** The brain learns best when learning with other brains. Safety and predictability allow the brain to have lower levels of stress chemicals that may interfere with learning.

AN OUNCE OF PREVENTION

According to the National Association for the education of Young Children, early childhood begins at birth. The achievement gap can also begin then. What does a child need to have an even start? The McCormick Tribune Foundation has a ten-point list of what can boost brain power (McCormick Tribune Foundation, 1997).

1. **Interaction:** The brain is social. Interaction makes children feel that they are worth spending time with.
2. **Loving Touch:** The body thrives with touch. Greeting students at the door, addressing them by name, and touching their shoulders or shaking their hands can make a difference. Young children need lots of hugs.
3. **Stable Relationship:** Everyone needs a significant other in his or her life. If there is no one at home to give a child a stable relationship, you might be the one!
4. **Safe, Healthy Environment:** At home, this means keeping dangerous items out of the way, protecting children from lead, and giving them proper nutrition. At school, we can support good nutrition, offer them a safe environment, and help them feel like they belong.
5. **Self-Esteem:** Offering children positive reinforcement, appropriate feedback, and giving them doable challenges can help them feel good about themselves.
6. **Quality Child Care:** This must be provided by people who can be trusted by parent and child. Providers must be aware of human development and the needs that children have.
7. **Communication:** The more children are spoken to, the more they will understand. From listening comes speaking, and from speaking comes reading.
8. **Play:** Play is learning, and this kind of learning is fun. Brains want to learn and they want to have fun. One study found that children deprived of playtime at school developed ADHD symptoms. They had difficulty sitting still and could not focus their attention (Sunderland, 2006).
9. **Music:** Music provides patterns for the brain. It also affects mood and movement. For those children who are stressed, music can help them relax.

10. **Reading:** Read to children every day. Show pictures and let them make up stories. Write their stories down and show them how their words can become a story.

About This Book

What you will find in Chapter 1 of this book is background information about how the brain grows. Pertinent structures and functions are all defined for you, so that when these terms appear in subsequent chapters, you will have the background knowledge you need. This may be a refresher for some of you, so feel free to skip the chapter and go back to it if a question arises while you read the rest of the book.

Chapter 2 covers birth through the end of the second year. This is background for you as you read Chapters 3–8, which provide year-by-year child and brain development. Each of these chapters begins with a scenario of a child. This will give you an overall snapshot of the age level. Then you will read about the latest applications of research about the developing brain for that age. Reading and language developmental milestones follow. Language and literacy skills will affect both personal and school success. Physical development and motor skills are next and become even more important as research suggests the strong connection between movement and learning. Cognitive development will offer information on learning and memory. Social/emotional development affects every aspect of a child's life. Becoming familiar with these milestones will help in planning curriculum and instruction. How children progress in their personal relationships will influence their learning (Jacobs & Crowley, 2007). There are sample activities at the end of each chapter that are developmentally appropriate for the age group. Please remember that if you are teaching four-year-olds, you may easily have brains that are a year or two behind or a year or two ahead.

Brain Briefing

The boxes throughout the text provide added information. *They are not pullouts from the text.* These are bits of research to support the text and to add to your knowledge base. I hope you find them interesting and helpful.

Child development books offer you guidelines and possibilities. I cannot stress how important it is that we understand that all brains are different. If you use the information in this book or any other as a yardstick, someone is going to come up short. These are child and brain development phases rather than stages. We all like to put ages and stages together in a nice neat package. Children don't come with a user's manual. Look at the big picture. You will be teaching 10 to 20 (or more) students at one time. Their chronological ages will differ. Their brain ages will differ. Their genders will differ. Their parents will differ. Their background knowledge . . . need I go on? The ages given for

milestones are determined by the age at which 90 percent of children have achieved the objective. If a baby has been born prematurely, up until age two you must adjust the age by subtracting the number of months missed during pregnancy (Fields & Brown, 2006). It is impossible to include every potential behavior at any stage of development. What you will read are composite lists from the experts in their fields. The suggested developmentally appropriate activities are from my own experiences, from practitioners like you, and from child development experts. At the end of each chapter is a checklist that you can copy and use for each student. This is to help you determine what you need to consider when designing instruction and the physical environment.

You have the awesome responsibility of offering experiences to shape growing brains. Every day when you walk into your classroom, there are brains seeking learning. By understanding and teaching the way the brain learns best, you can stimulate an enduring love of learning.

My hope is that this information will also be used to enlighten the parents of your students as they watch the incredible development of their children!