

The future of Education is Science... Neuroscience...

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Is Education a Science?

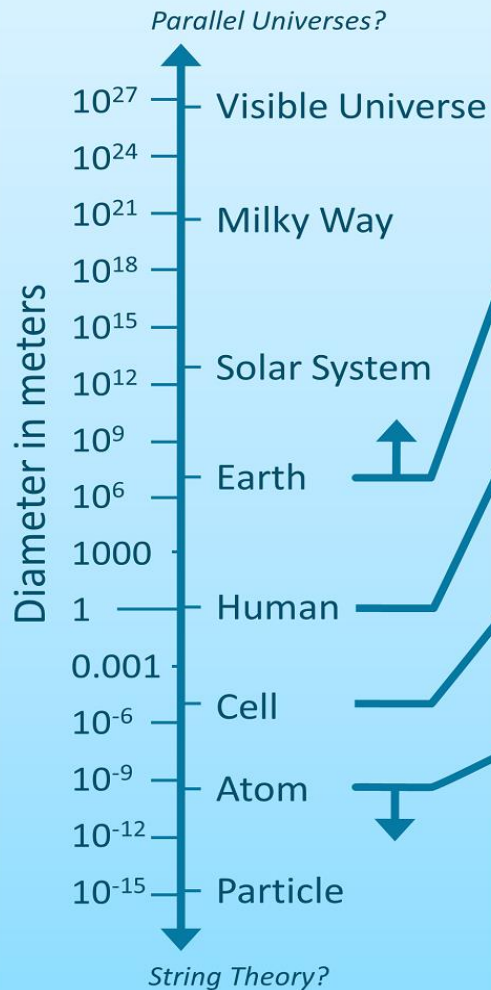
Science (*Merriam-Webster Online Dictionary*)

"3 a: knowledge / system of knowledge covering general truths or the operation of general laws especially as obtained and tested through scientific method

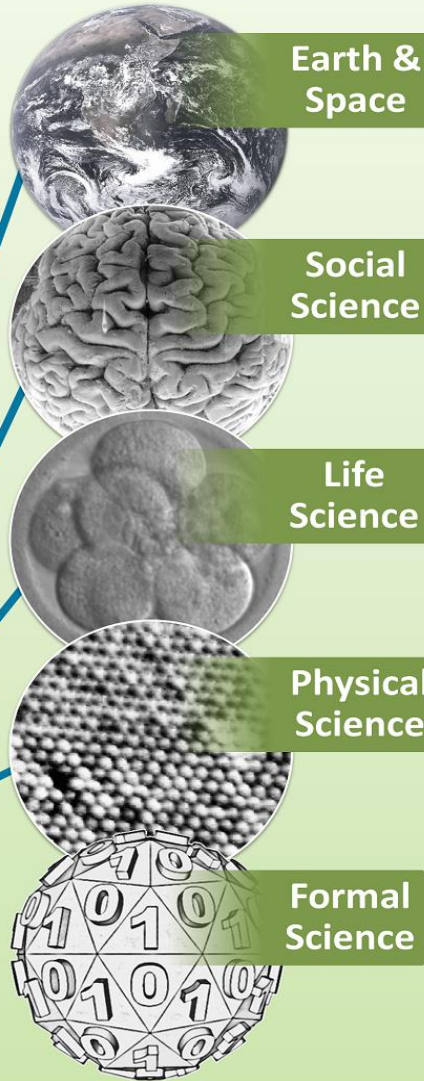
b: such knowledge or such a system of knowledge concerned with the physical world and its phenomena"

- Old French *science* "knowledge, learning, application; corpus of human knowledge"
 - Latin *scientia* "knowledge, a knowing; expertness," from *sciens* (genitive *scientis*) "intelligent, skilled," present participle of *scire* "to know," probably originally "to separate one thing from another, to distinguish," related to *scindere* "to cut, divide,"
 - PIE root **skei-* "to cut, to split" (cognates: Greek *skhizein* "to split, rend, cleave," Gothic *skaidan*.
- (<http://www.etymonline.com>)

