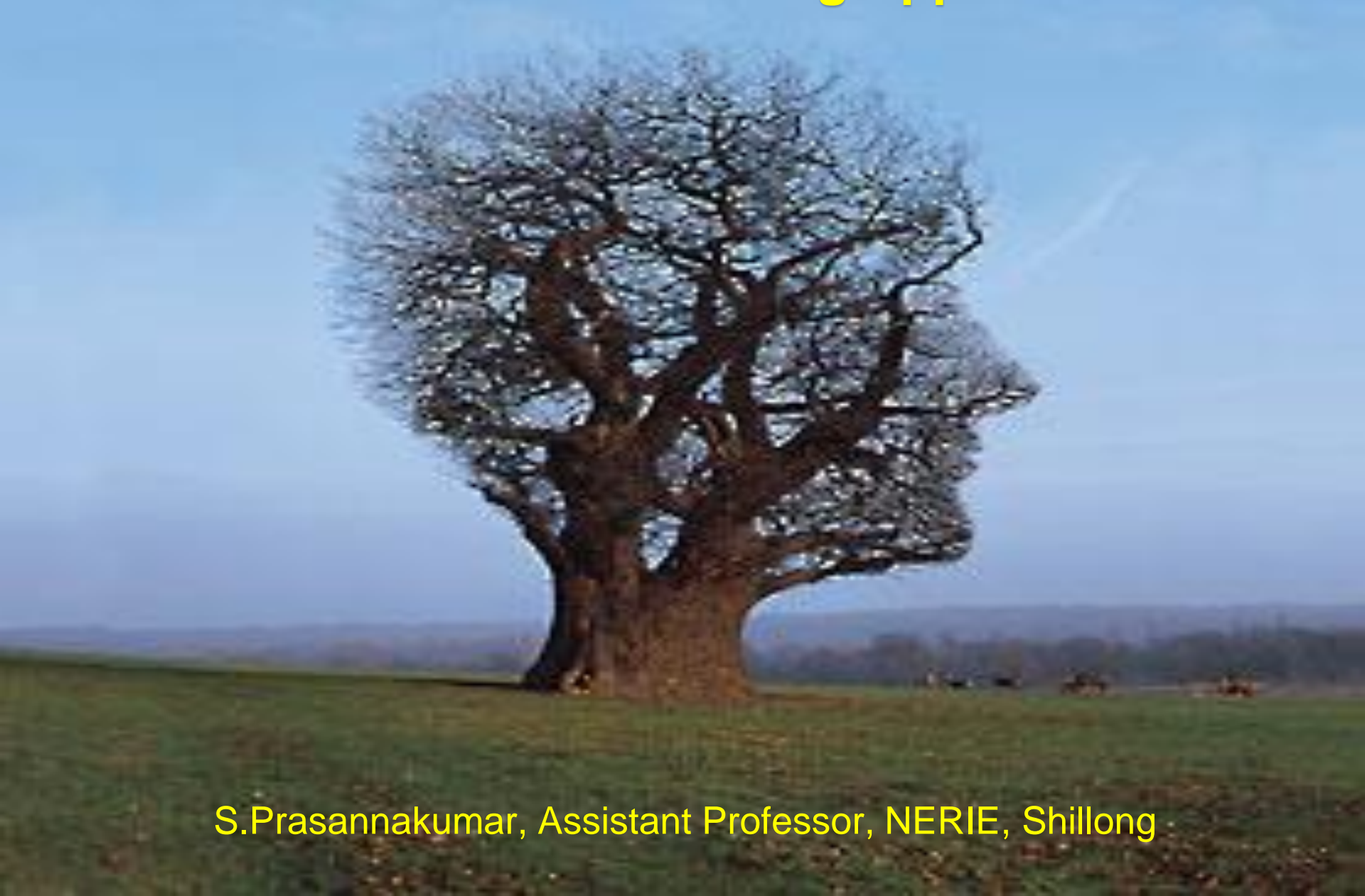


Teaching and learning in Science Through Information Processing Approach



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Warm-up

- ▶ How do knowledge, cognitive strategies, and knowledge about the use of cognitive strategies get into our heads in the first place?
- ▶ What is information and how it encode?
- ▶ How does it get organized and sorted?
- ▶ Where exactly is the information stored?
- ▶ How is it retrieved?

