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Brain Science and STEM Learning

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Abstract for DBER Group Discussion on 2014-04-17

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Title:
Brain Science and STEM Learning

Abstract:
Brain Science is an interdisciplinary science and as such touches on a host of domains that among others include Behavioral & Social Sciences, Biological Sciences, Computer & Information Science, Economics, Engineering (multiple domains from Electrical to Mechanical to Structural), Education, Human Resources, Engineering, Environmental, Education, Geosciences, Engineering, Mathematical, Physical Sciences, Psychology, and Zoology. The approach provides a means to study matter from an assortment of elements to the integration of complex domains that stretch from the interactions of neuropeptides to conscious thought that cover the lifespan of single cell organisms to humans. We will touch on a few of these dimensions, addressing both misconceptions that derail or distort the educational process as well as those that sustain and enhance the growth of minds.
BRAIN STEM

DENNIS L. MOLFESE, PH.D.
CENTER FOR BRAIN, BIOLOGY AND BEHAVIOR
“THREE ISSUES”

Pretend Science.

How the Brain Takes in Information

Using Brain Science to Instruct.
“BRAIN” MYTHS

“GRAY MATTER”.

THE MOZART EFFECT (Dr. Gordon Shaw, UCI)

THE WRINKLE EFFECT.

SUBLIMINAL LEARNING (James Vicary, Marketing Researcher - popcorn)

BRAIN SIZE (WEIGHT) (ratio)

Concussion is not brain damage, it is software damage & transient.

Alcohol kills brain cells (thiamine)

Left handed people are brain damaged or evil or both

Training the Right (Left) Hemisphere

Brain Development is completed by 5 years of age

You only use 10% of your brain.
Brain Development is finished by 5 years of age

Left and Right Hemisphere views of Neuron Change over Cortex (4 to 21 years)

Gogtay et al, 2004
Elementary-Aged Children Use More Cortex For Processing Than Adults

Casey et al., 2000
<table>
<thead>
<tr>
<th>Left Brained People</th>
<th>Right Brained People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefer Classical Music</td>
<td>Prefer rock music</td>
</tr>
<tr>
<td>• Prefer verbal instructions</td>
<td>Prefer verbal instructions</td>
</tr>
<tr>
<td>• Good at math</td>
<td>Good at art</td>
</tr>
<tr>
<td>• Like to read</td>
<td>Like to write</td>
</tr>
<tr>
<td>• Dog lovers</td>
<td>Cat lovers</td>
</tr>
<tr>
<td>• Usually do things in a planned orderly way</td>
<td>Spontaneous &amp; unpredictable</td>
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<tr>
<td>• Almost never absent minded</td>
<td>Occasionally absentminded</td>
</tr>
<tr>
<td>• Prefer well structured assignments</td>
<td>Prefer free exploration</td>
</tr>
<tr>
<td>• Read for specific details and facts</td>
<td>Read for main details</td>
</tr>
<tr>
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WRONG!!! There are individuals preferences but
Myths & Misrepresentations

• Left-handedness influences brain organization

  – Right handed people process language in the left brain

  – Left handed people - 50% use both sides of the brain and ten percent process language primarily in the right brain
Myths & Misrepresentations

- Left-handedness influences brain organization
  - NO !!!!!

  - Right handed people process language in the left brain - NO !!!!!

  - Left handed people - 50% use both sides of the brain and ten percent process language primarily in the right brain - NO !!!!!

Major point - there are sex differences in brain processing - YES !!!

- 5 - 15% of population is strongly left handed. Majority of the population lies along a continuum from strongly left to strongly right
How the Brain Takes in information
Myths & Misrepresentations

- Getting information into both brain hemispheres: Vision
Myths & Misrepresentations

- Getting information into both brain hemispheres: Audition
Using Brain Science to Instruct
How To be A Brain Myth Buster !!!

• Ask whose research is being referenced

• Ask where the research is published (science/education journals)?

• Ask for details, not just generalization

• Make Google one source of information for gathering facts

V. Molfese, 2002
How To Learn About the Brain!

- Give a child a MYTH and ask them to find out if true or false & why.
- Ask the child to indicate their sources (science/education journals).
- Ask for details.
Teach the Scientific Method

• Start with one Hypothesis
• Concrete steps to test Hypothesis
  – Make a chart (who, how, what)
• Teach about Experimental Controls
• Apply graphs and math to interpret
• Alternate interpretations/new hypotheses
QUESTIONS ???

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