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learning with technology

ERIKA BURTON, PH.D.



## 21st Century Focus: Brain Based Learning

### ***Educating students as a whole and teaching the way the brain naturally learns best***

*What is the scientific background behind brain based learning?*

Do most people only use 10% of their brains? This legend is well known in popular culture and rarely debated. Can you believe we use 100% of our brain through each and every day? The 10% myth can be linked to many but both Albert Einstein and Edward James believed we only use a small part of our mental and physical resources. . However, let's think about this premise. Was Einstein born with a bigger brain or did he simply "build himself a bigger brain?"

Neuroscientists have pinpointed through extensive brain scan research, the specific areas in the brain affected by learning. Armed with this information, these scientists have found supporting evidence that neurons continue to grow throughout adulthood. These recent findings contradict an established belief that adults can create neural pathways/connections but not grow new neurons. Not only are we capable of growing new neurons, but we can add to existing neural branches by properly "exercising" our brains. The key to maintaining these newly formed neurons is to connect them in some way to existing ones.

One way that we can make sure they are connected to existing neurons is through physical exercise. With exercise, we are able to maintain high levels of cognitive capabilities adding to the retention of information because we use the same part of the brain for movement and learning.

Numerous studies performed by Dr. Marian Diamond on neural stem cell dendrite growth have shown significant differences between individuals with enriched learning experiences verses those without such experiences. Dr. Diamond found that the more mature neurons react even better to intellectual enrichment. This provided evidence that dendrite growth in the outermost branches occurred in reaction to learning information. In order for dendrite branches to flourish and survive new information must be presented and understood in context to what has previously been learned.

Educators have taken brain research and developed curriculum based on the understanding that learning occurs when concepts are consistently practiced over time. Approaches need to be varied in order to accommodate students' individuality and strengths. The learning sequence related to a concept should remain logical, hitting upon previous knowledge whenever possible. Curriculum should be emotionally charged to increase high interest and retention among students.

Brain scans indicate that the hippocampus, where emotions are housed, is activated when learning occurs. This amounts to successfully transferring information into ones long term memory in that it can be practically applied in related situations.

>What educational practices have emerged from the convergence of brain and learning research?

Today, many educational practices have emerged from the convergence of brain and learning

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research. Students are asked to provide evidence of their learning in both written and oral form. They must demonstrate how they arrived at answers to questions. They play games with learning concepts and learn that their school subjects play an important part in understanding and functioning in the world and are interconnected. Students are asked to work in groups simulating authentic opportunities to use problem solving skills. Additionally, research has shown more minds working together provides more ideas, opinions and perceptions which can lead to deeper understanding of content.

Long past is the day where students sit idly in their classroom listening to a teacher lecture on any given topic and be expected to learn from that experience. We know that in order for students to retain information they need to have discussions, play games, and experiment. Information needs to become relevant to an individual's understanding of how the world works in order for it to be understood and used out of context in a given situation. Mastery of information can only be demonstrated when it can be recalled and used to benefit an individual with future tasks.

More teachers are applying differentiated instruction approaches to learning in order to meet the varying needs of students in their classrooms by applying Howard Gardner's theory that we all have 8 Multiple Intelligences (linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, naturalistic, and possibly moral) with which we have changeable degrees of ability. Research on differentiation has shared that providing opportunities for students to use all of their multiple intelligences is the best way to enhance any areas of weakness.

Classrooms have become a place where students play a more active role in choosing how they learn concepts and share evidence of their understanding through varying authentic assessment opportunities. Observers might witness students working in cooperative learning groups as they are guided by their teacher through differentiated instruction practices to learn concepts.

Today, teachers are adjusting their classroom practices. They are asking students to take responsibility for their learning more often in their classrooms. Students are given cooperative learning opportunities to discuss, reflect and solve problems. Teachers act as facilitators of these discussions, providing scaffolds to challenge students to think more critically and delve into higher order discussions on given concepts.

Games challenge students to use concepts they are practicing. They provide evidence that what they learn in school is important to help them resolve issues outside of school and in their futures. They learn through these natural opportunities that learning is significant and applicable to their lives.

