Issue No. XI April, 2011

Nurture

Pakistan's Pioneer Publication on Early Childhood Development

Cognitive Development

Issue No. XI April, 2011

Nurture

Pakistan's Pioneer Publication on Early Childhood Development

Write to us:

Nurture Magazine

Sindh Education Foundation
Plot 9, Block 7, Kehkashan, Clifton 5,
Karachi - 75600, Pakistan.
E-mail: nurture@ecdpak.com
Website: www.ecdpak.com

Write for us:

We invite you to send us your stories, anecdotes and experiences related to children's growth and development at the above address.

For more information on ECD practices, issues, programs and tools log on to www.ecdpak.com

Nurture is published bi-annually by the Sindh Education Foundation. The opinions reflected in the various contributions and features do not necessarily reflect the views of Sindh Education Foundation, Aga Khan Foundation or the Embassy of the Kingdom of the Netherlands.

The children of Sindh Education Foundation's partner schools and RCC Programme schools are showcased in photographs that are used for the purpose of this publication. The pictures are taken with the consent of parents and children and are part of SEF's image bank.

Nurture is funded under the RCC: ECD Programme supported by the Embassy of the Kingdom of the Netherlands and coordinated by the Aga Khan Foundation, Pakistan.

AGA KHAN FOUNDATION
An agency of the Aga Khan Development Network

Koninkrijk der Nederlanden

What is Cognitive Development?

Previously, the commonly held belief was that infants did not possess the capability to think or form complex ideas and stayed without cognition until they learned language. This perception has changed since we now know that babies are aware of their surroundings and interested in exploration from the time they are born. From birth, babies begin to actively learn. They gather, sort, and process information from around them, using the data to develop perception and thinking skills. This is the process that we know as cognitive development. Cognitive development is the construction of thought processes, including remembering, problem solving, and decision-making, from childhood through adolescence to adulthood. It refers to how a person perceives, thinks, and gains understanding of his or her world through the interaction of genetic and learned factors. Among the areas of cognitive development include information processing, intelligence, reasoning, language development, and memory.

Cognitive Development is one of the crucial aspects of early child development. Research shows that brain development that takes place prenatally and in the first year of life is more rapid and extensive than any other time in a person's life. It is also much more vulnerable to environmental influence than previously suspected and the influence of early environment on brain development is long lasting. The environment affects not only the number of brain cells and number of connections among them, but also the way these connections are "wired" to establish the child's subsequent life. It is thus the parents and teachers role and responsibility that that no undue stress is put on the child and that he or she should be given a safe and healthy environment for optimal cognitive development.

Factors affecting Cognitive Development

There are many things that influence cognitive development in a child. Parents and caregivers need to be knowledgeable in the key aspects of brain development of children to ensure the facilitation of suitable care. Following are some of the factors given to provide guidance in an effort to understand and enhance brain development in children:

Important influences on brain development before birth

Many factors can influence fetal brain development, but most healthy pregnant women do not need to radically alter their lifestyles in order to promote optimal brain development. Good nutrition is important, since brain growth like the growth of the rest of the fetus' body is influenced by the quality of a pregnant woman's diet. Alcohol and cigarettes should be avoided, since these can impair the formation and wiring of brain cells. Some chemicals and forms of radiation are potentially harmful to fetal brain development, but most need concern only women exposed through their occupations--that is, those who work on farms or in factories, laboratories, hospitals or other sites that expose them to dangerous chemicals, radiation, or infections.

Infections pose perhaps the greatest risk to the developing fetus' brain. Many seemingly harmless infections can seriously interrupt fetal development, including the formation and wiring of brain cells. These include rubella (which causes German measles) and varicella virus (cause of chicken pox). Prenatal testing and treatment can minimize the risk of some of these, but generally speaking, pregnant women can best protect their babies' brains by practicing strict hygiene.

