Teaching to the Brain's Natural Learning Systems

1

The Brain's Natural Learning Systems

Hundreds, maybe thousands of books about the brain have been published during the past 12 to 15 years, probably more than in the many decades before. Without question, educators want to learn as much as possible about how the brain functions in the limited time available to them for personal study. After all, teachers are responsible for what happens to somewhere around 20 to 150 young brains every school day. Even so, one might ask, "Do educators really need to understand how the brain functions to be effective teachers?" Probably not, because some teachers naturally stimulate and sustain the enjoyment of learning in youngsters. A teacher can have a storehouse of information about brain functioning and remain ineffective. Nonetheless, even the most successful teacher can use an introductory knowledge of how the brain functions to answer perplexing questions about why specific teaching techniques either work or do not.

In *Multimind: A New Way of Looking at Human Behavior*, Robert Ornstein (1986) describes different ways of learning as the brain's natural operating systems. He is not talking about different intelligences, which are advanced by Howard Gardner (1983) in *Frames of Mind*. Rather, Ornstein, a psychologist and neurobiologist, approaches the brain as a biological organ of multisystems related to brain structures:

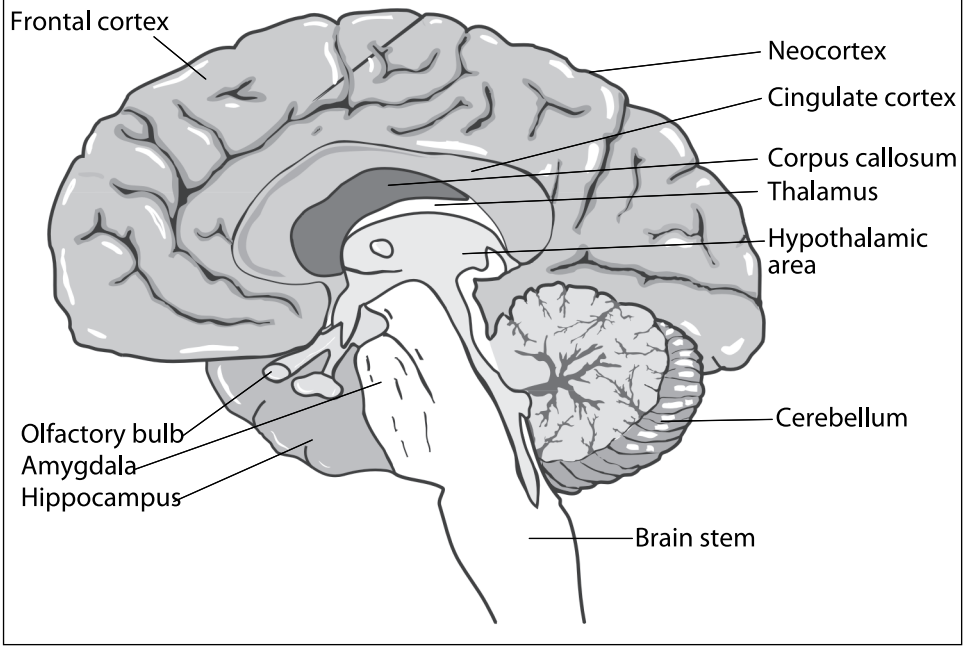
> Stuck side by side, inside the skin, inside the skull, are several special-purpose, separate, and specific small minds . . . . The particular collection of talents, abilities, and capacities that each person possesses depends partly on birth and partly on experience. Our illusion is that each of us is

> At the molecular level, scientists use biochemical probes to identify sites where emotional information is processed. Once the site is identified, then cellular analysis is done to determine which neurons and synaptic connections mediate the emotion. Finally, at the behavioral level, populations of neurons and specialized circuits are linked to see how the whole brain participates in the behavior. (p. 514)

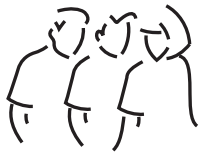
In part, emotions are chemical reactions to experiences that thwart or stimulate our desires—especially the desire to survive physically and psychologically. It is not yet clear where all the systems of emotion are located, but neurologist Joseph LeDoux (1996), author of *The Emotional Brain*, suggests that the major emotional systems of fear include the amygdala, the frontal cortex, and the cingulate cortex (semicircular structures that wrap around the mid portion of the brain known as the limbic area) (Figure 2.1). LeDoux identified visual and auditory neuronal pathways that go

—FIGURE 2.1—

LATERAL VIEW OF THE HUMAN BRAIN



3



The Social Learning System

The study of social learning is emerging as a critical area of neurobiological investigation. In fact, researchers have identified several neural structures and chemistries that relate to specific social needs and social emotions; however, much of what we might say about the social subsystems is speculative.

Structures of Social Learning

Research suggests that the right hemisphere is more important than the left for social interactions. Although social skills are not localized in any one part of the cerebral cortex, much has been learned about the importance of the orbitofrontal cortex for social judgments, as seen in the case of Phineas Gage's accident.

The orbitofrontal cortex covers the brain just above the bones that form the eye sockets or *orbits*, hence the term *orbitofrontal* (Carlson, 1995). Fontal lobe lobotomies take place in this area. When lesions occur in this part of the brain, aggressive animals become so docile they no longer showed fear of their natural enemies. For instance, Carlson reports on the work researchers did with a chimpanzee named Becky in 1935. She had violent temper tantrums whenever she responded to tests incorrectly; she rolled on the floor, defecated and urinated, and failed to respond to additional tasks. After removal of the frontal lobe, Becky became a model student, but failed to register any emotion to her natural enemies such as snakes. After undergoing similar operations, other monkeys found their social status plummet immediately when reintroduced to their group. They were treated like outcasts, attacked and forced to leave (Gazzaniga, Ivry, & Mangun, 1998).

Educational Considerations

What can educators do with research about the physical learning system? Can we touch children in loving, caring ways without violating the "hands-off-students" policy designed to protect children? I believe we can. By saying to students, "That was a superb job! May I shake your hand? (. . .pat you on the back? . . .give you a hug? . . . give you a high five?)" we are conveying warmth while also giving children the authority to respond within their comfort zones. If a slight touch unnoticed by college students changed how the library services and the librarian were perceived, then incidentally touching a child's hand could trigger brain chemicals that help a child feel worthwhile in the classroom—provided the touch is coming from a nurturing person.

With regard to tactual and kinesthetic input, teachers can transform any concept or idea—no matter how abstract—into manipulative materials or experiential activities, such as play acting, authentic problem-solving, active games, art projects, or service learning. The list is limited only by a teacher's lack of imagination and unwillingness to explore and experiment with active alternatives to traditional paper-and-pencil tasks. If educators believe in the old mission statement, "Take each child where he or she is and teach from there," then we must accept the fact that the majority of children need physical activity and hands-on experiences to develop academic skills. No rational teacher expects children to change how they learn any more than they expect children to change their eye color. Yet, when children are required to spend at least five hours a day in environments unfriendly to how they learn, is it any wonder many children lose interest in the schooling process?

Keeping the Physical Learning System in Balance

The brain's physical learning system transforms passions, visions, and intentions into *actions* because this operating system is propelled by the *need to do*. Obviously, the physical system likes movement, activity, and hands-on learning; and the neurobiological structures and networks busily accommodate.

Math and science teachers have long known the value of manipulatives for helping students learn abstract concepts: Math teachers use Cuisenaire rods to teach mathematical comparisons, and science teachers use colored sticks and Styrofoam balls to build models of molecules. Manipulatives have their place in language arts, too. They can help students "see" the main idea and structure of a reading, as well as identify opportunities for revision of their writing.