All these questions have to do with how the mind works—the processes involved in good thinking.

Content

- ▶ Basic Teachings of IP
- ▶ Definition of information processing
- ▶ Educational Implications of Information Processing

Approach

Basic Teachings of IP

- ▶ “The mind as computer” (How?) Based on a model of memory and storage
- ▶ The brain contains certain structures that process information much like a computer
- ▶ The human mind has three kinds of memories or “stores”

Human information processing

- The information-processing approach is that the human can be characterized as an information-processing system, which encodes input, operates on that information, stores and retrieves it from memory, and produces output in terms of actions

Definition of information processing

Information processing model:

- ❑ A model of learning that examines how we learn using the “mind as computer” metaphor.
- ❑ The “Information-processing Model” represents what happens when information flows through various internal structures which are supposed to exist inside the learner.

The Brain

The Computer

✓ The brain uses chemicals to transmit information

❑ The computer uses electricity

✓ Brains search memories using cues.

❑ Computers access information in memory by polling a memory address

✓ Memories in the brain grow by stronger synaptic connections.

❑ Computer memory grows by adding computer chips

✓ The brain does some multitasking using the autonomic nervous system.

❑ The computer can do many complex tasks at the same time ("multitasking") that are difficult for the brain.

▪ For example, the brain controls breathing, heart rate and blood pressure at the same time it performs a mental task.

▪ For example, try counting backwards and multiplying 2 numbers at the same time

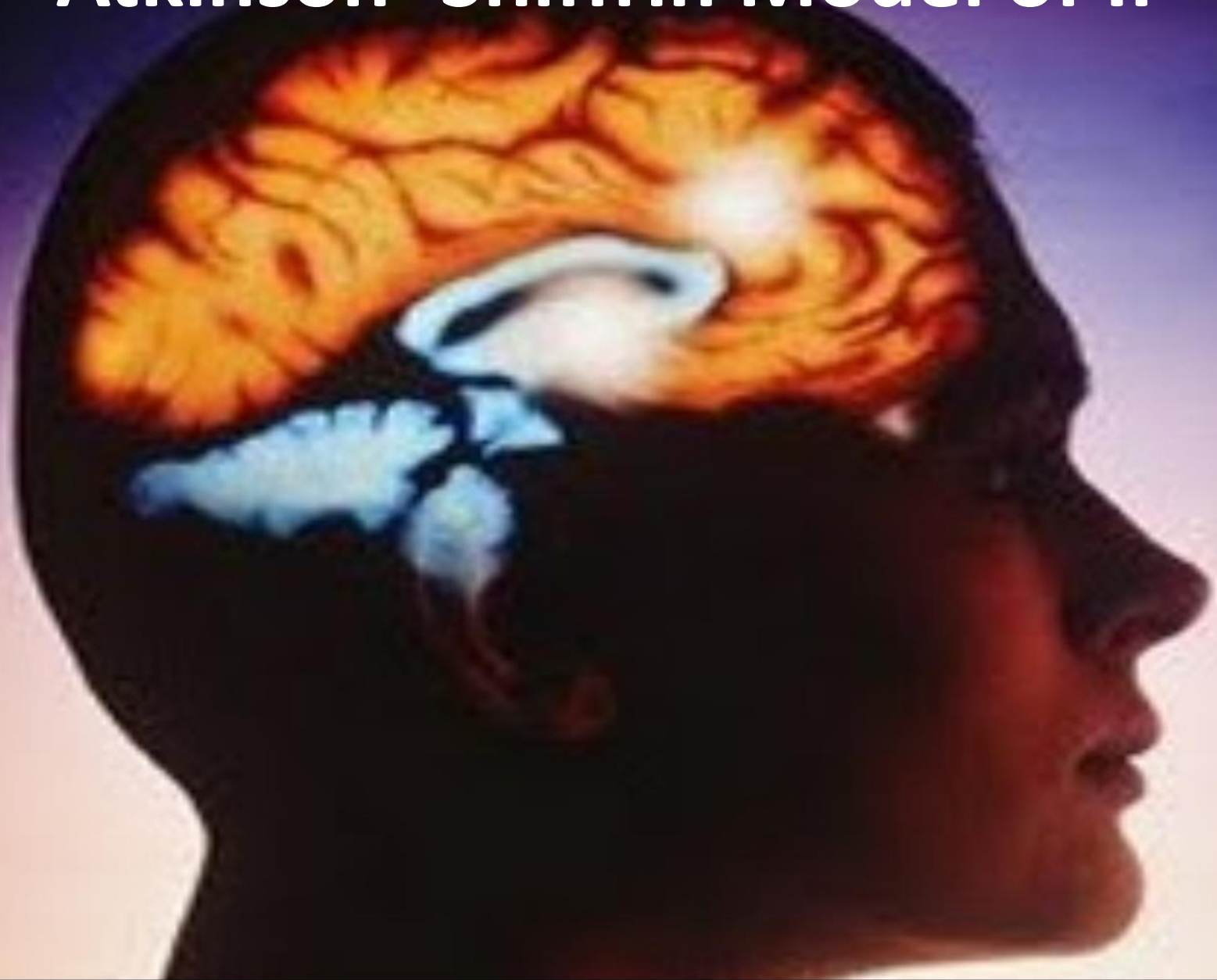
✓ The brain needs nutrients like oxygen and sugar for power.

