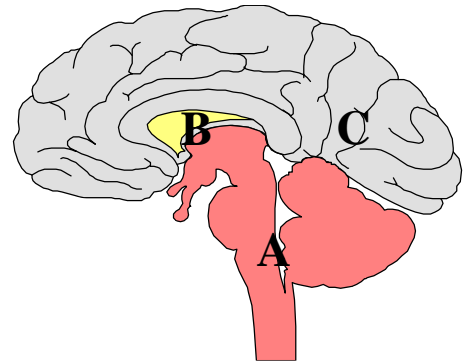


# Multiple Intelligences And Brain-Based Learning

## The Triune Model of the Brain

### The Brain Stem (A)

- Often called the reptilian brain
- Always on the alert for life-threatening events
- We "downshift" when responding to life-threatening conditions
- "Flight or Fight" level of brain
- Action takes place without thinking
- Anything that is a threat-real or perceived-causes brain to "downshift"
- When "downshifting" occurs, learning can not take place



### The Limbic System (B)

- This is the home of the emotions
- This part of the brain has visual memory, but language is limited to yells, screams, expletives
- Threats can cause downshifting, but not to "blanking out" stage of the brain stem

### The Cerebral Cortex (C)

- Processes thousands of bits of information per minute
- Slowest of the three levels of the brain
- Students must be in this level if learning is to take place
- Therefore, learning environment must be absent of threats.
- This is the home of academic learning.

Check the RASCL website  
for a range of links and other  
resources extending this topic  
<http://www.angelfire.com/hi/rascl>

## Howard Gardner's Multiple Intelligence's

Source: <http://www.ascd.org/pubs/el/sept97/gardnerc.html>

### The First Seven . . . and the Eighth

A Conversation with Howard Gardner

Human intelligence continues to intrigue psychologists, neurologists, and educators. What is it? Can we measure it? How do we nurture it?

Howard Gardner's theory of multiple intelligences, described in *Frames of Mind* (1985), sparked a revolution of sorts in classrooms around the world, a mutiny against the notion that human beings have a single, fixed intelligence. The fervor with which educators embraced his premise that we have multiple intelligences surprised Gardner himself. "It obviously spoke to some sense that people had that kids weren't all the same and that the tests we had only skimmed the surface about the differences among kids," Gardner said.

*More information on back page*



## Theories of Brain-Based Learning (Source: Carla Kock Augustana College)

Theory	Explanation
Bi-cameral Model Right/Left Brain Split Brain	Uses research about specialties of the two brain hemispheres as a basis for planning curriculum and instructional strategies that appeal to both the linguistic, analytical left brain and the spatial, sensory right brain
Multiple Intelligences	Bases instruction on belief that intelligence is multidimensional and that knowledge can be acquired through many different means. The eight intelligences listed by Howard Gardner include the following: <ol style="list-style-type: none"> <li>1. logical-mathematical</li> <li>2. verbal-linguistic</li> <li>3. musical</li> <li>4. spatial</li> <li>5. body-kinesthetic</li> <li>6. naturalistic</li> <li>7. interpersonal</li> <li>8. intrapersonal</li> </ol>
Triune Brain Theory	Relates instruction to the development of the three layers of the human brain formed during successive evolutionary ages and to the interactions between those three layers that influence and shape knowledge and learning
Proster Theory	Makes education brain-compatible by matching learning settings and instruction to what is known about the nature of the brain and how it works optimally, and uses the brain's tendency to detect and learn pattern recognition in order to increase learning
Brain-Based Learning	"Establishes and confirms that multiple, complex, and concrete experiences are essential for meaningful learning and teaching" (Caine & Caine, 1994). Uses what is known about memory to focus instruction toward meaningful learning instead of toward memorization.
Attentional Focus	Advocates a variety of teaching strategies to hold students' interest, recognizing that attention shifts depending on the environment's stimuli as well as on past experience.

