STRATEGIES FOR ENGAGED LEARNING
Using Movement, Rhythm, and Creative Play
To Enhance Learning

Presented by
Tim Burns

www.TimBurnsEducare.com
BRAIN MATURATION

- Bottom to top
- Inside to outside
- Side to side
- Back to front
## Developmental Stages and the Brain

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<th>Brain Stage</th>
<th>Intelligence Domain</th>
<th>Piaget Cognitive</th>
<th>Erickson Virtues</th>
<th>Maslow Needs</th>
<th>Kohlberg Moral</th>
<th>Steiner Spiritual</th>
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<td>Brain-Heart Integration</td>
<td>Heart: Wisdom and Compass</td>
<td>Post-formal operations</td>
<td>Care/Wisdom: Generativity vs. Stagnation/Integrity vs. despair</td>
<td>Self-actualization: morality, creativity, acceptance</td>
<td>Post-conventional: principled conscience universal ethic</td>
<td>Spiritual orientation</td>
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<tr>
<td>Neo-mammalian: Frontal cortex Teen to Adult</td>
<td>Thought: Abstraction &amp; Meaning-making</td>
<td>Formal operations</td>
<td>Fidelity: Identity vs. Role confusion Love: Intimacy vs. Isolation</td>
<td>Esteem orientation: confidence, achievement, respect for &amp; by others</td>
<td>Conventional: social-contract to Post-conventional</td>
<td>Soul orientation</td>
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<tr>
<td>Neo-mammalian: Posterior cortex Ages 6 - 11/12</td>
<td>Thought: Concrete &amp; Problem-solving</td>
<td>Concrete operations</td>
<td>Purpose: Initiative vs. Guilt Competence: Industry vs. Inferiority</td>
<td>Belonging orientation</td>
<td>Conventional: conformity authority social-order maintenance</td>
<td>Truth orientation</td>
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<tr>
<td>Paleomammalian: Limbic system Ages 2 - 6</td>
<td>Social-Emotional: Relationship</td>
<td>Pre-operational &quot;The dreaming child&quot;</td>
<td>Will: Autonomy vs. Shame &amp; Doubt</td>
<td>Love and affection orientation</td>
<td>Pre-conventional: punishment &amp; obedience</td>
<td>Beauty orientation</td>
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</tbody>
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E. Timothy Burns, 1990
NEURONS
Processes, labels and stores information as memories
SENSORY-MOTOR DEVELOPMENT

Diagram showing the connection between SENSORY and MOTOR systems, highlighting the roles of the Pons, Medulla, Spinal cord, and Cerebellum.
Mature Frontal Lobe Functions

- Envision the future
- Dream big dreams
- Set goals
- Make plans
- Detect problems
- Solve problems
- Manage emotions
- Control impulses
- Consider consequences
- Learn from mistakes
CEREBRAL CORTEX
Six Cell-Layers

Diamond, Marion and Hopson, J.
MOVEMENT and the BRAIN

Movement: Active and Stimulating

Exercise: Movements you already know how to do

Benefits:
- Brings oxygen rich blood to the brain
- Elevates serotonin for balanced moods
- Improves mental clarity
- Reduces stress
- Improves cardio-vascular health
- Stimulates neurogenesis
MOVEMENT and the BRAIN

**Movement:**
Active and Stimulating

**Stimulation:**
Movements that are new to you

**Benefits:**

- Provides neural growth
- Builds neural capacity
- New movements are accompanied by novelty, challenge, and feedback
- Builds foundation for higher learning
MOVEMENT and the BRAIN

Areas of the Brain Involved in Movement
THE CEREBELLUM

Movement, Posture, Coordination
THE CEREBELLUM
THE VESTIBULAR SYSTEM
Right-Left Hemisphere Functions

**LEFT BRAIN FUNCTIONS**
- Small Picture
- Verbal Communication
- Small Muscle Control
- Intelligence Quotient
- Word Reading
- Math Calculations
- Processing Information
- Conscious Actions
- Positive Emotions
- Receiving Auditory Input
- Linear and Logical Thinking
- Curious and Impulsive Actions
- Likes Routine/Sameness
- Activates Immunity

**RIGHT BRAIN FUNCTIONS**
- Big Picture
- Nonverbal Communication
- Large Muscle Control
- Emotional Quotient
- Comprehension
- Math Reasoning
- Interpreting Information
- Unconscious Actions
- Negative Emotions
- Interpreting Auditory Input
- Gets Abstract Concepts
- Cautious and Safe Actions
- Likes Newness, Novelty
- Suppresses Immunity
THE MIDLINE PLANES
Concentration Dimension
THE MIDLINE PLANES

Centering Dimension

[Image of a brain with labeled structures]
MOVEMENT, RHYTHM and LEARNING

“In the inferior olive and cerebellum, two brain regions that are involved in movement coordination, the system oscillates at 10 Hz. Those particular cells trigger timing throughout the nervous system.”

Rodolfo Llinas, M.D., neuroscientist, New York University

Kat McGowan, “Brainsong,” The Brain, Discover Magazine Special, June 2012
Gamma - 25-100 Hz (40hz typical). Binds conscious perception

Beta – 13-30 Hz. Active, alert, concentration

Alpha – 9-13 Hz. Relaxed focus, light trance, enhanced serotonin production

Theta – 4-8 Hz. Trance-like state; enhanced catecholamine aids retention of learning

Delta – 1-3 Hz. Dreamless sleep; HGH produced

REM – Rapid Eye Movement; dreaming
CHRONOBIOLOGY

Infradian
Circadian
Diurnal / Nocturnal
Ultradian

BIORHYTHMIC VARIATIONS in the Circadian Cycle

ULTRADIAN RHYTHMS
MODULATED MIND-BODY ACTIVITIES

MIND
Right-left brain dominance
Attention
Concentration
Learning
Memory
Sensations
Perceptions
Emotions
Dreaming
Fantasy
Imagination
Creativity
Trans-personal sense

BODY
Left-right nasal dominance
Autonomic nervous system
Gene-cell metabolism
Endocrine system
Immune system
Breast-feeding
Hunger and sex
Digestion
Work and sports
Stress response
Psychosomatic response
Cellular metabolism
Drug sensitivity

Findings on Daydreaming

• About one-third of our time is spent daydreaming
• The brain activates several areas associated with complex problem solving
• Recent brain scans reveal that the brain may be most actively engaged when wandering
• During daydreaming the brain makes new associations and forges new neural connections

Jonas Lehrer, *Imagine: How Creativity Works*  
Primary-Recency Effect

Retention: 40-Minute Learning Episode

BENEFITS of PLAY

• Greater self-regulation
• Problem solving abilities
• Emotional mastery and behavioral control
• Impulse regulation
• Reduction in drop-out rate, violence and crime
• Higher IQ scores

Adele Diamond, Ph.D.
Developmental cognitive neuroscientist
University of British Columbia
Interviewed on NPR, Mar 4, 2006
ELEMENTS of PLAY

• Pleasure and enjoyment
• Goals not imposed from the outside.
• Motivation is spontaneous, voluntary, and intrinsic.
• Active engagement on the part of the player.
• Attention to the means over the end product of the action or activity.

“Children’s Play,” Paul McArdle
Child: Care, Health and Development, Vol 27, No 6, 2001
### STAGES of PLAY

#### SOCIAL STAGES

| I. Solitary |
| III. Associative |
| IV. Cooperative |

#### COGNITIVE STAGES

| I. Object play (also called practice, exploratory, manipulative play) |
| II. Functional (use of an object for its intended use) |
| III. Pretend/symbolic |
| IV. Games with rules. |

Star Walk

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