Cognitive Neuroscience and Learning

MUADP-4_Level 1 (2024)

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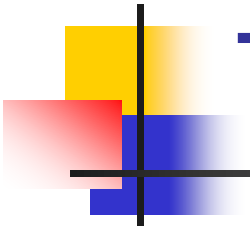
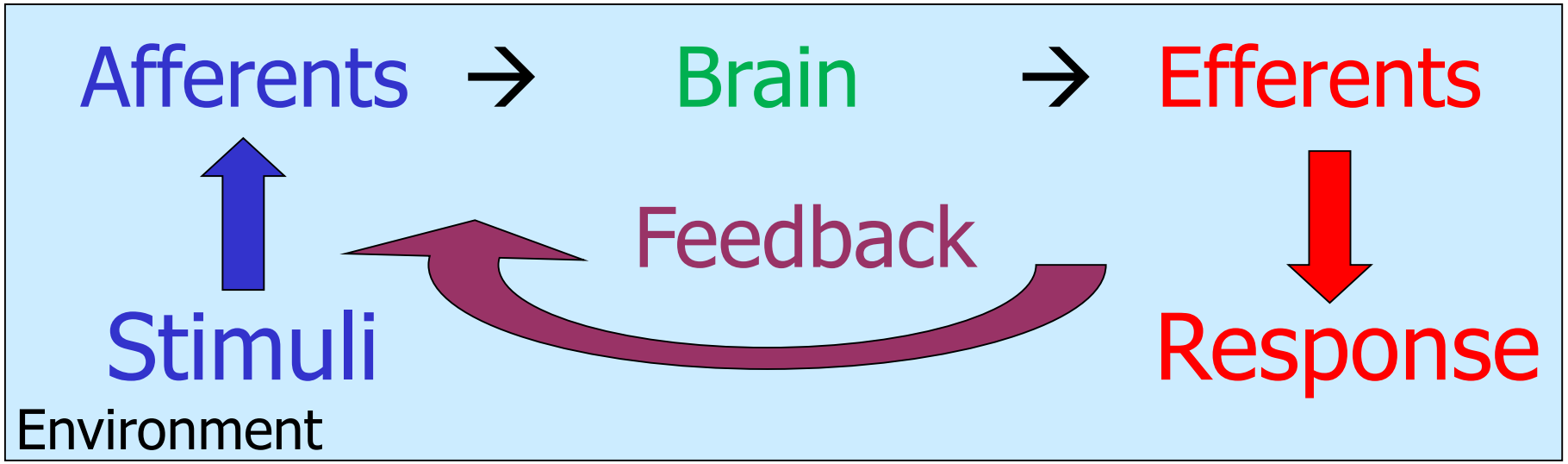


Topics…

Be able to explain and apply

1. System Concept & Physiology
2. What is Education & Education Concept?
3. Learning Styles
4. Brain & Learning
5. Brain-Based Learning
6. Cognitive Neuroscience
7. Learning & Memory
8. How to develop teaching media?

1. System Concept & Physiology

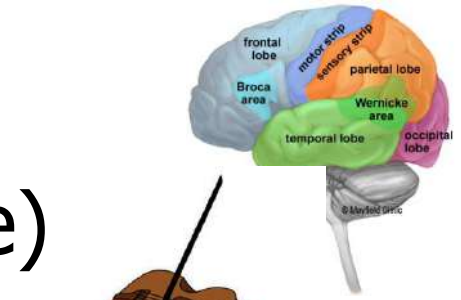


Education Concept (OLE & CPA)