Nature & Nurture

Genes and environment interact at every step of brain development, but they play very different roles. Generally speaking, genes are responsible for the basic wiring plan for forming all of the cells and general connections between different brain regions--while experience is responsible for fine-tuning those connections, helping each child adapt to the particular environment (geographical, cultural, family, school, peer-group) to which he belongs. The connections between brain cells in a child's brain are developing constantly. Current thinking suggests that about 30 percent to 60 percent of the brain's wiring depends on heredity, while about 40 percent to 70 percent develops based on interactions with the environment, including parents. A parent's care and guidance are much more likely to influence certain aspects of the brain.

How experiences shape the brain

The brain literally is growing new connections on a constant basis. Brain development is "activity-dependent," meaning that the electrical activity in every circuit—sensory, motor, emotional, cognitive--shapes the way that circuit gets put together. Research has shown that experiences with new kinds of activity or stimulation can generate growth in the brain within only a few hours after the experiences begin. Every experience whether it is seeing one's first rainbow, riding a bicycle, reading a book, sharing a joke, excites certain neural circuits and leaves others inactive. Those that are consistently turned on over time will be strengthened, while those that are rarely excited may be dropped away. Frequent new learning experiences and challenges are like "nutrients" to the brain that enhance growth.

Role of Parents

Parents are an essential part of a child's development. Infants prefer human stimuli, face, voice, touch, and even smell over everything else. They naturally orient to people's faces and would rather listen to a speech or singing than any other kind of sound.

Just as newborn babies are born with a set of very useful instincts for surviving and orienting to their new environment, parents are equally programmed to love and respond to babies' cues. Most adults instinctively want to nurture and protect infants. It is certainly no accident that the affection most parents feel towards their babies and the kind of attention they give them: touching, holding, comforting, rocking, singing and talking to, provide precisely the best kind of stimulation for their growing brains. Because brain development is so heavily dependent on early experience, most babies will receive the right kind of nurturing from their earliest days, through loving urges and parenting instincts. Loving, responsive care giving seems to provide babies with the ideal environment for encouraging their own exploration, which is always the best route to learning.

Nutrition

Brain development is most sensitive to a baby's nutrition between mid-gestation and two years of age. Children who are malnourished, not just fussy eaters but truly deprived of adequate calories and protein in their diet, throughout this period do not adequately grow, either physically or mentally.

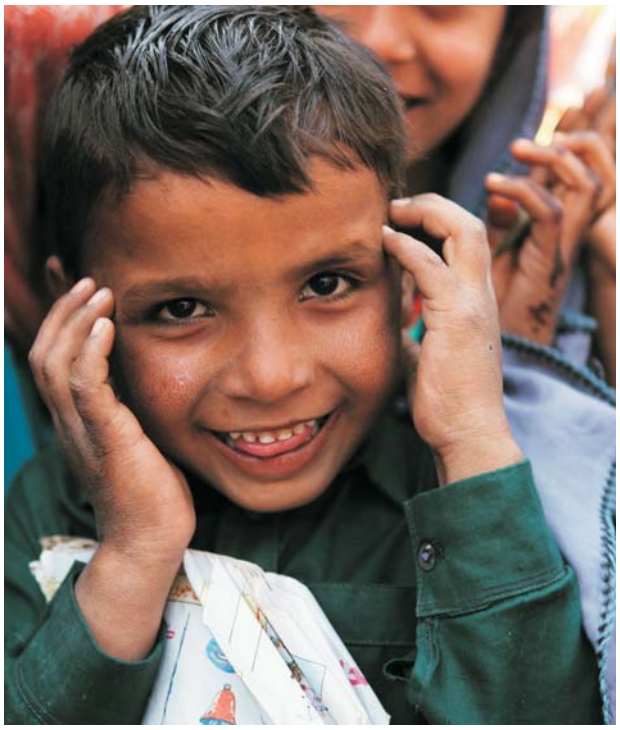
Some of the foods that aid in brain functioning include proteins, unsaturated fats, vegetables, complex carbohydrates and sugars. Some of the specific foods that children should eat more of to stimulate brain function and growth are leafy green vegetables, fish, nuts, lean meats, fresh fruits and dairy products. Vitamin and mineral supplements also can be helpful. Be careful if the child has particular food allergies.