❑ The computer needs electricity to keep working

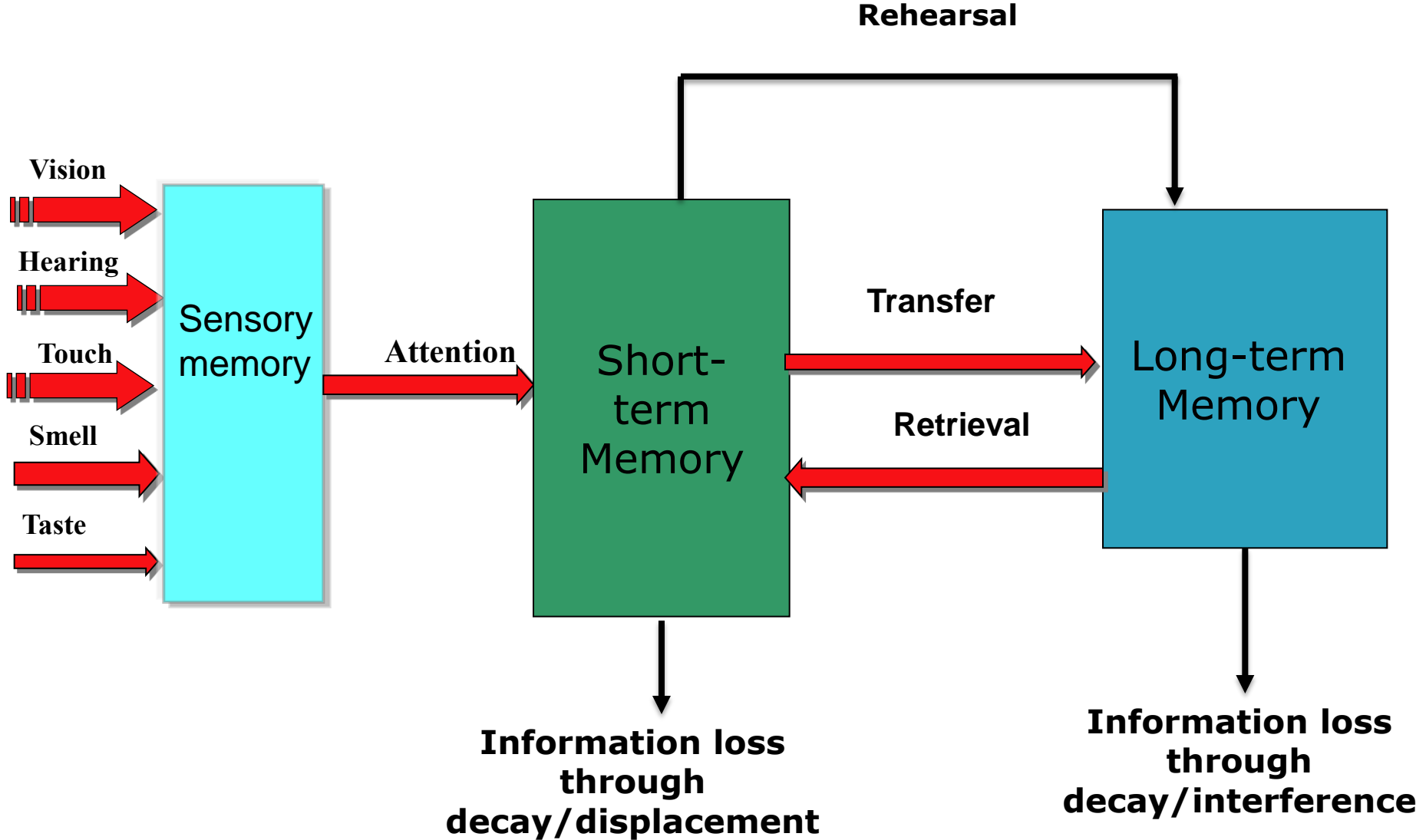
✓ The brain is a self-organizing system

❑ Computers are designed, built and are of fixed architecture,

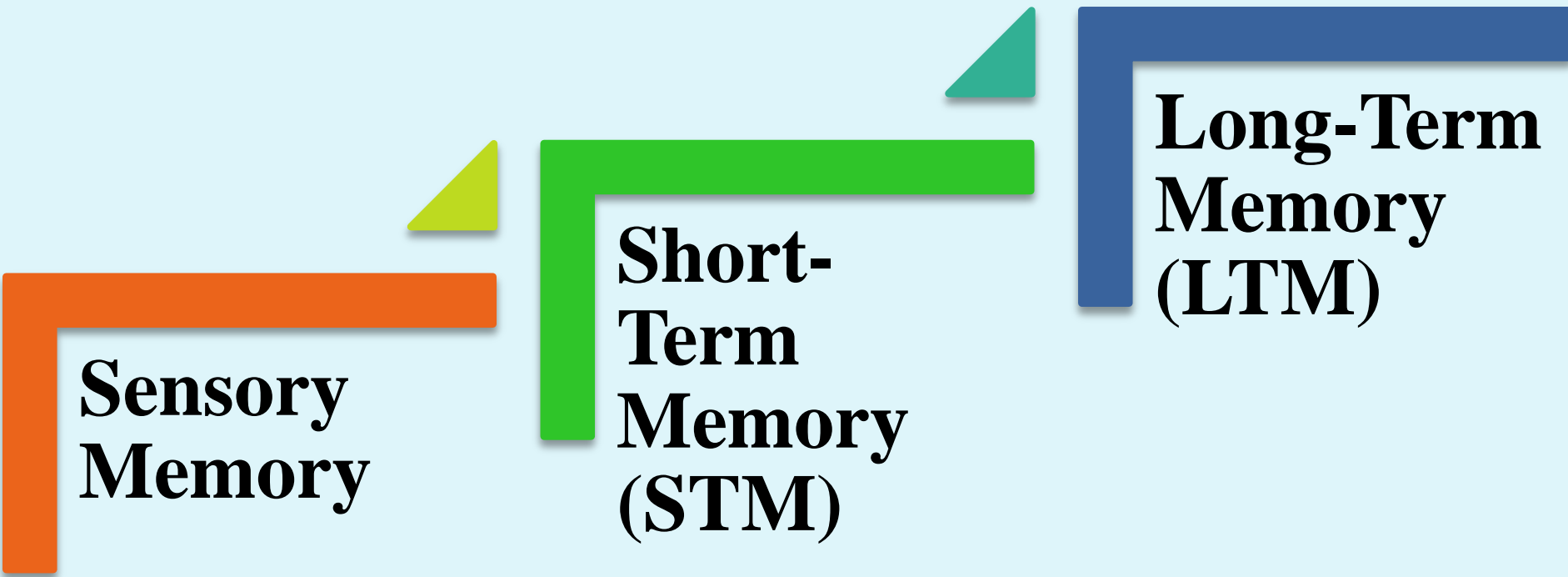
Atkinson- Shiffrin Model of IP



INFORMATION PROCESSING MODEL



THREE kinds of memories or “stores



The diagram illustrates the flow of information through three memory stores. It consists of three L-shaped blocks arranged in a staircase pattern from left to right. The first block is orange and labeled 'Sensory Memory'. A yellow triangle points from its top-right corner to the top-left corner of the second block. The second block is green and labeled 'Short-Term Memory (STM)'. A teal triangle points from its top-right corner to the top-left corner of the third block. The third block is blue and labeled 'Long-Term Memory (LTM)'. The background is light blue with a blue and black decorative shape at the bottom left.

