The Principle of Brain Plasticity

He was almost a year old. His chubby little legs still would not support him without something to hold on to, but he could pull up to his aunt’s coffee table and explore this new surface and all the things on it. Right on top he saw the vivid colors, bright lights, white steam, and all the silver and black pipes that curved and wound all over the cover page. With great excitement he patted the magazine his oil executive uncle had been reading as he shouted, “Catalytic cracker!” Everyone in the room stopped talking and stared at the baby. How could a baby know what the unit of refinery equipment was called? How could he even be talking at all? He must be a genius.

His mother was a bit embarrassed at the disruption, but explained to the room full of adults that between their house and downtown they often drove by a refinery, and at night it looked just like the picture the child had discovered on the table. She had told him the name of it, and he enjoyed saying it and especially enjoyed seeing it lit-up at night. To her it seemed very natural that he would enjoy sharing his discovery with everyone else. As he was her first child, she did not realize that the discussions and wood games they shared were seen as unusual by this group of adults of the 1950s. Only much later would she discover that the learning environment that she was providing at his very young age would be part of the conditions that would allow the development of what was later to be identified as giftedness.

NEW DISCOVERIES

Until the 1960s everyone accepted the “fact” that the brain developed in a regular, pre-determined and highly specified order that was totally age-related. Only in rare instances, usually under conditions of dire impoverishment, was it thought possible for children to perform differently than their genetic inheritance dictated. Even then, it was thought that there were built-in hallmarks of development that were age-controlled—activities such as sitting up and talking. So it was with great excitement that a team of neuroscientists at a brain research laboratory at the University of California, Berkeley, found that the brain actually develops. It led the way for the development of more sophisticated equipment that has allowed researchers to explore further into the structure and operations of the human brain.

WHY IT MATTERS

From the principle of brain plasticity—the understanding of how the brain changes and the importance of the environment to the development of the brain—has come a new realization of the significance of education, especially early education. Knowing that what the child learns will affect the structure and function of the child’s brain makes both the environment and the learning experiences within it critical to the development of a child’s potential. The plasticity in this interaction affects the child’s future, highly influencing what the child may become.

Brain plasticity also allows functional areas of the brain to be extended and enlarged, systems of cells to become more complex, and it allows more connections so that skills and abilities can be refined and perfected; this makes it possible for experience to further support an ability, both mentally and physically. For example, the specializations of the movement and skills developed by musicians who play different instruments have been found to grow and enhance different pathways within their brains. Differences between novices and highly skilled symphony musicians can also be found in the development of the cells and pathways of the brain.

The discovery of the principle of brain plasticity also changes our concept of giftedness. We can no longer think of high levels of intelligence (i.e., giftedness) as being solely inherited. We must now view the patterns and pathways of the brain as a genetic inheritance that can be developed or denied depending on environmental opportunities and learning experiences. Being a teacher, whether at home or in a classroom, must now be more appropriately valued and appreciated.

USES AND OUTCOMES

The development of intelligence depends on the interaction between biological inheritance and environmental opportunities to use this inheritance. The accompanying suggestions will help you create an environment that can support the principle of brain plasticity in your home or classroom. The development of a responsive learning environment is an important beginning. Begin this process at as early an age as possible.

AT HOME

Organize a designated area, for example, in the child’s room or a playroom, so that it is attractive and has many types of learning...
activities available at many levels of difficulty. For example,
• Provide mirrors, pictures hung at the child’s level, and low shelves that can hold many ways the child can explore learning.
• Make use of light, sound, color, and a variety of materials and activities stimulating to all of the senses.
• Provide a variety of toys and household objects to play with, including construction toys, books, art materials, puzzles, chairs, and a table.
• Include toys for floor play, climbing and crawling areas, and activities that require movement.
• Include activities for creating and problem solving.
• Provide choices and ways to stir your child’s curiosity.
• Talk with your child, look at books, and discuss what you read.
• Take walks together and hunt for treasures; discuss what you see (these trips are good beginnings for science discussions).
• Cook and clean together.
• Introduce unexpected and discrepant information.

AT SCHOOL
Optimal learning requires that the environment be viewed as a support for learning, including the physical environment, social-emotional environment, and the instructional environment.

Physical environment. The environment must be stimulating and include appropriate challenges that encourage curiosity and exploration.
• Develop an environment that is attractive, organized, and conducive to learning.
• Arrange the environment to be more like a laboratory or learning workshop, rich in materials at many levels that are accessible to the students.
• Organize the environment to provide simultaneous access to many activities.
• Designate areas to maximize time, space, and encourage variety in learning.
• Use classroom furniture and space to support instruction.
• Provide room for and inclusion of movement as part of the learning activities.

Social-emotional environment. Stress produces biochemistry from the adrenal cortex that dampens cerebral cortical function; therefore, fear, threat, anxiety, and tension must be minimized in the learning environment.
• Create an open, respectful, and cooperative relationship among teachers, students, and parents that includes planning, implementing, and evaluating student learning.
• Create a climate that is positive, supportive, and productive.
• Plan activities to build trust and psychological safety.
• Use team teaching as support for the students and the teachers.
• Share the responsibility for learning between teachers and the students.

Instructional environment. The brain responds to novelty, to the unexpected, and to discrepant information; therefore, novelty should be used to motivate and enhance the process of learning.
• Use a flexible, complex structure that can meet the needs of each student and can allow for individualized instruction.
• Use a curriculum in which the needs and interests of the students provide the base from which the core curriculum is presented, extended, and differentiated.
• Provide access to a variety of materials that have a range of levels, are novel, and use multi-sensory approaches.
• Use a minimum of whole-group lessons; focus instruction on flexible, small groups, and individuals.
• Use grouping practices that are flexible, multi-age, determined by need, and heterogeneous and/or homogeneous when it best fits the instruction and the needs of the students.
• Allow students to be involved and active as participants in the learning process.
• Encourage movement, choice, decision-making, self-directed learning, and inquiry.
• Use assessment, contracting, and evaluation as tools to aid in the growth of the student.
• Use cognitive, affective, physical/sensing, and intuitive activities as valued parts of the classroom experience to support learning.
• Use learning excursions beyond the classroom as a part of the instructional experience.

The limit of the potential for development of the brain is essentially unknown for most individuals since the dynamic nature of the brain allows intellectual growth to progress or regress—not remain static. Therefore, continuous progress from the student’s level of mastery must be available to all learners. There are exciting clues in brain research that can help parents at home and teachers in school to optimize learning experiences for the youngsters with whom they work. The principle of plasticity strongly suggests that the environment and the experiences that the environment provides be carefully monitored so that the growth of intelligence is facilitated and expanded rather than limited and inhibited. A stimulating, responsive environment is critically important to the development of a strong, integrated, flexible, and complex brain—a brain that can produce giftedness.

REFERENCES