In addition, drinking lots of water is helpful in learning, and children should be taught to drink water throughout the day to help them maintain energy levels and attentiveness.

An enriched learning environment

Research on brain development has shown that two key components enrich the learning environment that stimulates brain development.

First, children must have a continuous flow of new information and experiences that are challenging and allow them to solve problems. Too much or too little challenge leads to problems. Children should experience a variety of ways to learn, either by being



introduced to new material, which adds levels of difficulty to a learning situation, or by new learning techniques.

Second, children should be given feedback about how they are learning. Feedback to children should be specific and given soon after an experience. Parents should allow children to explore with them and give constructive feedback that allows a child to make changes and improve over time.

Activities that enhance children's overall brain development

Children benefit from a variety of different activities. However, three critical activities that contribute considerably to overall brain development are music, art and physical activity.

First, music engages all aspects of the brain and stimulates multiple aspects of brain functioning. Children should be exposed often to many different kinds of music, but especially rhythm and repetition in music and songs.

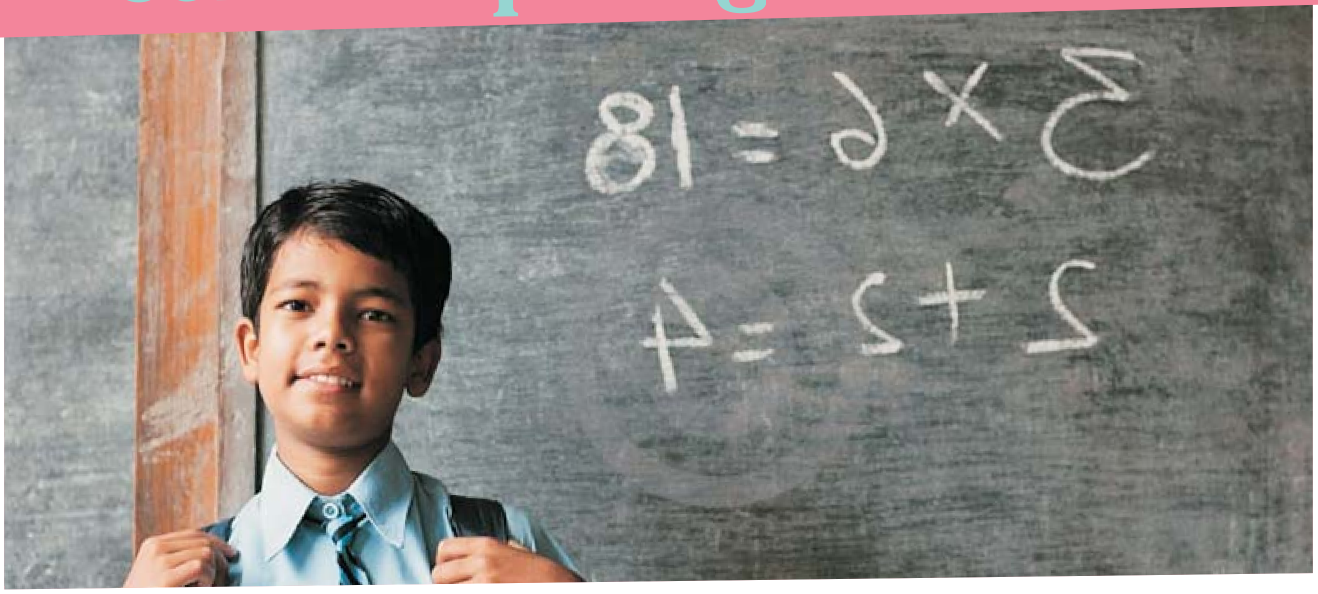
Second, art engages a variety of the brain's areas that help children learn emotion, cognition and memory. Children should receive many opportunities to draw, paint, craft and create using different types of art.

