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Great Public Schools for Every Child

12 Principles for Brain-Based Learning

Implications for the Classroom

Previously published in NEA's Doubts & Certainties

The Caines developed their 12 principles for brain-based learning in 1989 and have modified and refined them over the years. This article from NEA's Doubts & Certainties (1994) discusses the implications of these principles for the classroom.

Educators Renate and Geoffrey Caine define brain-based learning as that which immerses children in a multiplicity of complex experiences -- both authentic and fantasy -- and then provides a number of ways for them to process those experiences, including reflection, critical thinking, and artistic elaboration.

The Caines propose the following 12 principles for brain-based learning:

1. **The brain is a parallel processor.** The brain ceaselessly performs many functions simultaneously. Thoughts, emotions, imagination, and predispositions operate concurrently and interact with other brain processes involving health maintenance and the expansion of knowledge.

   Education must embrace and use all the dimensions of parallel processing.

2. **Learning engages the entire physiology.** The brain functions according to physiological rules. Learning is as natural as breathing, and it is possible to either inhibit or facilitate it. In fact, the actual "wiring" of the brain is affected by our life and educational experiences.

   Anything that affects our physiological functioning affects our capacity to learn.

3. **The search for meaning is innate.** The search for meaning (making sense of our experiences) is survival-oriented and basic to the human brain. The brain needs and automatically registers the familiar while simultaneously searching for and responding to novel stimuli.

   Both familiarity and novelty must be combined in a learning environment.

4. **The search for meaning occurs through "patterning."** In a way, the brain is both scientist and artist, attempting to discern and understand patterns as they occur and giving expression to unique and creative patterns of its own. The brain resists having meaninglessness imposed on it.

   Effective education must give learners an opportunity to formulate their own patterns of understanding. That means learners need a chance to put skills and ideas together in their own way.

5. **Emotions are critical to patterning.** What we learn is influenced and organized by emotions and mindsets involving expectancy, personal biases and prejudices, self-esteem, and the need for social interaction. Emotions and thoughts literally shape each other and cannot be separated.

   A*n appropriate emotional climate is indispensable to sound education.*

6. **Every brain simultaneously perceives and creates parts and wholes.** Although there is some truth to the "left-brain, right-brain" distinction, that is not the whole story. In a healthy person both hemispheres interact in every activity, from art and computing to sales and accounting. The "two-brain" doctrine is most useful for reminding us that the brain reduces information into parts

and perceives holistically at the same time.

Good training and education recognizes this simultaneous perceiving and creating of parts and wholes. One way to accomplish this is by introducing global projects and ideas from the very beginning.

7. **Learning involves both focused attention and peripheral perception.** The brain absorbs information of which it is directly aware, but it also absorbs information that lies beyond the immediate focus of attention. In fact, the brain responds to the entire sensory context in which teaching and communication occur. These "peripheral signals" are extremely potent.

   Educators, therefore, can and should pay extensive attention to all facets of the educational environment.

8. **Learning always involves conscious and unconscious processes.** Much of our learning is the result of unconscious processing. Moreover, it is the entire experience that is processed. That means that much understanding may NOT occur during a class, but may occur hours, weeks, or months later.

   Educators must organize what they do so as to facilitate the subsequent unconscious processing of experience by students.

9. **We have (at least) two types of memory systems: spatial and rote learning.** Our natural spatial/autobiographical memory system registers everything -- down to the details of your meal last night. It is always engaged, is inexhaustible, and is motivated by novelty. We also have a set of systems for rote learning, or recalling relatively unrelated information. These systems are motivated by reward and punishment. Thus, meaningful and meaningless information are organized and stored differently.

   The only way for people to deal effectively with vast amounts of new information and regular retraining is to learn for meaning.

10. **The brain understands and remembers best when facts and skills are embedded in natural spatial memory.** Our native language is learned through multiple, interactive experiences. It is shaped by internal processes and by social interaction.

    Any complex subject is given meaning when embedded in real experience.

11. **Learning is enhanced by challenge and inhibited by threat.** The brain learns optimally -- makes maximum connections -- when appropriately challenged. But the brain "downshifts" -- becomes less flexible and reverts to primitive attitudes and procedures -- under perceived threat.

    Educators must create and maintain an atmosphere of relaxed alertness, involving low threat and high challenge. That also needs to be the state of mind of the instructor. Above all, learners need to acquire a belief in their capacity to change and learn.

12. **Every brain is unique.** We all have the same set of systems, and yet we are all different.

    Choice, variety, and multisensory processes are essential for brain-based learning and instruction.

Source: National Education Association. *Doubts & Certainties*, January/February 1994. Material adapted from Renate Nummela Caine and Geoffrey Caine, *Making Connections: Teaching and the Human Brain*, ASCD, 1991; Addison Wesley, 1994.

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» What Is a Thinking Curriculum? -- This article discusses the ways a thinking curriculum weds process and content and provides guidelines across content areas that promote a thinking curriculum. From T.F. Fennimore and M.B. Tinzmann (NCREL, Oak Brook, 1990).

» Implications of Brain Research for Teaching Young Adolescents -- This research article discusses how the brain works and the implications for the classroom. From Lucinda M. Wilson and Hadley Wilson Horch (*Middle School Journal,* National Middle School Association Web site, 2002).