**Sensory
Memory**

**Short-
Term
Memory
(STM)**

**Long-Term
Memory
(LTM)**

Short Term Memory

- Psychologists use the term 'working memory' to describe the ability we have to hold information in mind and mentally manipulate information over short periods of time.



Some properties of STM:

- **Capacity:** 7 ± 2 "chunks" of information
- **Duration:** About 18-20 seconds (average).

- Information in STM can be **held in STM** via a method called **maintenance rehearsal**- that is, **repeating the information silently or aloud** so that it is recalled immediately when needed.



Three Major Concepts For Getting Information Into STM

- ✓ **First**, pay attention to a stimulus if it has an interesting feature.
- ✓ **Second**, pay attention if the stimulus activates a known pattern.
 - (Call to mind relevant prior learning)
- ✓ **Third**, Point out important information

Two Major Concepts For Retaining Information In STM

Organization And Repetition.

(How?)



□ **Repetition** must be done after forgetting begins.

➤ **Researchers** advise that the learner should not repeat immediately the content (or skill), but **wait a few minutes and then repeat.**

Specific examples of organization

Component (part/whole)--classification by category or concept .

Sequential -- chronological; cause/effect; building to climax .

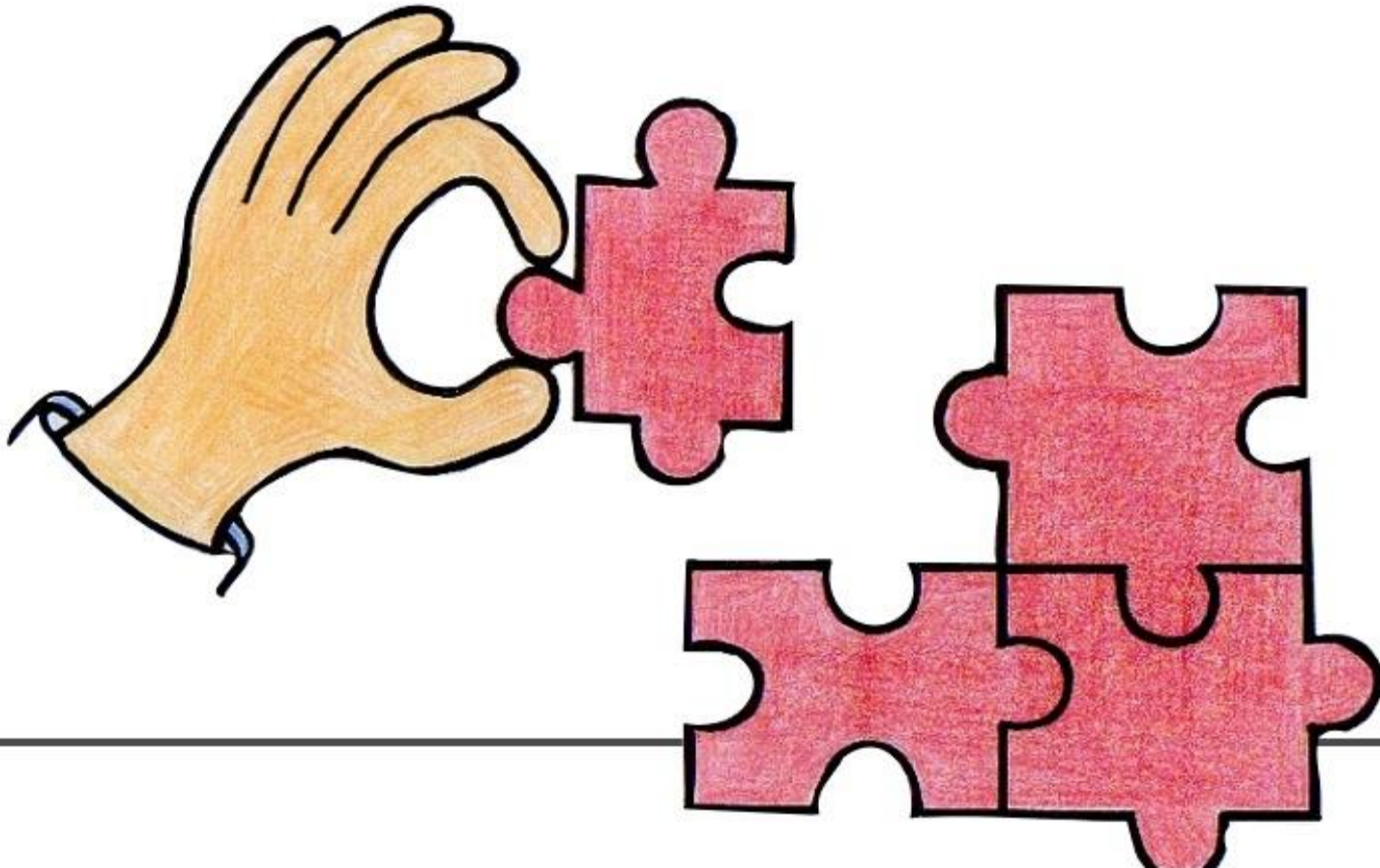
Relevance -- central unifying idea or criteria .