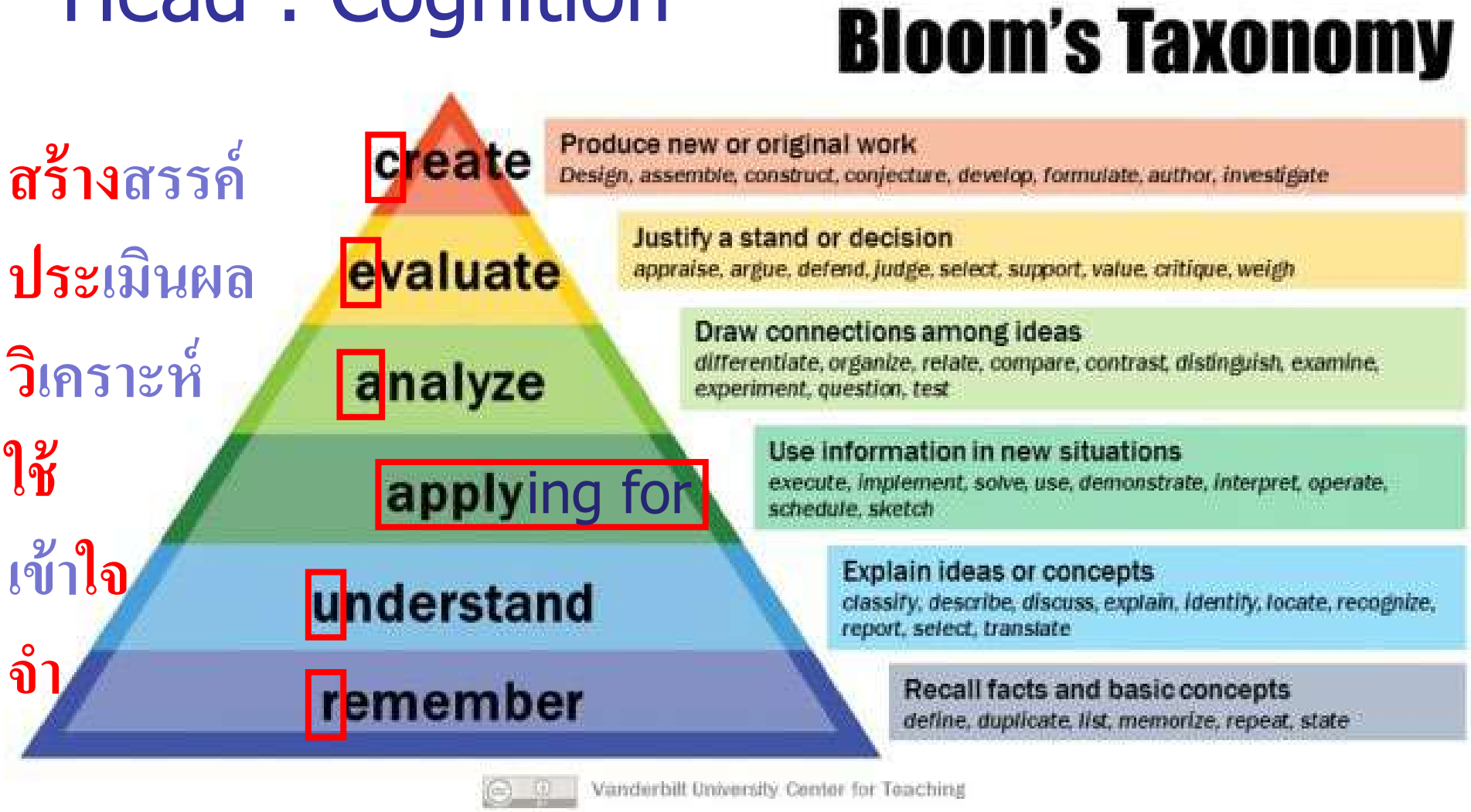
1. Objective: Learning Outcome
2. Learning process: Teaching & Learning
3. Evaluation: Formative, Summative