Third, physical activity and movement help stimulate much brain growth and facilitate key connections for learning. Regular exercise and engagement in all varieties of physical activity are critical for healthy brain development in children.

Cognitive Development

Age Range	Activity
One month	Watches person when spoken to.
Two months	Smiles at familiar person talking. Begins to follow moving person with eyes.
Four months	Shows interest in bottle, breast, familiar toy, or new surroundings.
Five months	Smiles at own image in mirror. Looks for fallen objects.
Six months	May stick out tongue in imitation. Laughs at peekaboo game. Vocalizes at mirror image. May act shy around strangers.
Seven months	Responds to own name. Tries to establish contact with a person by cough or other noise.
Eight months	Reaches for toys out of reach. Responds to "no."
Nine months	Shows likes and dislikes. May try to prevent face-washing or other activity that is disliked. Shows excitement and interest in foods or toys that are well-liked.
Ten months	Starts to understand some words. Waves bye-bye. Holds out arm or leg for dressing.
Eleven months	Repeats performance that is laughed at. Likes repetitive play. Shows interest in books.
Twelve months	May understand some "where is...?" questions. May kiss on request.
Fifteen months	Asks for objects by pointing. Starting to feed self. Negativism begins.
Eighteen months	Points to familiar objects when asked "where is...?" Mimics familiar adult activities. Know some body parts. Obeys two or three simple orders.
Two years	Names a few familiar objects. Draws with crayons. Obeys found simple orders. Participates in parallel play.
Two-and-a-half years	Names several common objects. Gives full names. Helps to put things away. Peak of negativism.
Three years	Constantly asks questions. May count to 10. Begins to draw specific objects. Dresses and undresses doll. Participates in cooperative play. Talks about things that have happened.
Four years	May make up silly words and stories. Beginning to draw pictures that represent familiar things. Pretends to read and write. May recognize a few common words, such as own name.
Five years	Can recognize and reproduce many shapes, letters, and numbers. Tells long stories. Begins to understand the difference between real events and make-believe ones. Asks meaning of words.

Mistakes: Letting Children learn through Experience



Making mistakes is a part of life. Everyone makes them, especially children with their lack of experience. What's important is how we learn from them. Despite this, children are raised in a society that pressures them to be perfect and intelligent - to achieve the highest test scores, to be the prized pupil, and get ahead of everyone else. Parents and teachers strengthen this pressure when they cover up children's mistakes, correct homework to improve grades, or drill knowledge into kids until they get it right. The stress is amplified when children are constantly praised for their intelligence. How does this focus on perfection and IQ affect learning? And how can we help children believe in themselves by accepting their mistakes and learning from them?

Historically, many educators have created conditions for learning that do not encourage errors. And caregivers have followed suit. For example, if we drill children over and over again with the same math problem, they will eventually remember the answer. And if they are lucky, they will remember the answer on a standardized test.

This approach to learning assumes that if students are allowed to make mistakes, they will not learn the correct information. However, recent research shows this to be an incorrect assumption. In fact, studies have found that learning is enhanced when children make mistakes.

Whether it involves homework, developing friendships, or playing games, learning is enriched through error. Making mistakes is part of how kids are challenged to learn to do things differently. It motivates them to try new approaches.

Studies have shown the importance of challenging children, even if they get things wrong. They have shown that praising children for their intelligence can actually make them less likely to persist in the face of challenge. To illustrate, 5th grade children in schools were divided into two groups for a social experiment. One group was praised for their intelligence while the other group was praised for their effort.

When the 5th graders were challenged with an extremely difficult test designed for a higher class, a surprising result occurred. The students who had been praised for their effort worked very hard, even though they made a lot of mistakes. The kids praised for being smart became discouraged and saw their mistakes as a sign of failure. Intelligence testing for the kids praised for their effort increased by 30% while the kids praised for their intelligence dropped by 20%.

