Intelligence and Learning

  - The brain has evolved over millions of years to be responsive to different kinds of content in the world
  - All of us have computers that respond to those contents
  - The strength or weakness of one computer doesn’t particularly correlate with the other computer

► Learning styles
  - Visual/Spatial: Learning through seeing
  - Verbal/Linguistic: Learning through hearing
  - Body/Kinesthetic: Learning through doing/moving/touching
  - Logical/Mathematical: Learning through numbers
  - Musical/Rhythmic: Learning through music
  - Inter/intrapersonal: Learning through others’/inner emotions

Intelligence Functioning

Mental Retardation

Learning Disabilities

► Neurologically-based processing problems
► Interfere with learning basic skills such as reading, writing, or math
► Can also interfere with higher level skills such as organization, time planning, and abstract reasoning
► The types of LD are identified by the specific processing problem:
  - Input: getting information into the brain
  - Organization: making sense of this information
  - Memory: storing and later retrieving this information
  - Output: getting this information back out when needed

Learning to read entails...

► Normally developed language skills
► Knowledge of phonological structures
► Knowledge of how written units connect with spoken units (alphabetic principle); Grain size matters!
► Phonological recoding and fluency
► Print exposure
► Reading disabilities are often caused by:
  - Difficulty applying the alphabetic principle
  - Failure to transfer oral language comprehension skills to reading
  - Failure to acquire new strategies needed for reading
  - Loss of motivation to read
Reading Disabilities: Dyslexia

► Impaired brain’s ability to translate written images received from the eyes into meaningful language.
► Occurs in individuals with normal vision, speech and intelligence → 1 in 5
► Individuals with dyslexia commonly have the following problems
  ► Reversals of letters (b for d), (p for q)
  ► Reversal of words (saw for was)
  ► May try to read from right to left
  ► May fail to see similarities and differences in letters/words
  ► May not recognize the spacing that organizes letters into separate words,
  ► Unable to sound out the pronunciation of an unfamiliar word

What those with Dyslexia see

Washout effect
River effect
Swirl effect

Chinese Characters

► Pictographs (≈4%) → drawing of real-life objects
  - Man  sun  mountain
► Ideographs (≈1%) → positional and numeral concepts by indication
  - One  一 up, above  上
  - Two  二 lower, below  下
  - Three  三
► Logical Aggregates (≈13%) → Form a new meaning by combining the meanings of two or more characters
  - Wood  木 Small Forest 林 Big Forest 林
  - Person  人 Small Group 从 Large Group 众
► Phonetic Complexes (≈82%) → combining the meaning of one character and the pronunciation of another character
  - (water) + 其 = 淇 (the river)

Dyslexia in Chinese

► Different parts of the brains are activated
  - Learning Chinese = areas for remembering visual patterns.
  - Learning English = areas for phoneme processing.
► It’s possible to have dyslexia in English but not in Japanese/Chinese

Semantic error (with visual error)
Orthographic/visual error
Auditory/phonological - homophones

病痛聰聽

Auditory/phonological - homophones

病: illness
P: chao[1]
P: chien[3]
S: clever
S: listen

Touch 常

Semantic error (with visual error)
Orthographic/visual error
Auditory/phonological - homophones

Deep vs. Shallow Orthography

Deep orthography

Shallow orthography

Arabic Language

► Alphabetic - 28 letters
► Consonants - letters
► Vowels - diacritics
► Cursive script
► Bi-Directional
  - Letters: RTL
  - Numbers: LTR
► Orthography
  - Deep – no vowels
  - Shallow – diacritics/vowelized
  - e.g.: In English hrd : hard, hired, heard, herd

Deep vs. Shallow Orthography

Deep orthography

Shallow orthography
Dyscalculia
► Having huge problems in math, in spite of being of normal intelligence
► Problems with:
  • "Linguistic" skills: understanding or naming mathematical terms, operations, or concepts, and decoding written problems into mathematical symbols
  • "Perceptual" skills: recognizing or reading numerical symbols or arithmetic signs and clustering objects into groups
  • "Attention" skills: copying numbers or figures correctly, remembering to add in "carried" numbers, and observing operational signs
  • "Mathematical" skills: following sequences of mathematical steps, counting objects, and learning multiplication tables
► Caused by:
  • Visual-spatial difficulties
  • Weakness in visual processing of numbers and mathematical notations

Dysgraphia
► Neurologically caused writing disability
► Pain while writing:
  • The pain usually starts in the center of the forearm and then spreads along the nervous system to the entire body.
► Symptoms:
  • May have illegible printing and cursive writing despite appropriate time and attention given the task
  • Shows inconsistencies: mixtures of print and cursive; upper and lower case; or irregular sizes, shapes, or slant of letters
  • Has unfinished words or letters, omitted words
  • Inconsistent spacing between words and letters
  • Exhibits strange wrist, body, or paper position
  • Has difficulty pre-visualizing letter formation
  • Can copy a section of text but not knowing what it says
  • Shows poor spatial planning on paper

Dyspraxia
► An impairment in the ability to plan skilled, non-habitual movements
► An impairment in the ability to relate the sequence of motions to each other
► Occurs since birth or at very young age
► Different from apraxia:
  • Adult condition: Disorder of learned movement or loss of ability due to brain damage
► Types:
  • Oral: difficulty in movements of tongue, checks, lips and jaw
  • Postural: inability to assume unusual or unaccustomed positions or postures involving motor planning
  • Constructional: inability to create, assemble, join or articulate parts to get a single structure

Attention Deficit Hyperactivity Disorder
► Used to be called "minimal brain damage", then "minimal brain dysfunction", it is neurological.
► Runs in families, 75% carries into adulthood
► 5-10% also have learning disabilities
► Symptoms
  • Lack of social skills, unpopular, need to be first
  • Needs are imperative, now, can not wait
  • Lower threshold for stimuli (ADHD a misnomer)
  • Distractability, inability to pay attention
  • Hyperactivity (more in boys than girls)
  • Impulsivity (doing things without thinking of the consequences)
  • Irritability (short fuses)

Literacy
► 23% (45M) adult Americans, function at the lowest level of literacy (level 1 or approx. 5th grade)
► 876 million illiterate adults in the world (1/5 population)
► 14% of the adult population is below basic prose literacy skills, with 26% of them 65+
  • Undiagnosed learning disabilities
  • High school drop out rate
  • General decline in cognition/memory
► 66-75% of the adults in the lowest [literacy] level and 93-97% in the second lowest level described themselves as being able to read or write English "well" or "very well."
► 70% of the participants reported they read "really well," while in actuality their reading scores reflected a 7th to 8th grade ability