Transitional (connective) -- relational words or phrases used to indicate qualitative change over time .

Chunking (grouping into units) is a major technique for getting information into short-term memory

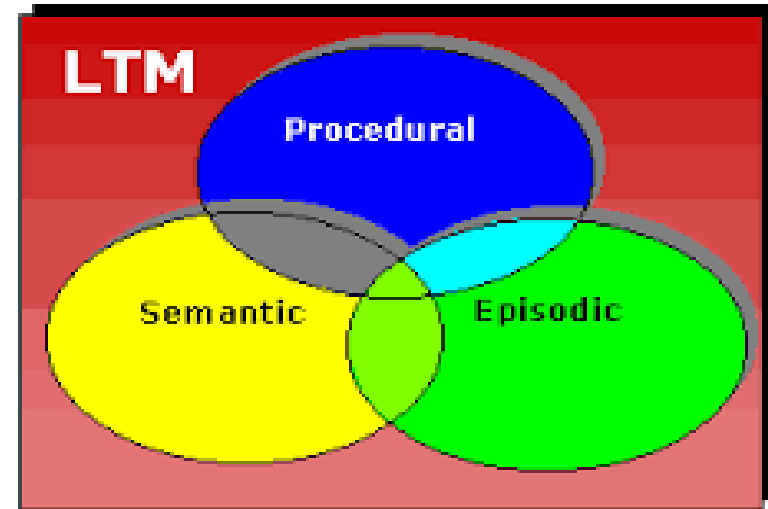
Long Term Memory

The long-term memory works to connect new concepts to those previously learnt



Some properties of LTM

- **Capacity:** **unlimited**
- **Duration:** Up to a **lifetime**
- **Processing:** Information is organized according to **meaning** and is associatively linked.



How we get information into LTM

Visual imagery --
mental picture
e.g., pictures,
charts, graphs.

coding -- e.g., (Loci
(locations);
Pegword (number,
rhyming schemes);
Rhyming (songs,
phrases); Initial
letter) .

Meaningful
Learning: refers to
learning new
information by
relating it to
previously learned
information.