These results show caregivers that glowing, unconditional praise that masks errors and mistakes is harmful to children's development. Being too quick with praise can be as detrimental as correcting mistakes that would have provided opportunities for learning.

Children make many kinds of mistakes. Some mistakes, like forgetting a homework assignment or not studying for an important test, have expected consequences. Others like lying, cheating, or actions that negatively affect friendships, have more complicated causes and are more complex to remedy. But all mistakes contain seeds of learning.

Boys & girls mental growth: A comparison

Even in families that give their girls toy cars and encourage their boys to play with dolls, more often than not, the girls will choose a barbie over a racing car, and the boys will take a toy gun over a doll any day.

What is the reason behind this? There is no doubt over the fact that some of this behavior is learned. However the gap between males and females goes deeper than how they have been brought up. Scientists suspect that even before birth, boys' and girls' brains are developing differently, shaping them into distinct beings.

Difference between male and female brain: Fact or fiction?

Fact. We know there are physical differences between a boy's brain and a girl's, both at birth and as children grow. But at least for now, exactly how those differences affect behavior, personality, and so on is a mystery.

For example, scientists say there probably is an area of the brain that propels many boys toward things that move and many girls toward nurturing, but it has yet to be identified.

Male cognitive development before birth

Boys in the womb are high on testosterone. In fact, studies regarding early brain development state that male babies are born with as much testosterone as a 25-year-old man. After birth, testosterone plummets until a boy reaches puberty.

Among its many other jobs, testosterone shapes a male's developing brain. Animal studies show that it pares down the connections between brain cells in some places and bulks them up in other places.

One study found that both male and female lab animals who were exposed to extra testosterone before birth performed better at maze tests shortly after birth. While scientists aren't ready to draw conclusions about humans based on this study, it is an indicator that testosterone may improve spatial reasoning.

Animal studies also show that in any male, some regions make connections typical of males, but some parts remain feminine. Research says that there's really no such thing as a completely male brain but usually an assortment of male and female.

Female cognitive development before birth

Girls make some testosterone before they're born, too, but not nearly as much as boys. And while girls do produce female hormones such as estrogen, these seem to have little impact on their developing brains. In other words, girls have the brain that boys would have if theirs weren't reshaped by testosterone.

Boys and girls mental growth: A comparison

Once girls and boys are born, their brains continue to take different paths. MRI studies show that some areas grow faster in female brains while others grow faster in

male brains. So, the brains of boys and girls who are the same age can be at different developmental stages. Eventually, though, they catch up with each other.

Size also varies. Male brains grow slightly larger than female brains, although the significance of this isn't clear.

Some research has shown that in girls, the region of the brain that helps control language and emotion – called the caudate – tends to be larger. This part of the brain becomes especially active when someone looks at a photo of a loved one.

Studies also indicate that part of the larger corpus callosum, which connects the two sides of the brain, is larger in girls than in boys. Some scientists think this could mean that girls tend to use both the left and right sides to solve problems.

In studies on animals, males have been found to have a slightly larger amygdala, a region of the brain that controls deeper emotions, such as fear.

These seemingly small differences in brain structure don't necessarily mean boys will be better at certain things and girls at others. Young brains are extremely plastic, and key regions grow or shrink depending on how they're used.

Do women tend to cry more easily than men because their brains are built to make them that way? Or are their brains shaped by their emotions? Or is it a little bit of both? We just don't know yet.

Adding to the mystery, individuals simply don't always conform to the stereotypes. There are plenty of "tomboys" who show little interest in dolls, and boys who are drawn to "girl" activities from an early age. These kids are well within the norm.

A difference in thinking?

Scientists with the National Institutes of Health are piecing together the results from the MRIs of brains of 500 healthy young boys and girls to try to answer some key questions about the development of young brains. Already, they've made some interesting findings:

In most tests, boys and girls showed very similar abilities. They were equally competent at math, raising the possibility that any gap in math skills in later years is a product of culture, not biology.