*You came into the world with approximately 100 billion brain cells. Give or take a few million, that's something you have in common with the great thinkers, philosophers, scientists, explorers, world leaders, Nobel prize-winners—all of the peak performers from all walks of life who have ever lived.*

*By and large though, it's not the number of brain cells (neurons) that's important. It's the number of connections that are made between those brain cells—and each of those 100 billion neurons can grow up to 20,000 "branches" or dendrites.*

*The capacity of the human brain is awesome in the extreme. This is a breathtaking potential that none of us ever fully realize.*

*As humankind probes the limits of outer space, the greatest unexplored territory of all lies here on Earth—within the confines of our individual brains. More possible connections in the human brain, in fact, than the number of atoms in the entire universe. That is the way Stanford University Professor Robert Ornstein dramatically makes the point.*

## Left and Right Sides of the Brain

(Source Charles Cave <http://www.ozemail.com.au/~caveman/Creative/Brain/lrbrain.htm>)

### Some notes from Betty Edward's **Drawing on the Right Side of the Brain**

During the 1960s, further research on the corpus callosum caused scientists to postulate a view of the relative capabilities of the two halves of the human brain: that both hemispheres are involved in higher cognitive functioning, with each half of the brain specialised in complementary fashion for different modes of thinking, both highly complex.

The main theme to emerge .. is that there appear to be two modes of thinking, verbal and nonverbal, represented rather separately in left and right hemispheres, respectively, and that our educational system, as well as science in general, tends to neglect the nonverbal form of intellect. What it comes down to is that modern society discriminates against the right hemisphere.

Roger Sperry - 1973:

Further evidence accumulated showed that the mode of the left hemisphere is verbal and analytic, while that of the right is nonverbal and global. New evidence found by Jerre Levy in her doctoral studies showed that the mode of processing used by the right brain is rapid, complex, whole-pattern, spatial, and perceptual - processing that is not only different from but comparable in complexity to the left brain's verbal, analytic mode. It was also found that the two modes of processing interfere with each other, preventing maximal performance.

### Two Ways of Knowing

Along with the opposite connotations of left and right in our language, concepts of the duality, or two-sidedness, of human nature and thought have been postulated by philosophers, teachers, and scientists from many different times and cultures. The key idea is that there are two parallel "ways of knowing".

L-Mode	R-Mode
L-mode is the "right-handed," left-hemisphere mode. The L is foursquare, upright, sensible, direct, true, hard-edged, unfauciful, forceful.	R-mode is the "left-handed," right-hemisphere mode. The R is curvy, flexible, more playful in its unexpected twists and turns, more complex, diagonal, fanciful.
<ul style="list-style-type: none"> <li>• step-by-step reasoning</li> <li>• logical</li> <li>• mathematical</li> <li>• speaking</li> <li>• dominates right brain</li> <li>• pattern user</li> </ul>	<ul style="list-style-type: none"> <li>• Mystical</li> <li>• musical</li> <li>• "creative"</li> <li>• visual-pictorial</li> <li>• submissive to the left brain</li> <li>• pattern seeker</li> </ul>
<ul style="list-style-type: none"> <li>• intellect</li> <li>• convergent</li> <li>• digital</li> <li>• secondary</li> <li>• Abstract</li> <li>• directed</li> <li>• propositional</li> <li>• analalytic</li> <li>• lineal</li> <li>• rational</li> <li>• sequential</li> <li>• analytic</li> <li>• objective</li> <li>• successive</li> </ul>	<ul style="list-style-type: none"> <li>• intuition</li> <li>• divergent</li> <li>• analogic</li> <li>• primary</li> <li>• concrete</li> <li>• free</li> <li>• imaginative</li> <li>• relational</li> <li>• nonlinear</li> <li>• intuitive</li> <li>• multiple</li> <li>• holistic</li> <li>• subjective</li> <li>• simultaneous</li> </ul>

# Theories of Brain Organisation

(Source: <http://www.ozemail.com.au/~caveman/Creative/Brain/herrmann.htm>)

## Theories of Brain Organisation from The Creative Brain - by Ned Herrmann Published by Brain Books 1988

The Creative Brain tells the story of the author's life's work: learning and teaching in very practical ways how understanding the brain can enhance our creativity, education, competence, communication, relationships, parenting, management style, productivity, and self-understanding, to name just a few.