Revised Bloom's Taxonomy

1. Cognitive Domain (Knowledge)
2. Psychomotor Domain (Skill)
3. Affective Domain (Attitude)

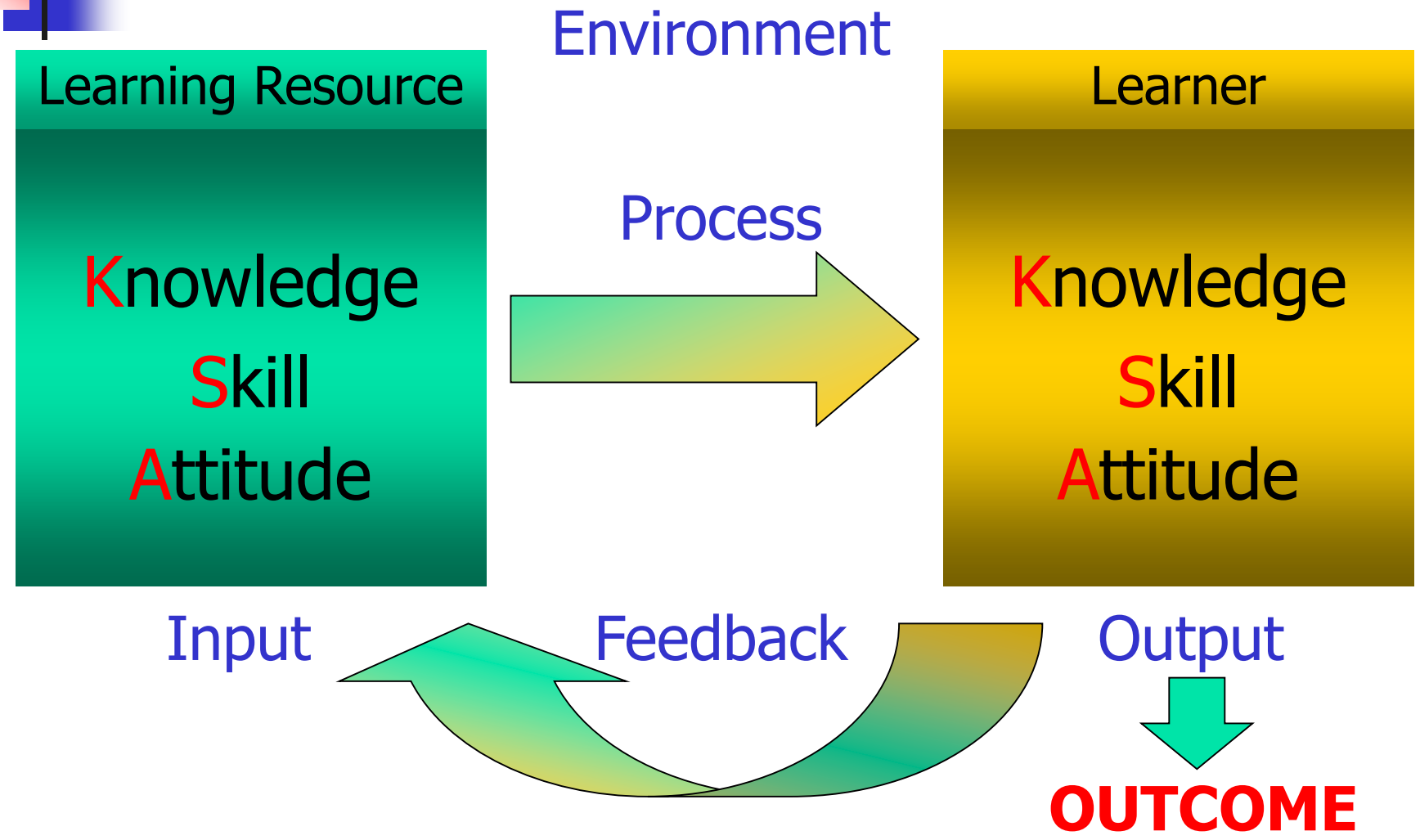


Head : Cognition



https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

Teaching & Learning Components



3. Learning Styles

- Style of learning based on each individual preference
- Learning Styles
  - Perceptual Modality / VARK Learning Style

Practice 1

- https://vark-learn.com/the-vark-questionnaire/

https://sites.google.com/site/learningstyleswiki/

Perceptual Modality

- Input modality/channel
- VARK Learning Style

1. Visual learning style
2. Auditory learning style
3. Read/Write learning style
4. Kinesthetic & Tactile learning style

Perceptual Modality (2)

- Dominant 1-2 learning modalities
- Process unconsciously
- May consciously aware of preferred modes
- Access through all senses,
  but generally favor 1 or 2

3.1 Visual Learning Style

- Input
  - Shape or form oriented
  - prefer seeing pictures, images, diagrams, map
  - when listening: create a mental picture
- Output
  - like drawing, showing pictures, …
  - I see that…
- Character
  - Eagle's eyes, Bird's eyes view
  - Parallel processing