Girls were somewhat better at memorizing and reciting lists of words, and they were slightly better at tasks that required finger dexterity and quick thinking.

Boys had the upper hand with spatial tasks, such as arranging blocks to form patterns.

Nothing is set in stone

Above all, the brain is flexible. Children build connections between brain cells, find fresh obsessions, and hone new skills as they read, listen, watch, and learn.

A girl who plays exclusively with dolls this month might move on to construction toys and blocks next month. Even if she never develops a fascination with toy cars, she may very well enjoy her bike and learn how to fix a chain. A boy may never play house with a doll, but he can learn how to take care of a pet and later raise a baby of his own.

It just goes to show that 'Biology is not destiny.'

10

Tips to Help Kids Learn from Mistakes

- Acknowledge that you don't expect your children to be perfect.
- Let them know your love is unconditional, regardless of their mistakes or lapses in judgment.
- Don't rescue children from their mistakes. Instead, help them focus on the solution.
- Provide examples of your own mistakes, the consequences, and how you learned from them.
- Encourage them to take responsibility for their mistakes and not blame others.
- Avoid pointing out their past mistakes. Instead, focus on the one at hand.
- Praise them for their ability to admit their mistakes.
- Praise them for their efforts and courage to overcome setbacks.
- Mentor them on how to apologize when their mistakes have hurt others.
- Help them look at the good side of getting things wrong

A Teacher's Guide to Brain Development

Over the last 40 years we have learned more about the human brain than in the previous 400 years. Educators and neuroscientists have been trying to put this knowledge to work by transforming the information of basic and clinical neurosciences into practical insights for the classroom. In this article we will be looking at how the brain works and what this can tell us about teaching for optimal learning.

First, however, it is important to remember that all learning is brain-based. Through the process of education, we are trying literally to change the brain. Indeed, education is practical neuroscience. That does not mean that every teacher needs to become a neuroscientist or memorize 100 neurotransmitters and 50 brain areas responsible for cognition. But it does mean that teachers can become more effective with some knowledge of how the brain senses, processes, stores, and retrieves information.

Mind Fatigue

Learning requires attention. And attention is mediated by specific parts of the brain. Yet, neural systems fatigue quickly, actually within minutes. With three to five minutes of sustained activity, neurons become "less responsive"; they need a rest (not unlike your muscles when you lift weights). They can recover within minutes too, but when they are stimulated in a sustained way, they just are not as efficient. Think about the piano and the accordion; if you put your finger on the organ key and hold it down it will keep making noise, but the piano key makes one short note, and keeping your finger there produces no more sound. Neurons are like pianos, not accordions. They respond to patterned and repetitive, rather than to sustained, continuous stimulation. Why is this important for a teacher?

When a child listens as you say, "Quaid-e-Azam was 6' tall," he uses one neural system (call it A). When he is told about a concept related to that fact ("The average height of men during the partition was only 5'8", a slightly different, but functionally interconnected neural set (B) is used. When she listens to a description: "Jinnah, at the darkest moment in the partition, when his people were deep in the despair, hopeless and dejected, slowly rose to his full height and, using his dominant personality was able to motivate his discouraged people to continue fighting for an independent state," yet other related neural systems are active (C and D). These interrelated neural systems are all important in learning; indeed, our students will learn more completely if they make "changes" (create memory) in all of these neural systems (A, B, C, and D). Facts are empty without being linked to context and concepts.

When a child is in a familiar and safe situation, his or her brain will seek novelty. So, if this child hears only factual information, she will fatigue within minutes. Only four to eight minutes of pure factual lecture can be tolerated before the brain seeks other stimuli, either internal (e.g., daydreaming) or external (Who is that walking down the hall?). If the teacher is not providing that novelty, the brain will go elsewhere. Continuous presentation of facts or concepts in isolation or in a nonstop series of anecdotes will all have the same fatiguing effect — and the child will not learn as much, nor will he come to anticipate and enjoy learning.