The science of neuropsychology has confirmed and extended Roger Sperry's work by establishing that many of our specific mental abilities are lateralised, that is, carried out, supported and coordinated predominantly in one hemisphere of our dual brain or the other.

### The Triune Brain Theory

Dr Paul McLean, head of the Laboratory for Brain Evolution and Behaviour at the National Institute for Mental Health, has proposed the triune brain theory, according to which the human brain is, in reality, three brains, each superimposed over the earlier in a pattern of brains within brains.

The first is an ancient, primitive reptilian brain,

The second, and next oldest brain is the limbic, or mammalian brain and registers rewards and punishments, is the seat of emotion, and controls the body's autonomic nervous system.

Finally, over the limbic brain lies the neocortex, or "thinking cap."

### The Left Brain/Right Brain Theory

To understand this theory, you need to know about the following:

1. The left and right halves of the neocortex
2. The left and right halves of the limbic system
3. The connectors, which are structures that provide pathways along which the different parts of the brain send signals to one another.

These specialised structures, plus two patterns of brain functioning - situational functioning and iterative function - comprise key aspects of left brain/right brain theory.

### The Whole Brain/Four Quadrant Model

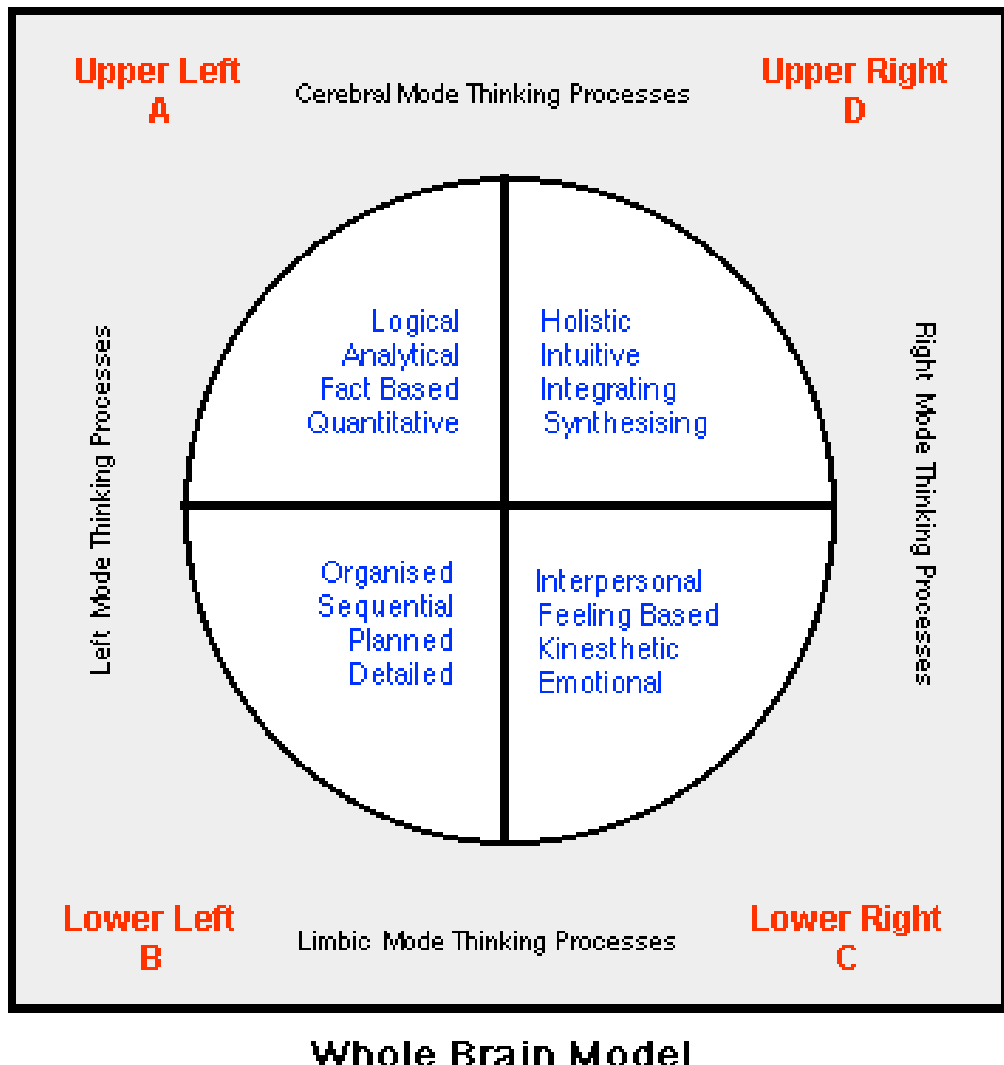
Ned Herrmann showed that by incorporating the research of Paul McLean of the Triune Brain and Roger Sperry's Left Brain/Right Brain function, we can build a model of the human brain with two paired structures, the two halves of the cerebral system and the two halves of the limbic system. This allows us to differentiate between not only the more popular notions of left/right brain, but also the more sophisticated notions of cognitive/intellectual which describes the cerebral preference, and visceral, structured and emotional which describes the limbic preference.