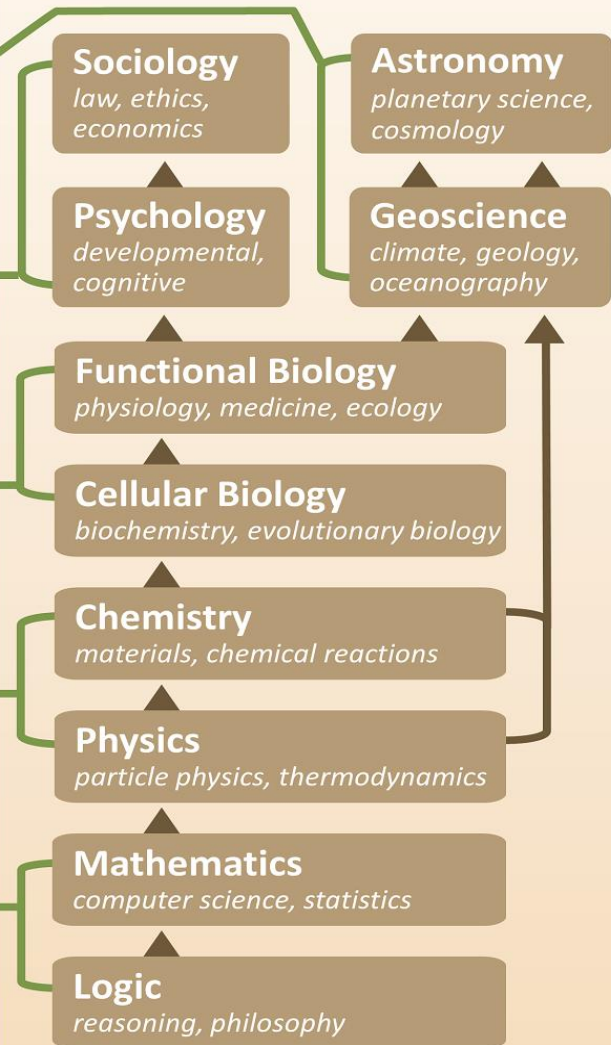
Scale of the Universe



Branches of Science



Hierarchy of Science



Please find Education among Sciences...

This image is the original work of Eric Fisk

Knowledge does not occur on levels / slices / parts / fields

Knowledge

- in East – gift, revelation, access to the Universal Consciousness;
- In West - collection of good quality information.

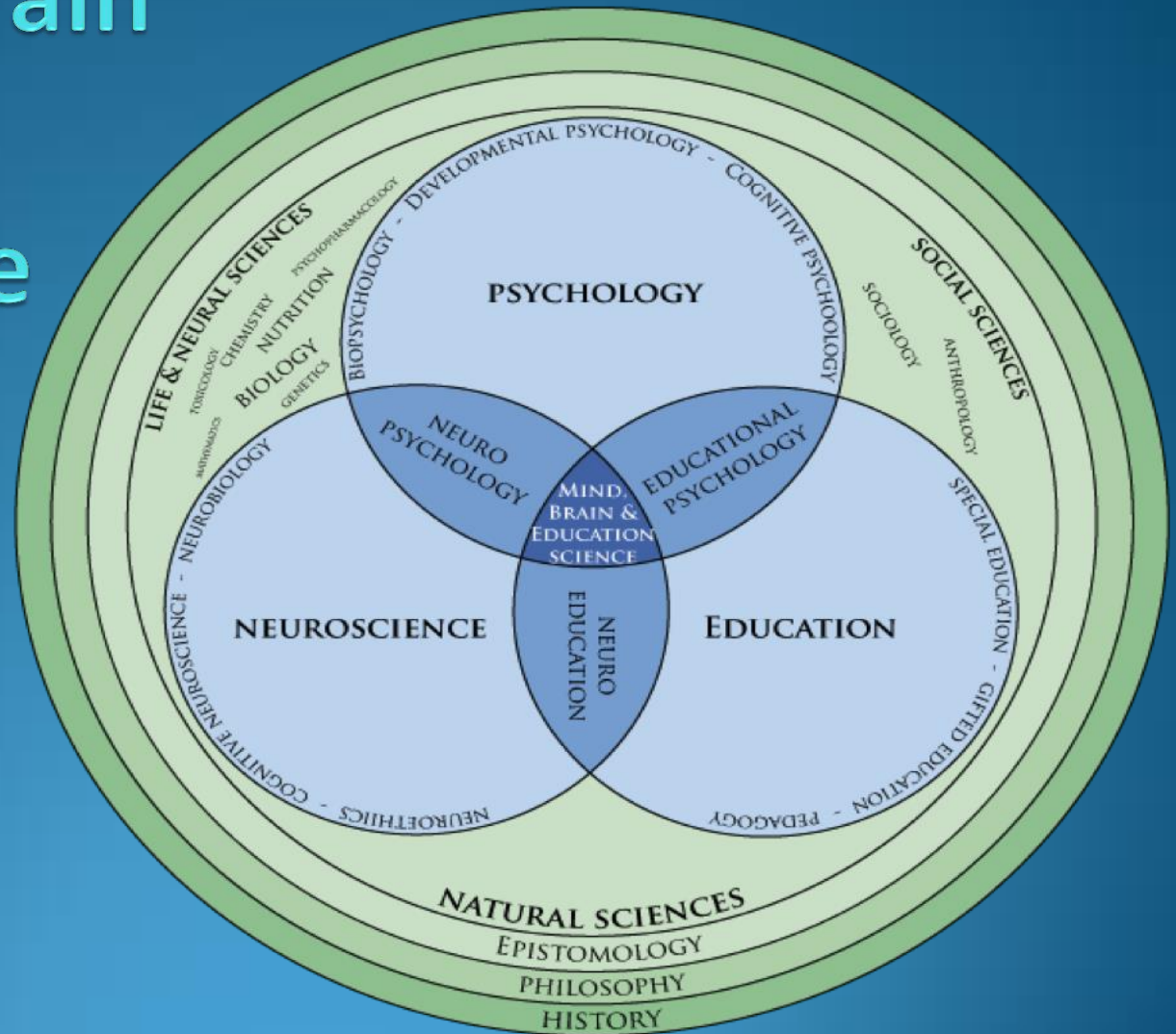
**Leap from Cartesian to
Wholeness = “the whole is
different from its parts”**