3.2 Auditory Learning Style

- Input: Listener & Conversation
  - Prefer spoken messages
  - Remember things said to them
  - Carry on mental dialogues
- Output: Interactive
  - Talk it out & Need to hear their own voice to process the information
  - I hear that…
- Character
  - Sequential processing

3.3 Read/Write Learning Style

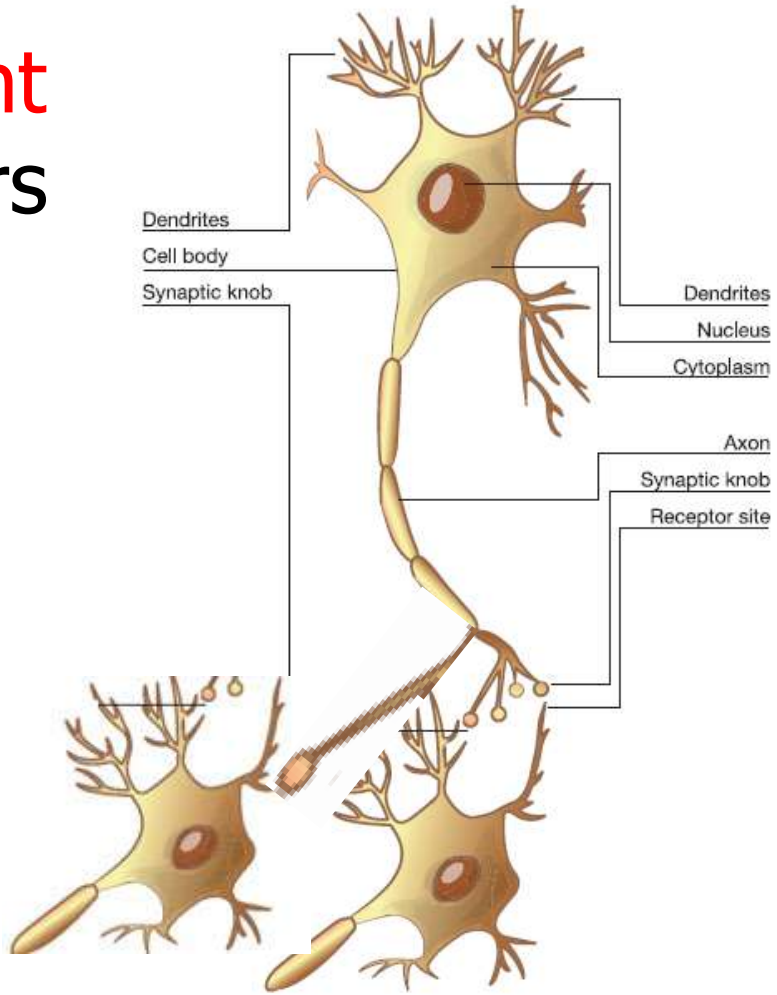
- Input:
  - Prefer reading text
  - Happy to have detailed manual, textbook, document, handout
- Output:
  - Prefer writing text, note, journal, diary
  - I used to read about…
- Character
  - eBook worm

3.4 Kinesthetic Learning Style

- Input
  - Tactile learners want to touch
- Output
  - Kinesthetic through muscle, joint, tendon
  - Want to sense the position and movement
  - Enough talking and looking, let's do it.
- Character
  - Prefer activities moving around
  - trials and errors, simulation, VR

