PDS0103
Helping Every Child Succeed

By Dr. Cindy Whaley

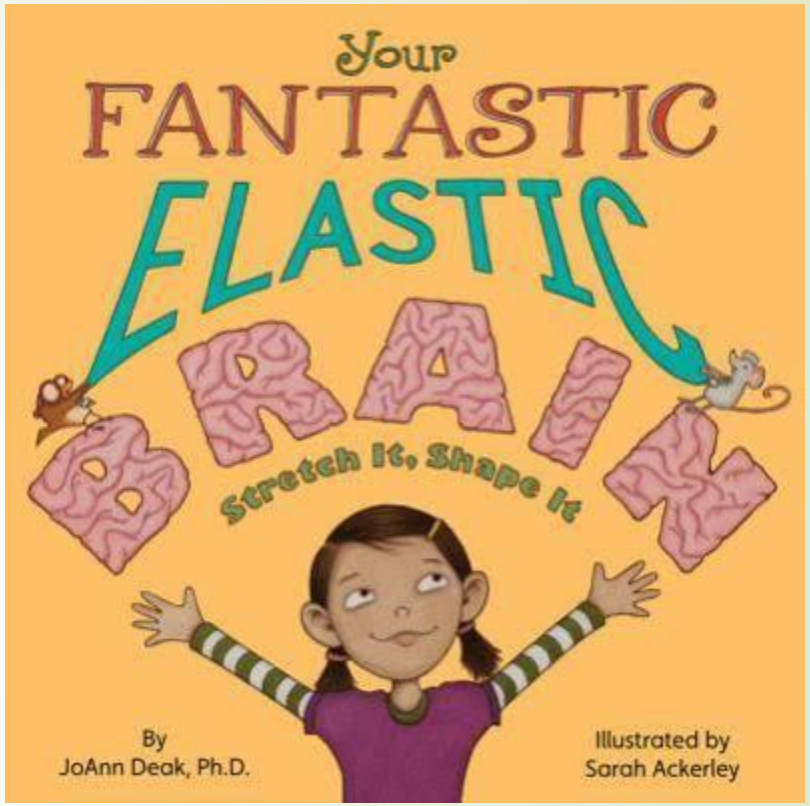
Module #1: Brain-Based Learning

Apply current brain research to your classroom instruction and student learning.

“I praise You because I am fearfully and wonderfully made; Your works are wonderful, I know that full well.”