**The Human Body = A Whole
which is something else than
the sum of its parts**

(Gestalt psychologist Kurt Koffka)

Education addresses mainly the Brain but we are not only our brains. We are not only the sum of our “intelligences”...

Mind and Brain Education = Convergence of Sciences



Source: Bramwell for Tokuhamma-Espinoza

Exploring the Brain

Types of Scans

SPECT = single photon emission computed tomography

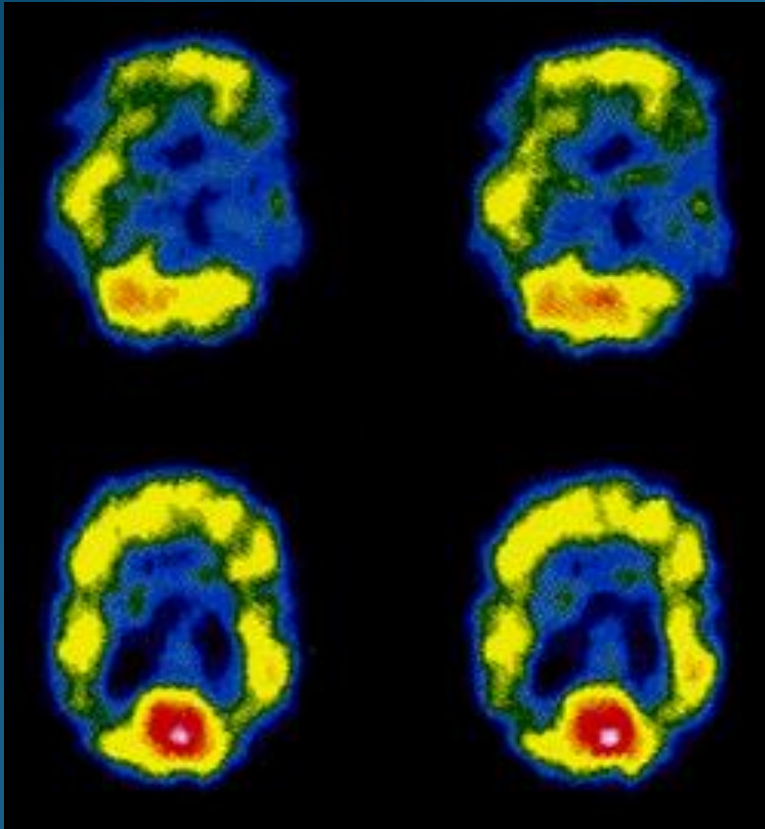
PET = positron emission tomography