One further concept is important to understanding Ned Herrmann's Whole Brain Model, and that is dominance. The evidence of human dominance shows that wherever there are two of anything in the body, one is naturally dominant over the other. Therefore like we are right or left handed, we are also naturally 'footed', 'eyed', 'kidneyed', etc. We can also be thought of as 'brained'. Since dominance can only occur between paired structures, the Herrmann Brain Dominance Model focuses on the Limbic and Cerebral layers of the Triune Brain.

The model is a metaphorical interpretation of how we think and what are our preferred ways of knowing.

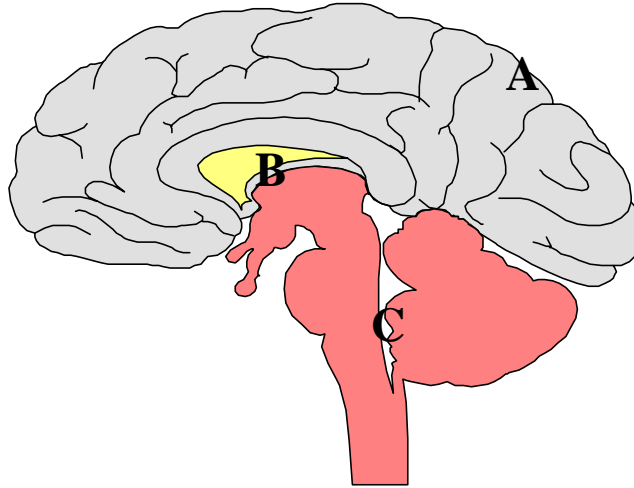
## Theories of Brain Organisation

(Source: <http://www.ozemail.com.au/~caveman/Creative/Brain/herrmann.htm>)



<b>Modes of Thinking</b>	
The upper (cerebral) left A	analytical, mathematical, technical and problem solving.
The lower (limbic) left B	controlled, conservative, planned, organised and administrative in nature.
The lower (limbic) right C	interpersonal, emotional, musical, spiritual and the "talker" modes.
Upper (cerebral) right D	imaginative, synthesising, artistic, holistic and conceptual modes.

# Elaine de Beauport's Multiple Intelligence System



Neocortex (A)	Limbic System (B)	Reptilian (C)
<p><b>Rational</b> To perceive the reason for, the cause and effect of sequential process, deduction, summary and conclusion</p> <p><b>Associational</b> To perceive randomly, to expand information through random connection, to perceive connections between and among, to juxtapose, to improvise</p> <p><b>Visual/Imaginal</b> To perceive in images</p> <p><b>Intuitional</b> To know from within, direct knowing without the use of reason</p>	<p><b>Affectional</b> To be able to be affected by, to recognise and develop closeness with a person, place, thing or idea.</p> <p><b>Motivational</b> To be close to one's wanting or desire, to know what one is close to, and what moves one into action</p> <p><b>Mood—Pleasurable/Painful</b> To be able to create vibrational mood states and shift from and into vibrational states along a pleasure-pain range, from depression through anger to ecstasy.</p> <p><b>Oral</b> To be aware of and able to guide vibrations connected with the oral area.</p> <p><b>Nasal</b> To be aware of and able to guide vibrations connected with the nasal area.</p> <p><b>Sexual</b> To be aware of, receive, originate, and give off vibrations of attraction</p>	<p><b>Basic</b> To be able to move toward and away from, imitate, and inhibit other ideas, actions, processes, and people</p> <p><b>Routine</b> To be able to recognise, create and sustain repetitive rhythm</p> <p><b>Ritual</b> To be able to recognise, create and sustain repetitive rhythm enhanced by art, music, drama, thought or action</p>
<p>The top or newest brain. Divided into left and right hemispheres.</p> <p>Left — rational and linguistic</p> <p>Right — Visual and intuitive</p>	<p>Mid-brain where emotions originate. All organs of the body are connected through the limbic system. Here are located the thalamus and hypothalamus.</p>	<p>The brain stem where automatic patterns, habits and routines originate</p>