Psalm 139: 14

Read Aloud



Your Fantastic Elastic Brain – Stretch It, Shape It

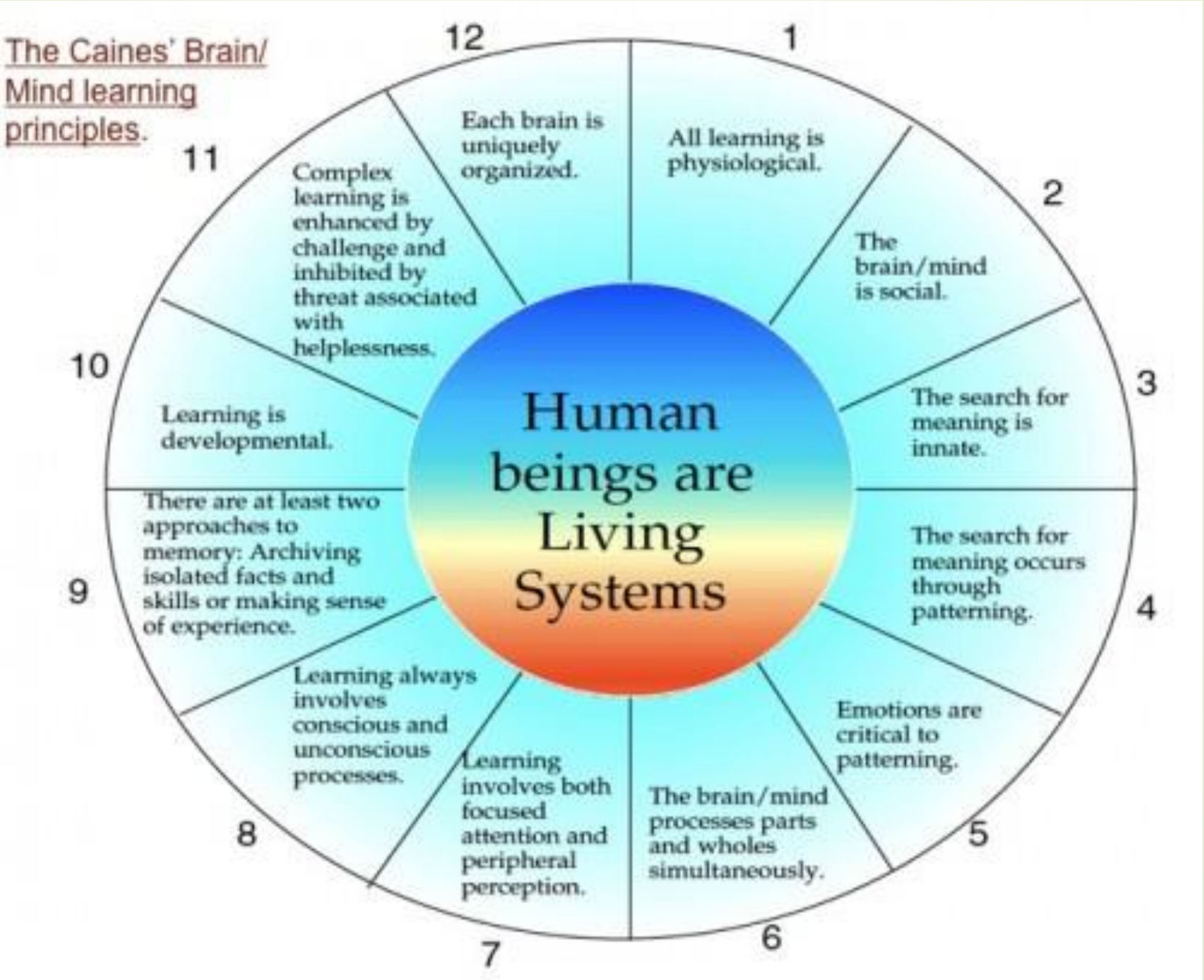
By JoAnn Deak, Ph.D.

Illustrated by Sarah Ackerley

Discussion #1

Caine & Caine's Research on the Brain

http://www.cainelearning.com/



Credit: http://www.cainelearning.com/

Brain/Mind Learning Principles

The Caines have synthesized research from many disciplines, ranging from neuroscience to cognitive psychology, into a set of principles that show how the process works. Each principle:

- Is universal and applies to every one;
- Is confirmed by research from several domains;
- Anticipates future research; and
- Provides implications for practice.

The principles show that body, brain, heart and mind are all engaged in natural learning.

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Principle 1

All learning is physiological

Body and brain change as a result of experience, a phenomenon known as neural plasticity. So new learning is literally structured in the physiology. Cognitive scientists therefore talk of "embodied cognition."

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Practical implication

1. Students need opportunities to move. Sitting still all the time is tiring, boring and counter productive.

2. Students need to take some action to implement what they study. This can take any form from role playing or making presentations to working on substantial projects that incorporate some of the standards.

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Principle 2

The Brain/Mind is Social

People are born with a "contact urge." Recent research on mirror neurons confirms that the social nature of human beings is grounded in biology. So the brain/mind is designed to learn by imitation and from modeling. The social nature of learning is sometimes described as situated learning

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Practical implication

1. It is important for students to have opportunities to sit with, talk to and work with each other.

2. Students benefit from imitation, modeling, and having opportunities to "live" what whatever is being learned.

Credit: http://www.cainelearning.com/

Principle 3

The search for meaning is innate.

People are born with "an explanatory drive." This means that everyone tends to filter input, organize information and experience, and ask questions according to what they are interested in and care about. And, at a deeper level, there is a hunger for meaningfulness and purpose

Credit: http://www.cainelearning.com/

Practical implication

1. Find ways to honor and acknowledge authentic student questions and decision making in their learning.

2. Find ways to access student interests, purposes, and passion.

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Principle 4

The search for meaning occurs through patterning.