fMRI – functional MRI

qEEG – quantitative EEG

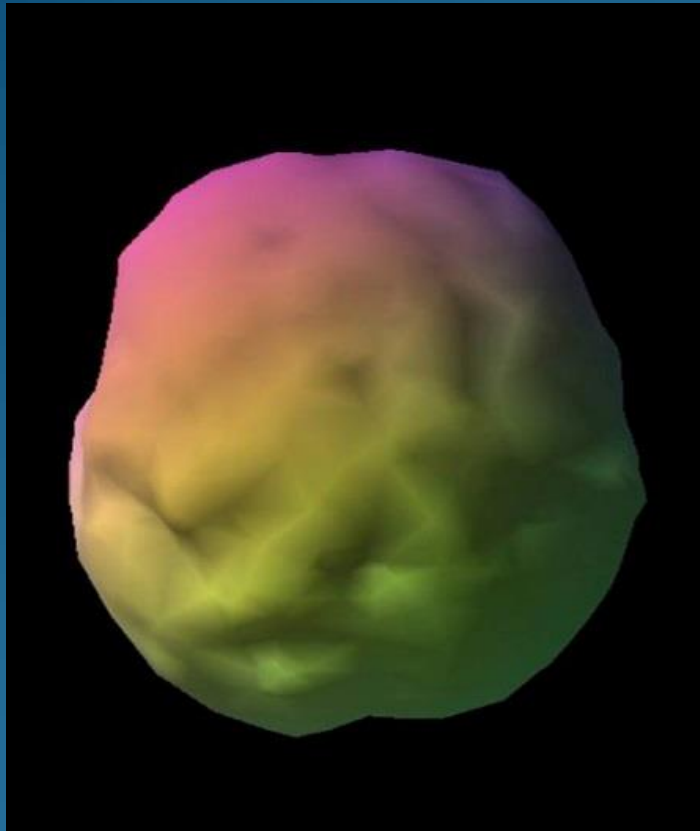
SPECT

is primarily used to view how blood flows through arteries and veins in the brain. It can detect reduced blood flow to injured sites.

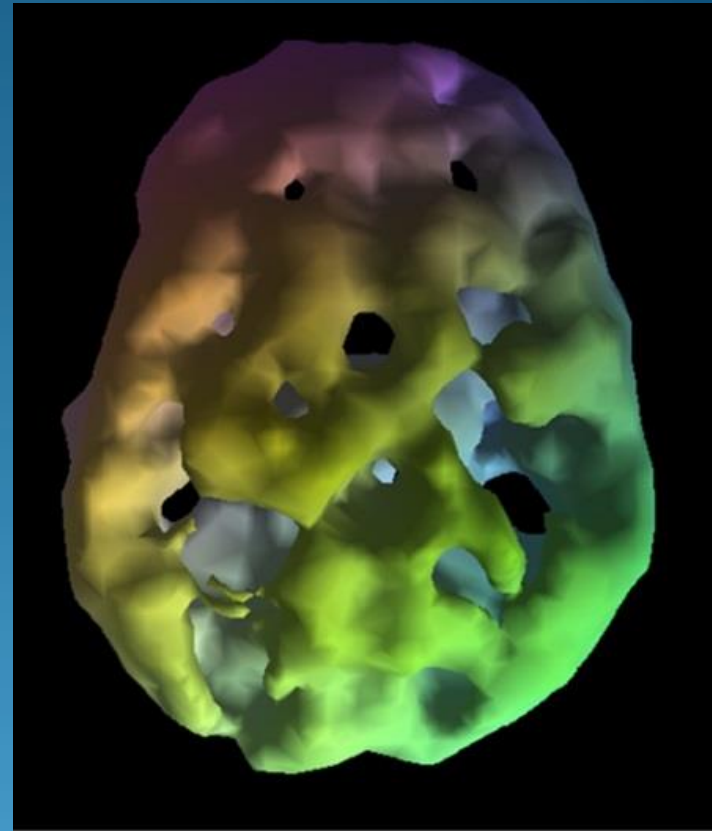


A SPECT scan of a patient with uncontrolled complex partial seizures. The temporal lobe on the left side of the brain shows less blood flow than the right, confirming the nonfunctioning area of the brain causing seizures.