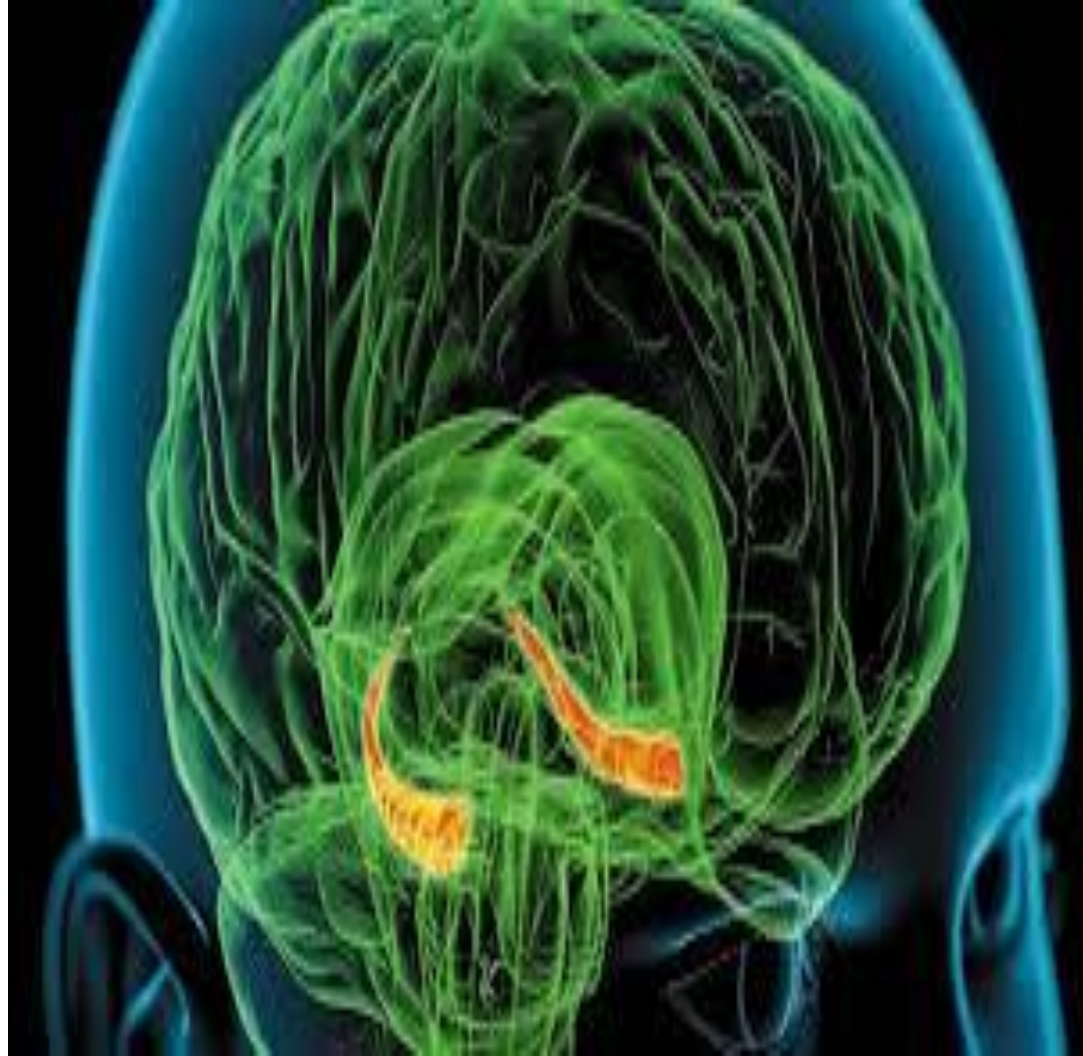
Cont...

For example, encouragement of students to learn new information by making it practical to them so that it will make sense to them.

Elaboration:
refers to expanding on new information based on what one already knows.

Knowledge base:
refers to information already in LTM.

Using the information processing approach in the classroom



Principle	Examples
<p>1. Gain the students' attention.</p>	<ul style="list-style-type: none"> ✓ Use <u>cues</u> to signal when you are ready to begin. ✓ Move around the room and use voice inflections
<p>2. Bring to mind relevant prior learning.</p>	<ul style="list-style-type: none"> ✓ Review previous day's lesson. ✓ Have a <u>discussion</u> about previously covered content.
<p>3. Point out important information</p>	<ul style="list-style-type: none"> ✓ Provide <u>handouts</u>. ✓ Write on the board or use transparencies
<p>4. Present information in an organized manner</p>	<ul style="list-style-type: none"> ✓ Show a <u>logical sequence</u> to concepts and skills. ✓ Go from simple to complex when presenting new material.

Principle

Examples

5. Show students how to use **coding** when memorizing lists.

- ✓ Use mental imagery techniques such as the keyword method
- ✓ • Make up silly sentence with first letter of each word in the list. •

6. Provide for **repetition** of learning.

- ✓. State important principles **several times** in different ways during presentation of information (STM).
- ✓ Have items on each day's lesson from previous lesson (LTM).
- ✓ Schedule periodic reviews of previously learned concepts and skills (LTM).

7. Show students how to categorize (**chunk**) related information.

- ✓ Present information in categories.
- ✓ Teach inductive reasoning

Thank you