## Using your Head: An Owners Manual

( Source: <http://www.supercamp.com/news/spring97/manual.htm>)

**Most of us have days when everything is crystal clear**, we can solve any crisis and master the most complex problems. Other times, we are lost in a fog of forgetfulness, barely able to recall our own telephone number. To make the most of our minds we need to be familiar with how it works and learn what we can do to maximize its power.

### The Triune Brain

Researcher Dr. Paul MacLean has come up with a model of the brain he calls the triune brain. According to Dr. MacLean, the brain has three basic parts, **the reptilian brain, the limbic system, and the neocortex**, each one a subsequent step in our evolutionary development toward higher thinking. **The reptilian brain**, or brain stem, was the first to develop. It is the seat of the most basic functions: sensory motor functions and the survival instinct. Its concerns are food, shelter, reproduction and territory. We use the reptilian brain to explore our environment, responding to danger with the "fight or flight" instinct. The reptilian brain helps us survive, but when it dominates, we're thinking at a very basic level. Before we can think at a higher level, we need to know our basic needs are taken care of and we are in a safe environment. That's why the first few days at SuperCamp are devoted to developing this level of safety.

Next in brain development is the **mammalian brain, or limbic system**, located in the center of the brain. This complex system deals with health, emotions and learning. It controls both automatic functions like heart rate, blood pressure and metabolism, and feelings, like anger, joy, and sorrow. It is also linked to memory and the ability to learn.

According to whole-brain learning, **emotional well-being is crucial** to the learning process. "The emotional part of the brain is the catalyst for learning," says Lori Walker, director of curriculum at Learning Forum. "It opens up the gateway to the cortex so learning can take place. That's why we work so hard to establish a safe, trusting environment at Super-Camp."

Since emotions and health are in the same part of the brain as memory, it follows that good emotional and physical health are necessary for optimum learning. At SuperCamp, a positive emotional environment, exercise and well-balanced meals are part of the daily routine. Communication techniques and relationship skills like Open the Front Door and Four Part Apology help resolve any negative emotional conflict and **establish a feeling of well-being**, setting us up to be more receptive toward learning.

The **neocortex** is where the highest level of thinking takes place. Reasoning, decision-making, purposeful behavior, language, voluntary motor control and nonverbal ideation are developed in this wrinkly gray matter, which makes up about 80 percent of the brain. We use the neocortex to perform such high level tasks as mathematics, spelling, grammar, or carrying out a science experiment.

When the reptilian brain and limbic system are satisfied--that is, when you feel safe and are physically and emotionally healthy, your neocortex, (problem-solving abilities) is at its best. That's why it's possible to learn so much in such a short time at SuperCamp--all the elements for higher thinking are in place. Before your next school assignment, try making sure your brain's needs--**safety, health, and emotions**--are met. You'll see how much easier school can be when you really use your head.



by Renee Norman

<http://www.lane.educ.ubc.ca/insights/v01n03/norman.htm>

I am an earth-dweller, I live among other earth dwellers, and I feel that dwelling, feel that living. I live and feel and know through my emotions as well as my intellect, my heart as well as my head, through affect as well as cognition, my senses as well as my mind, through artistic as well as scientific modes of knowledge. I know that the rainwater which dampens the earth I live upon is caused by water that is condensed from the aqueous vapour in the atmosphere and falls in drops from the sky to the earth, but it is the taste of this rainwater upon my tongue and my hair dripping in my eyes and the poetic words I attempt to inscribe which give the factual knowledge life and depth and feeling. Emotion has left its trace upon my learning, and when I have felt its absence in my life, bereft, I have searched for it anew.