Source: <http://www.mayfieldclinic.com/>
<http://www.brainplace.com/>



**Healthy Brain
SPECT Scan**

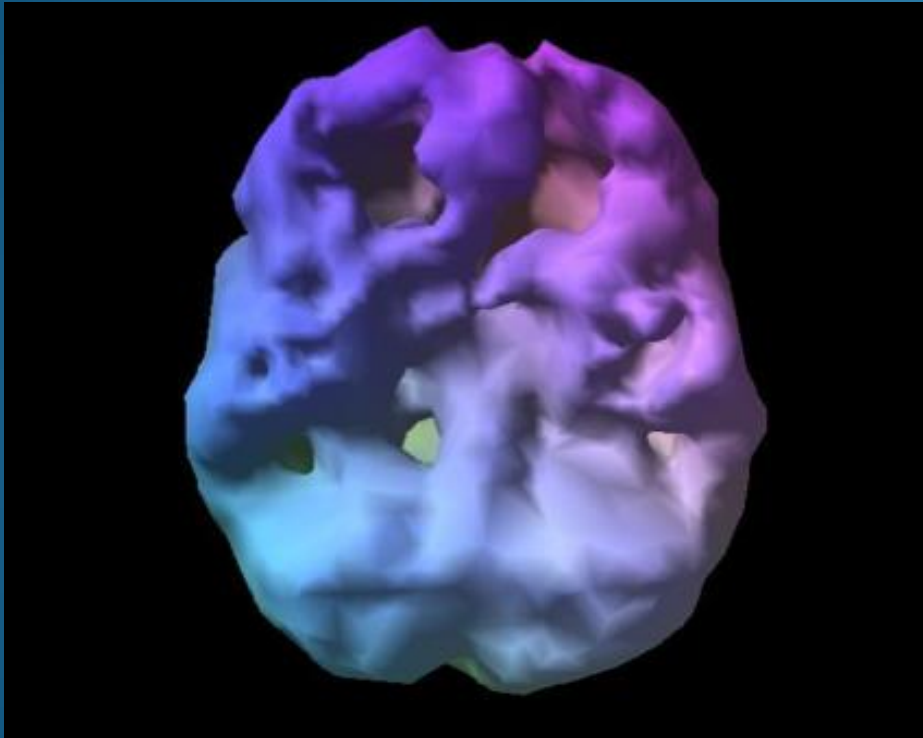


**Alcohol Abuse
SPECT Scan**

A healthy brain is fully irrigated with blood.
An injured brain shows no activity in certain zones.

Source: <http://www.thebraincoach.org/Brain-Images.html>

Example no.1 - Hypofrontality



ADHD

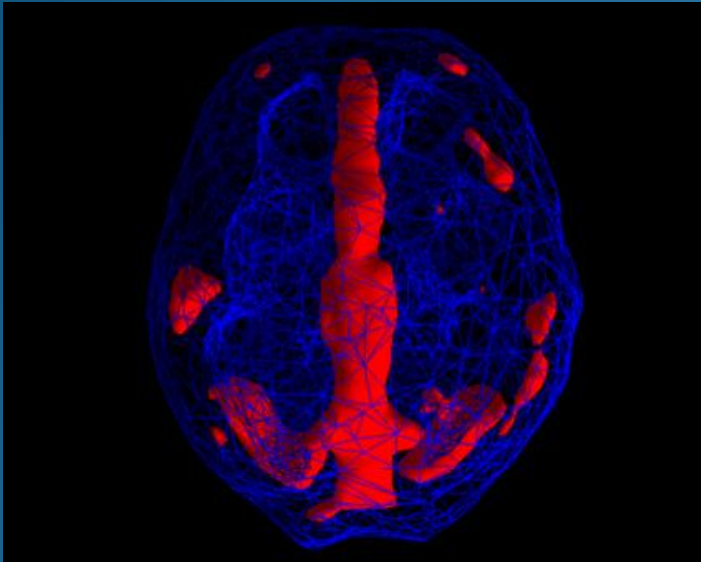
Schizophrenia

Traumatic Brain Injury

Predicts relapse in
alcoholics

Some forms of depression

Example no.2 - Overfocussed

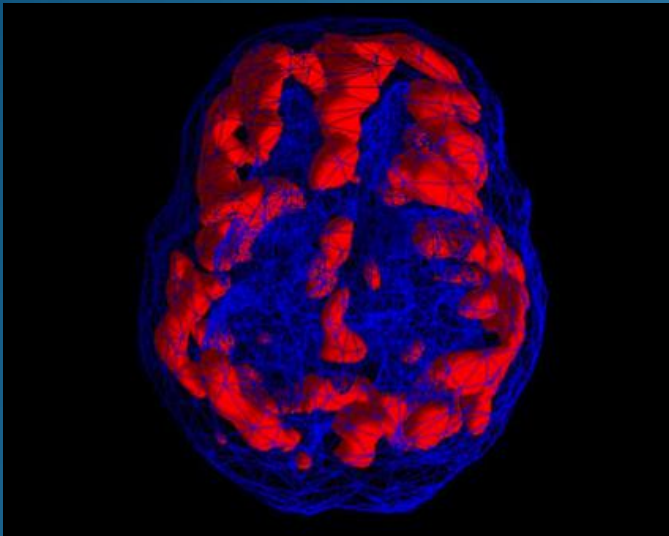


- too much activity in the anterior cingulate gyrus (the brain's “gear shifter”). Being flexible / shifting from thought to thought / task to task is very difficult.

