What is Brain Compatible Learning?

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This article speaks to educators seeking a breakthrough in learning. Brain-based education, a new way to look at learning, offers the potential to boost knowledge and skills for all students. Unwittingly, teachers often use practices in classrooms that interfere with the brain's efficient and natural processes for learning. In this article, we will identify approaches that help ensure permanent learning, deep engagement and enthusiastic students.

It's only in the past few decades that medical science, researchers in cognition and other disciplines have uncovered evidence of how the brain functions. Educators can profit enormously from this knowledge. We can extrapolate from findings about the brain to suggest "brain-compatible" practices for schools.

We find the pioneering work of Leslie Hart convincing, practical and in the mainstream of recommendations utilizing brain research. Hart has authored several books and many articles on brain-based learning. ASCD has published several books on using brain-based education in the past several years. An ASCD network newsletter is based on brain-compatible learning. Numerous other books and videos are available on multiple intelligences, learning styles and the general area of brain-based learning.

Any understanding of the brain begins with accepting the concept of the brain as the organ for learning. The brain handles all purposeful learning, behavior, and emotions. Most educators, including many in training, have not been adequately exposed to the body of valuable new insights which forms the basis of brain-compatible education. This new knowledge, especially as it affects educators, is embodied in Leslie Hart's writings on human learning and the work of many others.

We might start with the easiest area to the grasp, that of the physical structure of the brain. It has 100 billion neurons with from one to 20,000 connections each. This "wiring" scheme is far more complex than the telephone system for the entire world including the Internet. This three-pound organ comprising less than 3 percent of the body's weight uses 20 percent of the body's oxygen. Composed of two hemispheres, its functions seem analogous to three stages of life evolutionary development of the brain: reptilian brain, old mammalian brain and the new mammalian brain or neocortex.

For our purposes as educators, we can turn now to a description of the brain's foundation in regard to the learning. From considerable research on the brain, brain-compatible education means attention to the two basic building blocks and two conditions of the brain's functioning:

1. Patterns or understandings. Patterns are structures in the brain of recognition or understanding. We have a mental pattern or structure in our brain for recognizing the letter "A" whether written in old English or block type style or 1/4 inch high on a page or six feet high on a billboard. We have a pattern for the supper table that tells the brain to run "programs" of sitting down, pulling in the chair, picking up a fork, etc.

   We have patterns that recognize the roles of male, female, mother, woman, sister, relative, friend. We have patterns for faces, sounds, smells, and touches. We may recognize a face from a side profile at a distance in a crowd of someone we haven't seen for five years because the brain connected the face to a pattern in its memory.

   Patterns develop from experience, most efficiently in a rich and stimulating environment. They develop through large amounts of input to the brain. Schools must increase the variety of experiences, activities

and stimulation by an enormous factor, say ten fold for healthy brain development. Most parents know this instinctively and try to provide a great variety of experiences for their child.

The fact of the matter is that in most classrooms the brain is starved for input. Teachers probably do not realize the stultifying effect of a low input classroom on one of the brain's basic building blocks to learning. Providing the brain with massive amounts of input is done by immersing students in complexity, issues, real world projects, field trips, speakers, and many kinds of media.

2. Programs are the brain's instructions to the carry out an action, such as to walk, jump, button a shirt, solve a problem, speak the word "hot" or write it. Each of these actions draws upon many patterns and memories and, in most cases, requires a massive number of coordinated instructions to the muscles and regions of the body.

   Programs are learned largely through trial and error, with increasing refinement through practice. Humans develop and deepen thousands, perhaps millions, of programs through the reinforcement of carrying out activities many times in various ways. A stroke which injures a part of the brain may damage the program for walking. The adult still knows what walking is but having lost the program has lost the capacity to actually walk. With therapy, a new program may be developed. It appears that the younger the person, the more plastic or flexible is the brain's ability to adjust.

   Research has demonstrated a richly woven tapestry of neuronal connections occurs from stimulating, active environments. Programs develop by doing, actions, projects and practice. That is why schools must be experiential, that is, where students invent, try their wings, and apply thinking skills, talents and abilities.

   Sitting passively in straight rows of desks on a steady diet of worksheets and text book drills kills the relentless motivation to learn and to master what the person considers meaningful. It creates discipline problems because the brain MUST have challenges and opportunities to apply learning. In most school settings, students are like race cars at the starting line, energized and ready to go, but the flag never falls, so they sit and sit and sit.

   Students must be given and must assume responsibility, be allowed to tackle new tasks, be involved in complex interdisciplinary projects, life-linked studies — in short, they must learn by doing. It means listening to the youth and taking into account their boundless questions, ideas and interests as beginning and important points to the study of societal issues.

3. Feedback or finding out how successful one was. Students, indeed, all human beings need to learn if they did a good job through their own observations and what others tell them. Every coach knows the danger of practicing the wrong action not realizing its incorrectness. Feedback involves not only physical actions but also thinking patterns, responses and habits.

