Brain-Based Learning Highlights

Author: ***Andrea Spears and Leslie Wilson***

Definition

Brain-Based learning is a comprehensive approach to instruction based on how current research in neuroscience suggests our brain learns naturally. This theory is based on what we currently know about the actual structure and function of the human brain at varying stages of development. This type of education provides a biologically driven framework for teaching and learning, and helps explain recurring learning behaviors. It is a meta-concept that includes and eclectic mix of techniques. Currently, these techniques stress allowing teachers to connect learning to students' real life experiences. This form of learning also encompasses such educational concepts as:

- mastery learning,
- learning styles,
- multiple intelligences,
- cooperative learning,
- practical simulations,
- experiential learning,
- problem-based learning,
- movement education.

History

For 2,000 years there have been primitive models of how the brain works. Up until the mid 1900's the brain was compared to a city's switchboard. Brain theory in the 1970's spoke of the right and

left-brain. Later the concept of the *triune* brain (a term coined by Paul McClean that refers to the evolution of the human three part brain) was introduced. In this theory McClean hypothesized that survival learning is in the lower brain, emotions were in the mid-brain, and higher order thinking took place in the upper brain. Currently, we embrace a whole systems, complex brain model.
During the last two decades neuroscientists have be doing research that has implications for improved teaching practices. Neuroscience is based on information obtained through autopsies, experiments, and different types of scans -- MRIs, EEGs, PET and CAT scans, as well as the most recent brain research lab studies in neuroscience. Neuroscientists construct clinical studies that use double blind, large, diverse, multi-age, multicultural groups of people to gather reliable information. This information has helped determine how human learning actually occurs. In essence these scientists have been peering into the "black box" in order to determine how the brain processes and retains information. Thus, technology in medicine has paved the way for many new learning innovations.

Specifically based on conclusions from research in neuroscience, professors from major universities have taken this information and incorporated it into books about learning. In accordance with these suggestions classroom practices can be modified by teachers applying new theories of teaching and learning based on recent findings. Some noted authors in this area are Marian Diamond, U. C., Berkeley; Howard Gardner, Harvard University; Renate and Geoffrey Caine; Thomas Armstrong; Candace Pert, Eric Jensen; etc.

Core principles directing brain-based education are:

1. The brain is a parallel processor. It can perform several activities at once.
2. The brain perceives whole and parts simultaneously.
3. Information is stored in multiple areas of the brain and is retrieved through multiple memory and neural pathways.
4. Learning engages the whole body. All learning is mind-body: movement, foods, attention cycles, and chemicals modulate learning.
5. Humans' search for meaning is innate.
6. The search for meaning comes through patterning.
7. Emotions are critical to patterning, and drive our attention, meaning and memory.
8. Meaning is more important than just information.
9. Learning involves focused attention and peripheral perception.
10. We have two types of memory: spatial and rote.
11. We understand best when facts are embedded in natural spatial memory.
12. The brain is social. It develops better in concert with other brains.
13. Complex learning is enhanced by challenge and inhibited by stress.
14. Every brain in uniquely organized.
15. Learning is developmental. (Caine)

What then can educators do to enhance learning in classrooms?

Implications for best teaching practices and optimal learning

There are interactive teaching elements that emerge from these principles.

- ***Orchestrated immersion:*** Learning environments are created that immerse students in a learning experience. Primary teachers build a rainforest in the classroom complete with stuffed animals and cardboard and paper trees that reach to the ceiling. Intermediate teachers take students to a school forest to explore and identify animal tracks in the snow and complete orienteering experiences with a compass. Junior high teachers take a field trip to an insurance company to have students shadow an employee all day. High school teachers of astronomy have students experience weightlessness by scuba diving in the swimming pool.
- ***Relaxed alertness:*** An effort is made to eliminate fear while maintaining a highly challenging environment. Teachers play classical music when appropriate to set a relaxed tone in the classroom. Bright lights are dimmed. Vanilla candles are used to calm students and peppermint scents are used to stimulate the senses. All students are accepted with their various learning styles, capabilities and disabilities. A relaxed accepting environment pervades the room. Children are stretched to maximize their potential.

- ***Active processing:*** The learner consolidates and internalizes information by actively processing it. Information is connected to prior learning. The stage is set before a unit of study is begun by the teacher preparing the students to attach new information to prior knowledge so the new information has something to "latch onto." (Jensen, Caine)

Twelve design principles based on brain-based research

1) *Rich, stimulating environments* using student created materials and products are evident on bulletin boards and display areas.
2) *Places for group learning* like tables and desks grouped together, to stimulate social skills and cooperative work groups. Have comfortable furniture and couches available for casual discussion areas. Carpeted and areas with large pillows who prefer not the work at a desk or table.
3) *Link indoor and outdoor spaces* so students can move about using their motor cortex for more brain oxygenation.
4) *Safe places* for students to be where threat is reduced, particularly in large urban settings.
5) *Variety of places* that provide different lighting, and nooks and crannies. Many elementary children prefer the floor and under tables to work with a partner.
6) *Change displays in the classroom* regularly to provide a stimulating situations for brain development. Have students create stage sets where they can act out scenes from their readings or demonstrate a science principle or act out a dialogue between historical figures.
7) *Have multiple resources available.* Provide educational, physical and a variety of setting within the classroom so that learning activities can be integrated easily. Computers areas, wet areas, experimental science areas should be in close proximity to one another. Multiple functions of learning is our goal.

8) *Flexibility:* This common principle of the past is relevant. The 'teachable moment" must be recognized and capitalized upon. Dimensions of flexibility are evident in other principles.

9) *Active and passive places:* Students need quiet areas for reflection and retreat from others to use intrapersonal intelligences.

10) *Personal space:* Students need a home base, a desk, a locker area. All this allows learners to express their unique identity.

11) *The community at large* as an optimal learning environment: Teachers need to find ways to fully use city space and natural space to use as a primary learning setting. Technology, distance learning, community and business partnerships, all need to be explored by educational institutions.

12) *Enrichment:* The brain can grow new connections at any age. Challenging, complex experiences with appropriate feedback are best. Cognitive skills develop better with music and motor skills. (D'Arcangelo)

Optimizing learning through different mediums:

Music: Music can lower stress, boost learning when used 3 different ways:

- as a *carrier* - using melody or beat to encode content,
- *as arousal* - to calm down or energize,
- as a *primer* - to prepare specific pathways for learning content) impacts the immune system, and is an energy source for the brain.

Art: Art is an important part of brain-based education in that it provides many learners with avenues of expression and emotional conduits for learning and retaining information. Art is important in technology to aesthetically create pleasing power point presentations and multi-media displays to showcase work. Multicultural awareness is improved through the study of art. Due to the diverse power of art, some educators think the "arts" should be named as the fourth "R."

Diverse forms of assessment: Maintaining portfolios is important for reflective improvement and self-assessment. These help teachers, parents and students observe demonstrated growth over time. Teachers also need to maintain appropriate content mastery through regular testing programs. And, demonstrations, writing and art are ways of assessing students' progress, as are pre and post surveys and tests useful in assessing students' progress. Both verbal and written self-assessments are important parts of proving academic growth, and interdisciplinary and cross-curricular projects provide realistic assessment tools. In essence, students should be exposed to multiple assessment methods. (Jensen)