## Howard Gardner's Multiple Intelligence's

(Source: <http://www.accelerated-learning.net/multiple.htm>)

The outcome was his ground-breaking book *Frames Of Mind* in which Gardner convincingly argues for an alternative look at human intellectual competencies and in which he then outlined seven distinct intelligences:

**Linguistic Intelligence.** The ability to read, write and communicate with words. Authors, journalists, poets, orators and comedians are obvious examples of people with linguistic intelligence.

*Famous examples: Charles Dickens, Abraham Lincoln, T. S. Eliot, Sir Winston Churchill.*

**Logical-Mathematical Intelligence.** The ability to reason and calculate, to think things through in a logical, systematic manner. These are the kind of skills highly developed in engineers, scientists, economists, accountants, detectives and members of the legal profession.

*Famous examples: Albert Einstein, John Dewey.*

**Visual-Spatial Intelligence.** The ability to think in pictures, visualize a future result. To imagine things in your mind's eye. Architects, artists, sculptors, sailors, photographers and strategic planners. You use it when you have a sense of direction, when you navigate or draw.

*Famous examples: Picasso, Frank Lloyd Wright.*

**Musical Intelligence.** The ability to make or compose music, to sing well, or understand and appreciate music. To keep rhythm. It's a talent obviously enjoyed by musicians, composers and recording engineers. But most of us have a basic musical intelligence which can be developed. Think how helpful it is to learn with a jingle or rhyme? (e.g. "30 days has September.")

*Famous examples: Mozart, Leonard Bernstein, Ray Charles.*

**Bodily-Kinesthetic Intelligence.** The ability to use your body skillfully to solve problems, create products or present ideas and emotions. An ability obviously displayed for athletic pursuits, dancing, acting, artistically or in building and construction. You can include surgeons in this category but many people who are physically talented—'good with their hands'—don't recognize that this form of intelligence is of equal value to the other intelligences.

*Famous examples: Charlie Chaplin, Michael Jordan.*

**Interpersonal (Social) Intelligence.** The ability to work effectively with others, to relate to other people and display empathy and understanding, to notice their motivations and goals. This is a vital human intelligence displayed by good teachers, facilitators, therapists, politicians, religious leaders and sales people.

*Famous examples: Gandhi, Ronald Reagan, Mother Teresa, Oprah Winfrey.*

**Intrapersonal Intelligence.** The ability for self-analysis and reflection—to be able to quietly contemplate and assess one's accomplishments, to review one's behavior and innermost feelings, to make plans and set goals, the capacity to know oneself. Philosophers, counselors, and many peak performers in all fields of endeavor have this form of intelligence.

*Famous examples: Freud, Eleanor Roosevelt, Plato.*

In 1996, Gardner decided to add an eighth intelligence (Naturalist) and in spite of much speculation resisted the temptation to add a ninth—*Spiritual Intelligence*.

**Naturalist Intelligence.** The ability to recognize flora and fauna, to make other consequential distinctions in the natural world and to use this ability productively—for example in hunting, farming, or biological science. Farmers, botanists, conservationists, biologists, environmentalists would all display aspects of this intelligence.

*Famous examples: Charles Darwin, E. O. Wilson.*

### Mind/Brain Learning Principles by Renate and Geoffrey Caine

- The brain is a complex adaptive system.
- The brain is a social brain.
- The search for meaning is innate.
- The search for meaning occurs through "patterning".
- Emotions are critical to patterning.
- Every brain simultaneously perceives and creates parts and wholes.
- Learning involves both focused attention and peripheral perception.
- Learning always involves conscious and unconscious processes.
- We have at least two ways of organizing memory.
- Learning is developmental.
- Complex learning is enhanced by challenge and inhibited by threat.
- Every brain is uniquely organized.