- People that get stuck into negative thought patterns or behaviors, as a result of a deficiency of serotonin and dopamine in the brain.

Source: <http://www.additudemag.com/slideshow/61/print.html>

Example no.3 - Ring of fire

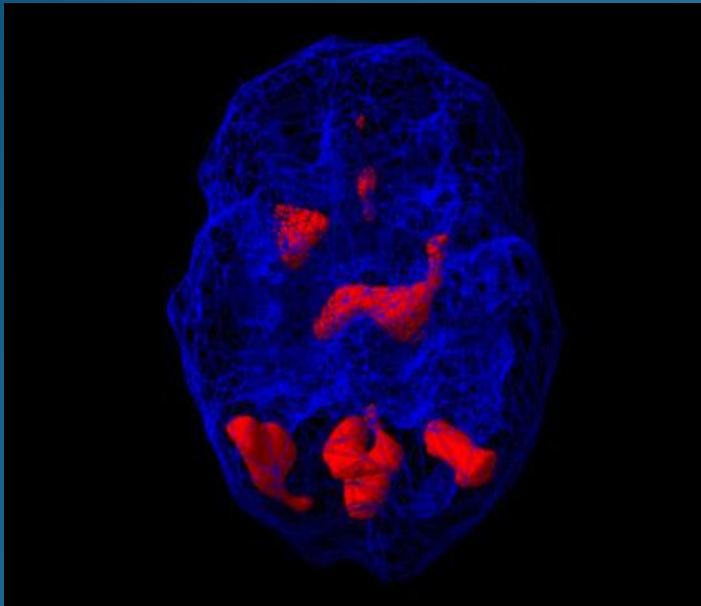


- The entire brain is overactive - there is too much activity across the cerebral cortex and many of the other parts of the brain.

- symptoms: sensitivity to noise, light, touch; periods of mean, nasty / unpredictable behavior; talking fast; anxiety and fearfulness.

Source: <http://www.additudemag.com/slideshow/61/print.html>

Example no.4 - Limbic ADD



- too much activity in the limbic part of the brain (the mood control center) and decreased prefrontal cortex activity, whether concentrating on a task or at rest.
- moodiness, low energy, feelings of helplessness / excessive guilt, chronic low self-esteem. It is not depression.

Source: <http://www.additudemag.com/slideshow/61/print.html>

There are many examples of
scans that may explain all the
“disorders” teachers
diagnose as laziness, lack of
respect, and other traits
which don’t belong, in fact,
to “character”...

NEUROMYTHS

(as accepted by OECD)

1. “People are either right or left brained” /
people are either logical, or creative .

What means “logical” or “creative”, though?

How do you measure creativity?

According to a theory of education the left / “logic” hemisphere deals with math skills.

There are different kinds of math skills and the ability to deal with numbers comes from processing in both hemispheres.

- the left hemisphere - involved in counting and reciting multiplication tables, which rely on memorized verbal information
- the right hemisphere - estimating. Both hemispheres make critical contributions for most of cognitive skills.

“It takes two hemispheres to be logical / creative”.

Kara D. Federmeier, Edward W. Wlotko, Aaron M. Meyer, “What’s ‘right’ in language comprehension: ERPs reveal right hemisphere language capabilities”. *Lang Linguist Compass*. 2008 January 1; 2(1): 1–17

Recognition Networks

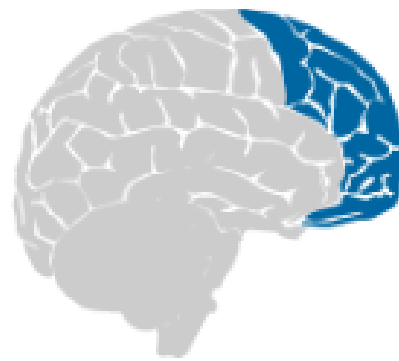
The "what" of learning



How we gather facts and categorize what we see, hear, and read. Identifying letters, words, or an author's style are recognition tasks.