The brain/mind organizes all experience into patterns, and even tends to invent patterns or fill in information to make experiences meaningful. So meaning is grounded in how things are connected with each other. Cognitive psychologists use many different terms to describe these patterns, terms such as categories, frames, and schemata.

Credit: http://www.cainelearning.com/

Practical implication

1. Use projects and problems that naturally organize information and experience in ways that make sense.

2. Use processes, ranging from questions to detailed observation, so as to help students discover links to what is already known.

Credit: http://www.cainelearning.com/

Principle 5

Emotions are critical to patterning.

Cognition and emotion interact. Neuroscience now shows that emotions are involved in every thought, decision, and response. In fact, emotion and physical reactions are so much a part of understanding that neuroscientist Antonio Damasio talks of "the feeling of what happens." So powerful learning is enhanced by rich emotional experiences, guided and moderated by higher order functions.

Credit: http://www.cainelearning.com/

Practical implication

1. Introduce new material in ways that are inviting, and make it possible for learners to establish a genuinely positive emotional link to that material.

2. Help students discover love for content, so that they can get beyond fun to passion.

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Principle 6

The brain/mind processes parts and whole simultaneously.

The brain is structured hierarchically. Each lower level item, which seems to be a separate part, is always integrated into a higher level whole item. So colors and lines are seen as a door, and a door is seen as part of a house, and a house is part of a neighborhood.

One region of the brain, the prefrontal cortex, is specifically designed to integrate the operations of all the other regions of the brain. That is why it is also known as the integrative cortex.

Credit: http://www.cainelearning.com/

Practical implication

1. Every skill and concept is better understood and mastered when there is an interplay between the specific elements and the concept or skill as a whole.

2. Offer students opportunities to work with "natural" wholes in which standards are embedded. These include stories, problems, and projects.

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Discussion #2

Principle 7

Learning involves both focused attention and peripheral perception.

Part of what is learned comes from paying full attention and being emotionally engaged. And part is a matter of learning by picking things up indirectly from the context. Claxton describes this as "learning by osmosis."

Credit: http://www.cainelearning.com/

Practical implication

1. Find ways to help learners stay emotionally engaged.

2. Help students learn breathing and observational techniques to master the art of focusing attention.

3. Design the physical context, including posters, props, and the sue of seating arrangements, so that it indirectly conveys information and suggestions that support what is being learned.

Credit: http://www.cainelearning.com/

Principle 8

Learning involves both conscious and unconscious processes.

The brain/mind continuously processes information and experiences below the level of awareness. This is sometimes called the cognitive unconscious. In fact one of the steps to creative insight is to allow time for unconscious "incubation."

The executive functions of the brain, including the ability to plan, make decisions, and reflect on one's own processes – also called metacognition – can be expanded in all students at all ages.

Credit: http://www.cainelearning.com/

Practical implication

1. Incorporate processes, such as the arts, that prime unconscious incubation. And allow time, and create spaces, for students to come to insight.

2. Create situations in which students ask their own questions, make decisions that have real consequences, and have opportunities to reflect on and learn from the consequences of their actions.

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Principle 9

There are at least two approaches to memory.

Scientists have identified several different memory systems, all of which interact in real life.

A key distinction is between systems that are use to archive and store information and routines (sometimes by rote memory) and systems that naturally register, make sense of, and store ongoing experience.

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Practical implication

1. Use projects, stories, situations, and problems that organize material into experiences that are naturally remembered.

2. Assist students to use in-depth observation and analysis of what transpires, and guide them to deeper understanding by ongoing and effective questioning.

3. Only use memorization techniques, such as creative practice and rehearsal, occasionally and as needed.

Credit: http://www.cainelearning.com/

Principle 10

Learning is developmental.

There are several theories about stages in the development of identity and maturity of people generally, and about the development of general capacities such as the shift from concrete to abstract thinking.

There is a rough progression in the mastery of any discipline, from novice to expert.

Natural learning is an ongoing process, so that insights continuously emerge, and skills and capacities continuously develop.

Credit: http://www.cainelearning.com/

Practical implication

1. Projects, materials, and processes, should be scaffolded so that they are appropriate for the developmental stage of students.

2. There should be many opportunities to reflect on experience, and deal with regular feedback, so that insight and understanding can develop over time.