The best presentation, the most engaging and effective teaching, has all three elements. And it is very important how the teacher puts these elements together.

Engage the Student

The most effective presentation must move back and forth through these interrelated neural systems, weaving them together. These areas are interconnected under usual circumstances, like a complete "workout" in the gym where we rotate from one station to another. Similarly, in teaching, it is most effective to work one neural area and then move on to another. Engage your students with a story to provide the context. Make sure the story can touch the emotional parts of their brains. This will activate and prepare the cognitive parts of the brain for storing information. Information is easiest to digest when there is an emotional aspect to it — humor, empathy, sadness, and fear all make "dry" facts easier to swallow. Give a fact or two; link these facts into related concepts. Move back to the narrative to help them make the connection between this concept and the story. Go back to another fact. Reinforce the concepts. Reconnect with the original story. In and out, bob and weave, among facts, concept, and narrative.

Human beings are storytelling primates. We are curious, and we love to learn. The challenge for each teacher is to find ways to engage the child and take advantage of the novelty-seeking property of the human brain to facilitate learning.

Cognitive Development Myth or Fact?

As scientists learn more about how the human brain develops, many of our ideas about the brain are being challenged. We are learning that some old ideas actually were myths, and they are being replaced with new facts and understanding. We are also learning that children keep learning and that brain development is an important key to a child's long-term mental development.

Consider the following examples – what is myth and what is fact?

Myth At birth the brain is fully developed, just like one's heart or stomach.

Fact Most of the brain's cells are formed before birth, but most of the connections among cells are made during infancy and early childhood.

Myth The brain's development depends entirely on the genes with which you are born.

Fact Early experience and interaction with the environment are most critical in a child's brain development.

Myth A toddler's brain is less active than the brain of a college student.

Fact A 3-year-old toddler's brain is twice as active as an adult's brain.

Myth Talking to a baby is not important because he or she can't understand what you are saying.

Fact Talking to young children establishes foundations for learning language during early critical periods when learning is easiest for a child.

Myth Children need special help and specific educational toys to develop their brainpower.

Fact What children need most is loving care and new experiences, not special attention or costly toys. Talking, singing, playing and reading are some of the key activities that build a child's brain.

Children's Learning

Children's learning can be more effective if the following considerations are taken into account:

1. Children are not "empty vessels." Children come to school with previous experience and insights.
2. Children want to learn. The natural curiosity of children can be used to help them learn without presenting material as a lesson.
3. Children learn best when using a range of senses.
4. Children like to copy. Children easily pick up both bad and good habits, so good role models are needed at school and at home.
5. Children need to learn information that is relevant. Learning needs to be related to a child's environment, because learning is not limited to the classroom environment.
6. Children need praise. Positive reinforcement helps children to experiment successfully.
7. Children love to play. Playing is an active form of learning.

Keep an Eye out

According to the National Institute of Child Health and Human Development , a child should immediately be evaluated for autism if the child:

- Doesn't babble or coo by 12 months of age.
- Doesn't point, wave, grasp or make other gestures by 12 months.
- Doesn't say single words by 16 months.
- Doesn't say two-word phrases on his or her own by 24 months.
- Has any loss of any language or social skill at any age.

References

m/tidbits/comp-games-brain.htm
http://www.babycenter.com/
http://www.psychologytoday.com/
http://www.ag.ndsu.edu/pubs/yf/famsci/fs609w.htm
Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health, 5th ed. and Child Development Institute, http://www.childdevelopmentinfo.com.
http://www.answers.com/topic/cognitive-development#ixzz1YhXuA7hV
http://www.schoolsanitation.org/BasicPrinciples/ChildrensLearning.html
http://www.raisesmartkid.com/all-ages/1-articles/17-brain-development-of-children
http://main.zerotothree.org/site/PageServer?pagename=ter_key_brainFAQ