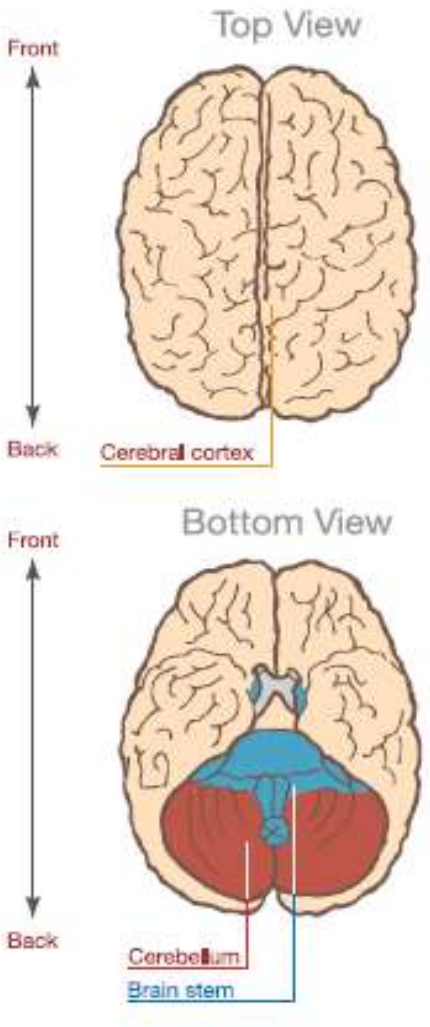
4. Brain & Learning

- Learning by engagement → increased nerve fibers & synapses
- The more the brain is used, the more fiber branches and synapses are formed

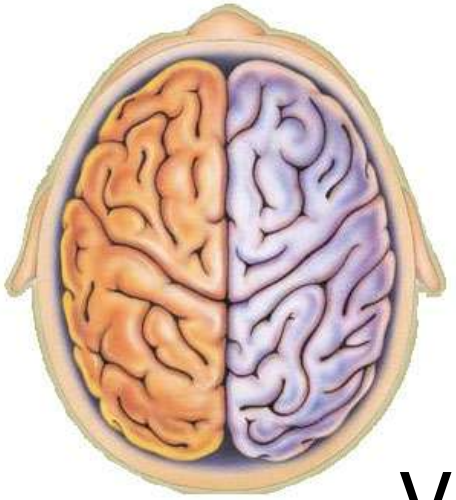


4. Brain & Learning (2)

- Interest & Emotion
- Relaxed alertness
- Relevant to real life experience
- Learning through experience & practice
- Brain lateralization
  → Dominance
  Left & Right brains



Left



Right

- Details
- Temporal: Time-series
- Sequential
- Logical
- Mathematics & Language
- Scientific
- Analytic

- Visuo-spatial
- Spatial: 3D
- Parallel
- Feel like…
- Music & Art
- Imaginative
- Synthetic, Creative

5. Brain-Based Learning

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5.1 Physiology of Learning

5.2 Psychology of Learning

5.1 Physiology of Learning

* Healthy Brain:
  - Food/Water, Air, Exercise, Rest, Emotion
- Consciousness, Subconscious learning
- Sensory Perceptions: 5 senses
- Motor/Exercise, Rhythmic movement
- Repetition & application are the keys
- Thinking
- Meditation → Status of brain waves
- Feeling & Emotion

5.2 Psychology of Learning

- Feeling and Emotion
  - Love / Hatred
  - Happiness, Peacefulness / Anger, Sadness, Anxiety
  - Curiosity, Fun, Challenge / Boredom
- Relaxation / Stress, Threat
- Reward / Punishment
- Attention, Inspiration
- Passion & Perseverance