Strategic Networks

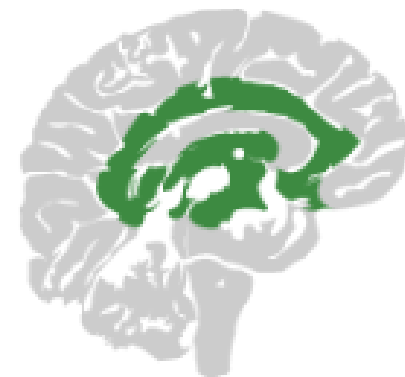
The "how" of learning



Planning and performing tasks. How we organize and express our ideas. Writing an essay or solving a math problem are strategic tasks.

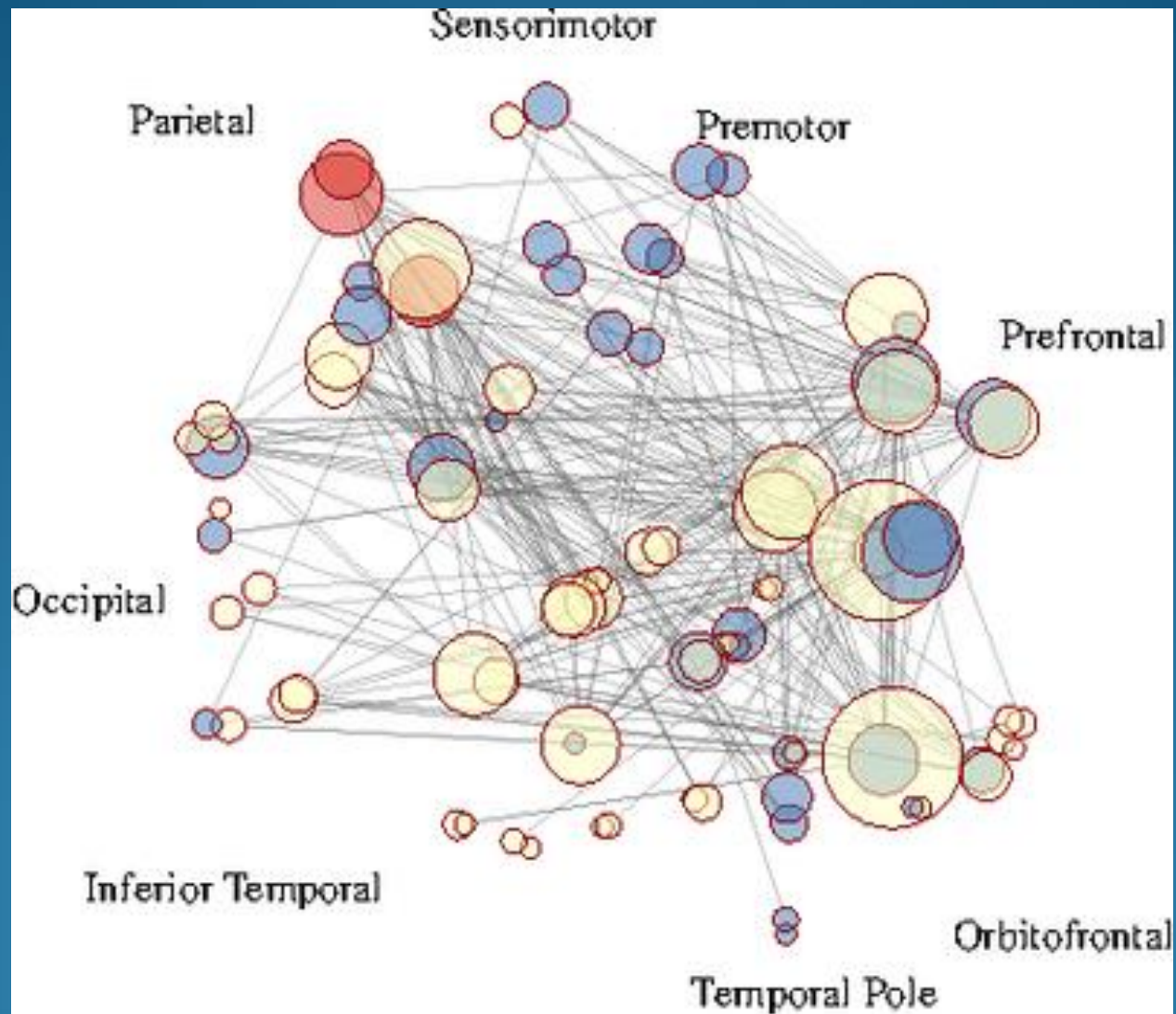
Affective Networks

The "why" of learning



How learners get engaged and stay motivated. How they are challenged, excited, or interested. These are affective dimensions.