3. Some capacities, such as becoming independent decision makers, develop over many years and need to be continuously present in learning environments.

Credit: http://www.cainelearning.com/

Principle 11

Complex learning is enhanced by challenge and inhibited by threat associated with helplessness and/or fatigue.

The brain/mind literally becomes less effective and people lose access to their own capacities for higher order functioning and creativity when the survival response kicks in. The survival response, what LeDoux calls the "low road," is triggered by such factors as being overwhelmed, losing control, experiencing excessive stress, and meaninglessness.

Credit: http://www.cainelearning.com/

Practical implication

1. Establish good relationships within a classroom or environment so that adults and students listen to each other, and students feel safe to ask questions, make suggestions, and try things out.

2. Use projects that make sense, and allow students to pursue their own interests within the context of the projects.

3. Ensure that students have adequate resources and some control over the use of their time and how they will proceed.

Credit: http://www.cainelearning.com/

Principle 12

Each brain is uniquely organized.

Although all people have many capacities and qualities in common, everyone is also a unique blend of experience and genetics.

There are many ways of identifying individual differences. One example is Gardner's theory of multiple intelligences. Another is the Caines' identity profile. A great deal of work has also been done on learning styles, reading styles, sensory preferences, and more.

In addition to individual differences, there are social and cultural differences that impact how people learn.

Credit: http://www.cainelearning.com/

Practical implication

1. Learning environments and experiences must be designed so that they both treat everyone equally and at the same time, help individuals to capitalize on their own strengths and overcome their own weaknesses.

2. It helps to use a good learning style inventory so that students can grasp some of their own predispositions and preferences.

3. Educators need to develop an awareness of different cultures and customs.

Credit: http://www.cainelearning.com/

Discussion #3

20 Instructional Strategies That Engage the Brain

1. Brainstorming and discussion
2. Drawing and artwork
3. Field trips
4. Games
5. Graphic organizers, semantic maps, and word webs
6. Humor
7. Manipulatives, experiments, labs, and models
8. Metaphors, analogies, and similes
9. Mnemonic devices
10. Movement

Worksheets Don't Grow Dendrites by Marcia L. Tate, 2010

20 Instructional Strategies That Engage the Brain

11. Music, rhythm, rhyme, and rap
12. Project-based and problem-based instruction
13. Reciprocal teaching and cooperative learning
14. Role plays, drama, pantomimes, and charades
15. Storytelling
16. Technology
17. Visualization and guided imagery
18. Visuals
19. Work-study and apprenticeship
20. Writing.

Worksheets Don't Grow Dendrites by Marcia L. Tate, 2010

Discussion #4

What is Brain-Friendly Assessment?

A brain-friendly assessment is any assessment device designed and administered by one who has a thorough understanding of how the brain acquires, evaluates, and stores information, as well as the various variables that affect human learning, recall, and performance. A well-designed brain-friendly assessment will reflect a more accurate picture of what the learner knows, understands, and can do than one that is not so designed.

For example, the unexpected quiz used as a "gotcha" device will simply reveal how much the learner's cerebral anxiety mechanisms have interfered with long-term memory and recall.

Brain-Friendly Assessments by David A. Sousa, 2015

Types of Assessments

From the beginning to the end of a unit of instruction, students will progress at different rates, depending on ability, past knowledge about the new learning, interest in the topic, and the methods of instruction. It is important, therefore, to assess what is happening to their brains at various points along the journey to achieving a learning objective.

Teachers should consider a *preassessment* at the beginning of a unit of instruction, formative assessment along the way, and a *summative assessment* at the end. The terms *formative* and *summative* do not describe a *type* of assessment, but *when* that assessment is given and how the results are used. When teachers and students use the assessment results to improve instruction, the assessment is formative. If, on the other hand, the teacher uses the assessment to sum up the learning at the end of the unit of instruction, it is summative. Excellent results on the summative assessment most likely indicate excellent design in the formative assessment. Similarly, poor results on the summative assessment usually reveal poor design in the formative assessment.

Brain-Friendly Assessments by David A. Sousa, 2015

Discussion #5

Closure to Module #1

1. Final reflections
2. Individual Implementation plans
3. School-wide plans