6. Cognitive Neuroscience

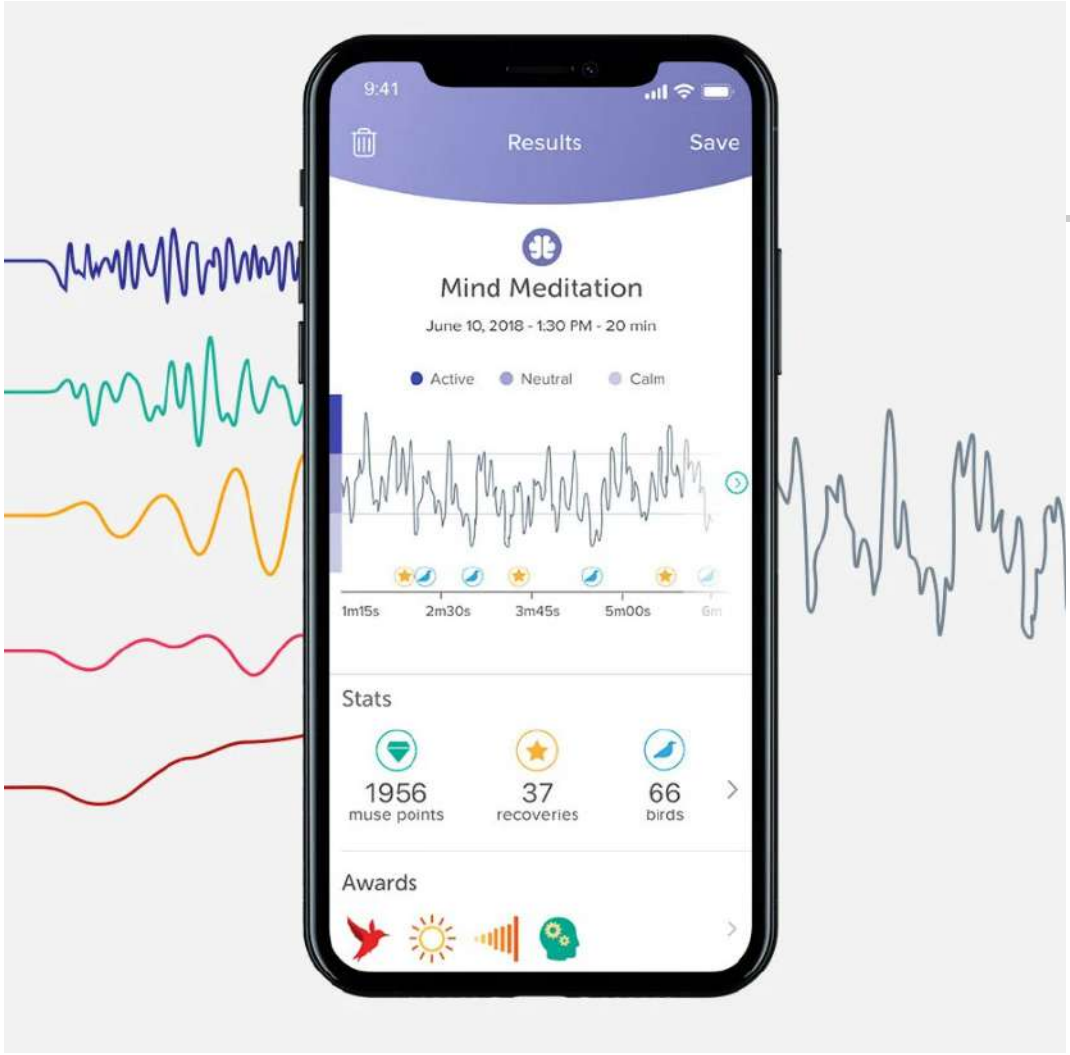
- Neurophysiology
  - Mechanism of learning and memory
- Neurobehavior science
  - Behavior and expression
- Psychology of learning
  - Education Concept

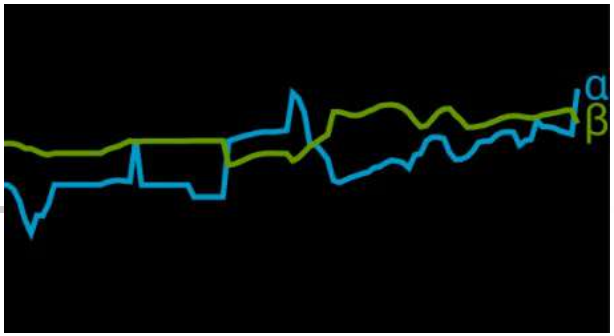
6. Cognitive Neuroscience (2)

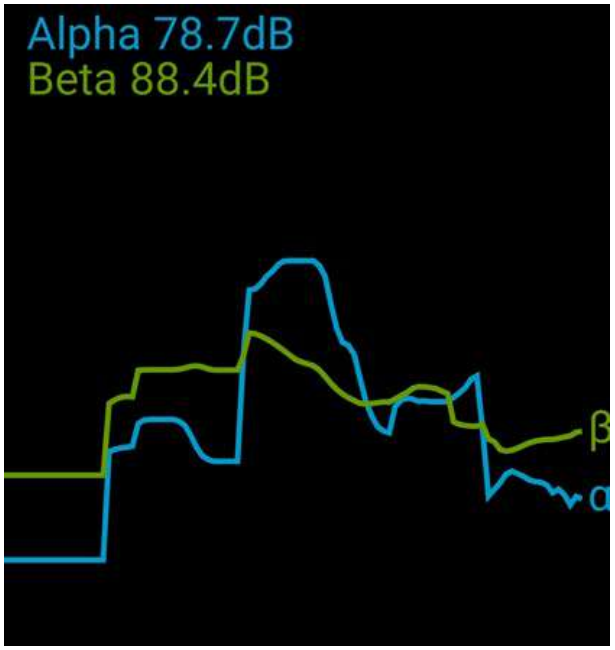
- Input : Perception → Electroencephalogram (EEG) ,vERP, aERP
  - Vision, Hearing
- Process:
  - Language, Pre-attention, Attention
- Output:
  - Motor control & expression, navigation
  - Learning and Memory