   Feedback in the practical sense means suggestions and coaching at all stages of development. Even champions have coaches! The feedback must be immediate and helpful. Most classrooms give little actual time to showing students how to improve beyond global test scores and grades. Students need to be coached, given suggestions, receive peer reactions, see and reflect on the results of their efforts in important endeavors, such as teaching a younger child. Feedback is the breakfast of champions.

4. Safety and security. Another aspect of brain theory is the concept of "downshifting," a condition in which the person under threat or danger seemingly shifts from a higher region of the brain to a lower (older in evolutionary time) region to prepare for fight or flight. We understand better than ever the power of the

emotions and how areas of the brain filter input through reactions to emotion laden situations. Knowledge of this kind deeply impacts learning and responses.

This explains why the child needs to feel safe and secure in order to learn. Schools must accept the child as a precious and venerated person and provide a kind, orderly and safe environment. Remember, the brain, in effect, downshifts under extreme threat or danger and is not at its best for learning when the child is fearful or overly anxious.

The school must be a secure setting free from intimidation. Learning conditions must not result in apprehension, for example of threat of failure. Students must be able to test their skills at real tasks in a safe, non-critical environment. In such settings, children and youth accept huge challenges if allowed to the proceed at their own pace.

Learning can be defined, therefore, as the acquisition of patterns and the development of useful programs. This constitutes learning in the human brain. The brain has exceptional capabilities at developing patterns and acquiring programs given appropriate conditions. It is an absolutely natural inbred activity. The critical point is how this is accomplished.

The brain thrives on input. Amazingly, the input does not need to be highly organized and sequenced. The brain as an enormously powerful pattern detecting device sorts random input into patterns if provided large quantities of details, variations of situations and ample opportunities to "play" with or manipulate the material. Songs, rhymes, background music, stories, posters, chants, movement, skits, models, and many types of input create greater learning.

One sees this most clearly in infants who learn the language and its structure without lessons or an articulated, sequenced curriculum. In fact, were adults to establish an infant curriculum for talking, the likelihood of the need to start tutoring or remedial talking programs would soon rear their ugly heads.

There are optimal environments for learning to talk. They consist of homes where there is talking with the youngster, reading to the youngster, asking the child to explain something and adults talking among themselves in the presence of the child. These afford high input, stimulation, activity and modeling. This illustrates the brain's extraordinary capacity for extracting meaning from the environment and organizing enormous streams of incoming data.

As an example of a remarkable feat by the brain, consider how an infant in a bilingual home becomes fluent in two languages by age four without teachers, lessons, textbooks, work sheets, standardized tests, home work and pain. This is astonishing given the difficulty of teaching foreign languages in schools. This kind of learning requires an astounding number of patterns and programs in the child's brain.

We have all observed how infants aggressively seek experiences. Their brains automatically strive to establish meaning. It is equally obvious how the brain is picky about what it accepts. Material that is too remote or difficult is rejected and not processed. Already learned material runs the danger of boring the child. Hence the importance of a child-centered environment. The child, driven by an aggressive, seeking brain, strives to understand and master the environment and to be seen as competent. Every student differs on these dimensions.

Here are a few examples of brain-compatible learning activities:

K-12 students use universities to see medical operations and observe advanced arts activities (dance, painting, photography, drama, music). Students need mental models to study in order to develop accurate visions for the future of their talents and abilities.

Students study airports, transportation systems, television studios, governments, juvenile delinquency and world events. The world and all of its complexity and variety needs to be understood by students. They gain understanding through immersion, observation, reflection, simulations, involvement and sharing their learnings with others.

Students prepare for and participate in exchanges with urban and rural schools. With the school's guidance, they write letters, research their destinations, make transportation and living arrangements and on their return, present their experiences to the school and community.

Students manage the computer labs, video studio and production centers for use by learners of all ages. They handle maintenance, instruction in use and provide supervision. Older students instruct younger students and assume greater degrees of responsibility as they prove themselves.

Students comb the community for resources because they understand that every community is a gold mine of people, events and activities for learning. Students create data bases of the deep reservoirs of talent: people with cooking skills, story tellers, trappers, clergy, doctors, miners, foresters, gardeners, travelers, hobbyists, craft artisans, business people, government agencies, clinics, and so on. They help teachers find the sparks of reality that bring life to the topics being studied.

Students provide tutoring to the other students through cooperative learning, cross age groupings, support groups, teaching classes, supervision of younger children, and suggestions and coaching for work teams.

The topics of interest to the youth are endless. In each area they receive training in skill areas such as interviewing and recording notes, learning enormous amounts of normal subject matter content in context.

School staffs can establish a process for upgrading their understanding of modern learning principles at great profit to themselves. Such knowledge creates immense intellectual excitement and stimulates exchanges of ideas for their application to the lives of children and youth in school.

Brain-based learning theory provides the vehicle for transforming schools into launching pads for engaging and powerful learning experiences. To the extent schools understand and use brain-based learning activities, students and teachers will become more vigorous lifelong learners.

References:

.Hart, Leslie A. (1998) *Human Brain and Human Learning*. Books for Educators, Kent, WA,.