Thematic instruction may vary based on student interest. Themes assist students with understanding content within context and allow the abstract to become meaningful while at the same time connect students emotionally to a concept. Additionally, thematic learning enhances students recall of prior knowledge and intrinsically motivates them through the learning process. Observations of what these practices might look like in a classroom situation would vary depending on grade, subject, and teachers' /students' comfort with applying multiple intelligences and an emotional connection to learning.

An example of a brain based thematic lesson in which students are learning about coordinate geometry might involve the following steps. Students might first brainstorm the uses and application of this concept and when they have or might use this skill in their future. Breaking down any math concepts into manageable pieces is the first step to successfully understanding it. A teacher might expose students to a grid and the nature of the X and Y axis and where each is located on a grid. He/she might even take this a step further and have students identify the X and Y axis as H and V for horizontal and vertical before teaching the abstract X and Y concepts. There might be several guided learning opportunities for students to identify the X and Y coordinates individually through team games as well as to find points of origin on an actual map of their city creating relevance towards this concept of coordinate geometry. They may play

games where they become the points of origin using a life size grid. Groups may practice finding points of origin to identify a path taken by a missing person within their city. Finally, individuals might create their own point of origin path on a coordinate geometry grid creating a shape, path towards a location, or secret treasure to authentically establish their understanding of a state standard or goal which they will remember and use in the future.

### **Brain Based Learning and Curriculum**

Brain based learning is here to stay and will continue to gain momentum as more educators accept the value of educating children the way that the brain naturally learns best. Schools have begun the process of adopting a brain based curriculum and work together to determine the unique needs of their students and determining how to execute best practices in relation to students' abilities. The entire learning community comprised of parents, teachers, administrators and support personnel are a part of this process. Professional development, workshops, books, and discussions play a role in the training of staff as they delve into creating meaningful curriculum adjustments to current practices.

Some of the main points touched upon during a reform of curriculum deal with the role and development of authentic assessments, emotional intelligence (character development) applying multiple intelligences towards learning practices, incorporating cooperative learning, initiating and learning how to engage students in higher order thinking skills through discussions where students share experiences with and connect with concepts in a personal way. Additionally, it should be noted that success with learning differently encompasses students exceeding the self-fulfilling prophecy that if teachers hold students accountable towards achieving lofty goals, students will rise to the challenge.

### **Student Success with Brain Based Learning Approaches**

Much of the research on brain based learning has been gathered from secondary school studies. Curriculum specialists, researchers, neuroscientists, psychologists and educators have immersed with packaged ideas on how to implement these best practices into the K- 12 curriculum and beyond, without overburdening teachers. There have been many convincing research based articles on the benefits of brain based learning. The research shares that brain based learning approaches are applicable and transferrable to all educational levels. Current research on the success of Multiple Intelligences explicitly foundational in brain based learning is shared in case study format most notably through Kagan & Kagan in conjunction with 6 urban schools comprised of 2 elementary, 2 middle, and 2 secondary. The success of students and school systems for that matter that infuse brain based learning strategies into their curriculum reaches beyond raising summative test scores. Students are expected to develop holistically into socially and morally responsible members of our 21st century. Although committed learning communities improve on standardized tests scores with time. As Caine & Caine suggest the process takes between 3 and 5 years which is consistent with others who study the results of meaningful change theory.

### **Future of Brain Based Learning**

Brain based learning is not a fad in the educational arena that will pass with time. Gardner in his new book 5 Minds for the Future acknowledges that our world is becoming smaller and in order to thrive in the 21st century there are several important disciplines one must possess. The importance of being disciplined and committed to lifelong learning within a field and beyond, creative and able to synthesize and apply information as well as being a respectful and ethical human being are traits honed over time. It is imperative that we continue to emphasize the importance of learning differently. Teachers understand that children have unique learning styles but in order to be a complex and analytical thinker they must exercise their brains to working out problems in multiple ways. We can no longer expect students to learn listening to the teacher as a sage on the stage. Students deserve to learn the Brain based learning captures

these traits and purports what educators do applying best practices in the classroom. However, like never before the future of young minds depends on it.

*Erika Burton, Ph.D. is Co-founder and Director of Curriculum and Instruction for Orion's Mind. For information, visit [www.orionsmind.com](http://www.orionsmind.com)*

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