MUSE: Brain Sensing Headband

https://choosemuse.com/

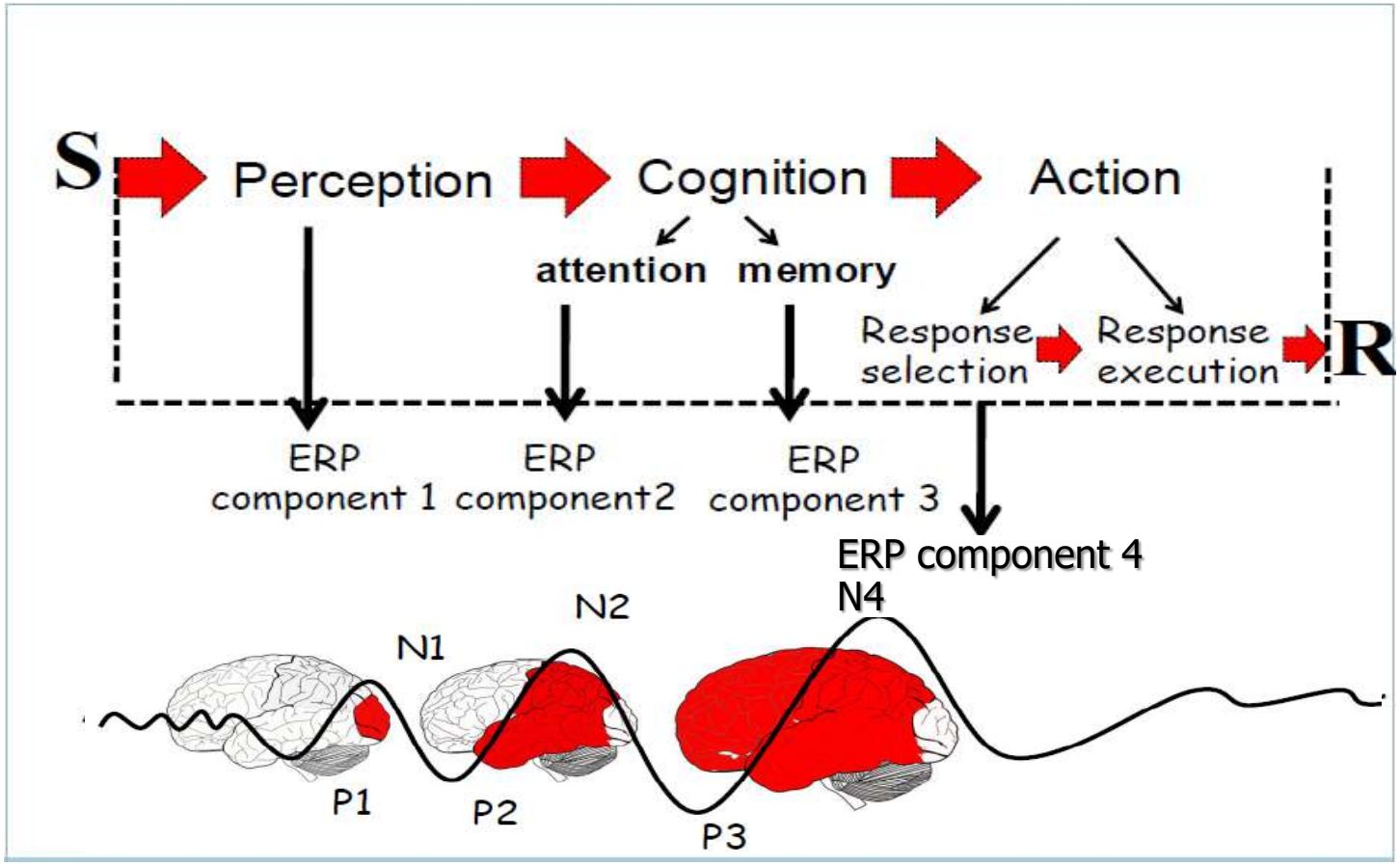






Electroencephalogram (EEG): Alpha & Beta

visual Event-Related Potential

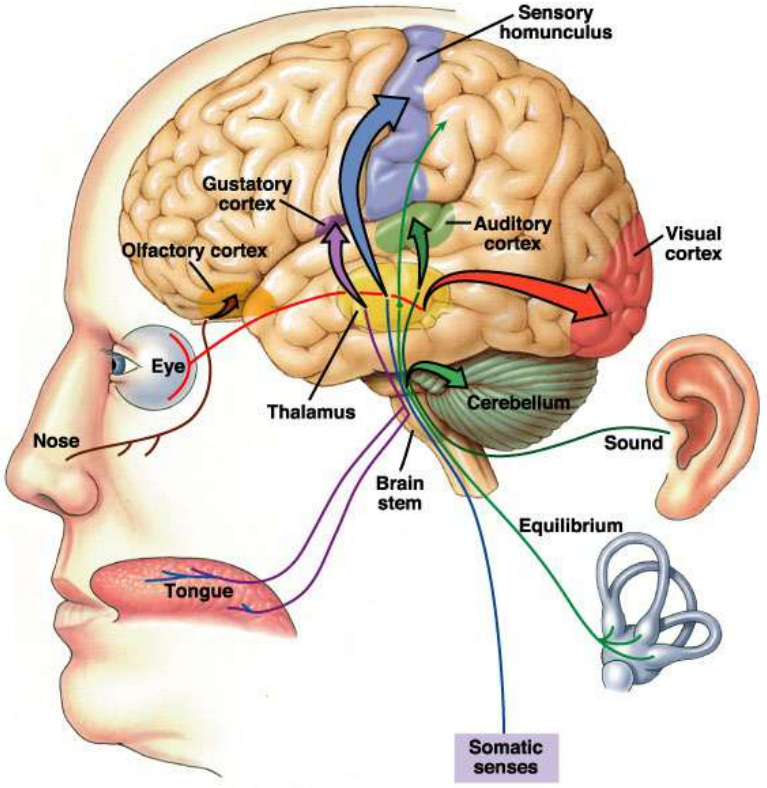


6. Cognitive Neuroscience (3)

- Study the factors influencing learning and memory
- Apply Education Concept and ICT to enhance learning & memory

7. Learning & Memory

- Stimuli
  → Sensory perception
- Physiology &
  Psychology of Learning
- Repeat at the right time
- Apply all the time
- Practices make perfect



Practice 2: Which one is better for learning?

A

Apple

B

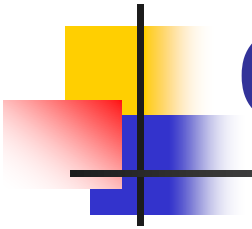
Apple

C

Apple

D

Apple



Confucious

I hear, and I forget;

I see, and I remember;

I ***do***, and I understand.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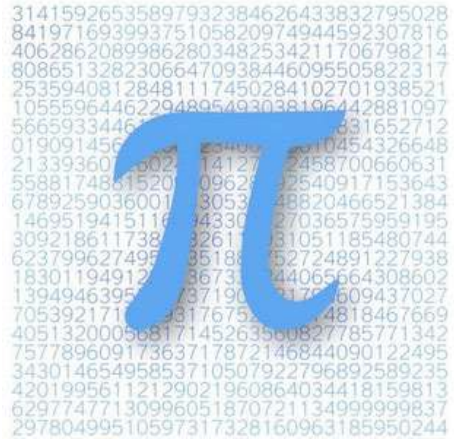

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20899 86280 34825 34211 70679

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