Source: <http://www.cast.org/udl/index.html>



Ginestet, C.E. and Simmons, A. (2011). Statistical parametric network analysis of functional connectivity dynamics during a working memory task. *NeuroImage*, 5(2), 688-704.

2. “The first three years of a child are decisive for later development and success in life, because the brain is only plastic for certain kinds of information during specific critical periods”

- Source - Konrad Lorenz's studies on critical period of imprinting in birds.

-In humans, the **critical periods** are not so sharply delineated and are influenced by many factors.

- Brain networks change with experience – the brain has a great capacity to form synapses (a quality named **synaptic plasticity**). Any kind of stimulation induces new connections between neurons, and this ability is conserved throughout the whole life.

- The ability to learn the sounds and the grammar of a language appears to be optimal in the early and middle childhood years, but **plasticity is not limited to the first three years of life.**

3. “Enriched environments enhance the brain’s capacity for learning”

= if a child has not been fully exposed to an “enriched environment”, it will not recover later on in life and those capacities that could be accomplished early in life are lost.



What means
“enriched environment”?

Is it this cage “richer” than a
sewage system?

The richest environment is Nature.

No artificial maize for rats, no plastic toys for kids can be
more demanding than the Nature tools...
A bug is far more interesting than any toy

4. “There is a visual, auditive and a kinaesthetic type of learning”

= learning occurs through different ‘channels of perception’, and the type of learner – biologically determined – can be characterized by the predominant use of one channel of perception.

To fully develop, as a complete being, all the senses
have to be stimulated.

Each child is fully and exceptionally gifted.

But the society he lives in prunes the abilities which
are not considered at a certain moment.

Being a “nose” in a visual society is not a gift...

Why not?

Another “Cartesian approach” is Howard Gardner’s theory of multiple intelligences – although useful in stimulating people to “unpack their gifts”, it may block the fully manifestation of the intelligence itself, as a result of the whole human potential.

5. “We only use 10% of our brain”

one of the most stated brain myths, is still in use.

Actually, we use a 100% of our brains.

Sources of this myth:

- the ratio of glia cells to neurons in the brain (10:1);
- the studies of Karl Lashley, who explored, at the beginning of the XX-th century, the function of certain brain areas using electric shocks. Many brain regions did not react, hence, he concluded that these regions did not have any function;
- it seems that Albert Einstein told to a journalist that he only used 10% of his brain, as an answer to a question concerning his intelligence, but there is no official record of this statement.

6. “Two languages compete for resources – the more one language is learnt, the more the other language is lost; knowledge, acquired in one language, is not accessible in the other language – the two languages lie next to each other in separated brain areas, with no points of contact; knowledge acquired in one language cannot be transferred to the other language; the first language must be spoken well, before the second language is learnt”.

Brain imaging revealed the processing of different languages occurs in much of the same brain tissue.

When bilinguals are rapidly toggling back and forth between their two languages — that is, in “bilingual mode” — they show significantly more activity in the right hemisphere than monolingual speakers, particularly in a frontal area called the dorso-lateral prefrontal cortex (the source of the bilingual advantages in attention and control). This expanded neural activity is so prominent and predictable on brain scans that it serves as a “neurological signature” for bilingualism.

Source: <http://www.brainfacts.org/sensing-thinking-behaving/language/articles/2008/the-bilingual-brain/>

We are more than our brains...

**Most of our lives occur beyond
our mind, beyond “control”**

Dr. Stephen Cowan's statements:

- *Growth and development are not a race*
- *Family traditions encourages strong roots and a healthy life*
- *We grow in cycles*
- *Encouragement is not the same as indulgence*
- *Pushing your buttons is a spiritual practice, and children are our spiritual teachers*
- *A symptom is the body's way of letting us know something has to change*
- *Healing takes time*
- *The secret of life is letting go*
- *Trust yourself: You're the expert on your child*

“Studies have shown that a mother’s intuition is more powerful than any lab test. Today, there is way too much scary information that interferes with our ability to listen to our own intuition...

Look into your baby’s eyes. Imagine what it feels like to be conscious of the world before you have language, before all those labels that scare us and divide things into good and bad, right and wrong. It is what Zen Buddhists call “beginner’s mind.” Watch closely how your baby breathes with his belly. This is Qigong breathing. Stop thinking for a moment and try breathing this way. You may just find the answers you need waiting for you there.”

Take the long view...
The scientific view