

Semester 1 (PSYA)

CORE COURSES

- **CC1 Introduction to Psychology**
- UNIT 1: INTRODUCTION
- UNIT 2: PERCEPTION
- UNIT 3: LEARNING AND MOTIVATION
- **UNIT 4: MEMORY**

UNIT 4: MEMORY

- MODELS OF MEMORY:
 - LEVELS OF PROCESSING
 - PARALLEL DISTRIBUTED PROCESSING
 - INFORMATION PROCESSING
- RECONSTRUCTIVE NATURE OF MEMORY
- FORGETTING
- IMPROVING MEMORY.

PSYCHOLOGY

- Psychology derives its origin from Greek terms – ‘psyche’ meaning ‘soul’ or ‘mind’ and ‘logos’ meaning ‘to know about’.
- Wilhelm Wundt in 1879 first established a laboratory at Leipzig University in Germany and introduced the term ‘conscious experience’.
- Psychology as the **Science of Behaviour**.

PSYCHOLOGY

Psychology is defined formally as a science which studies mental processes, experiences and behavior in different contexts.

Mental Processes

- Such as remembering, learning, knowing, perceiving, feeling – helps to understand how the mind works and to help us improve the uses and applications of these mental capacities.

Experiences

- Experiences are subjective in nature.
- Experiences are embedded in our awareness or consciousness.
- Experiences are influenced by internal and the external conditions of the experiencer.

Behaviour

- Are responses or reactions we make or activities we engage in.
- Behaviours are overt or covert.
- Components:
 - Cognition.
 - Conation
 - Affection.

Sensation

- Sensation is the primary experience of knowing the world around us. It is the first step in understanding the more complex higher order cognitive processes such as perceiving the object, thinking, problem-solving etc.
- Sensation involves converting stimulation into a form the brain can understand (neural signals). This entire channel of process from reception leading to transmission of impulses to the sensory area is called sensory process and sensing of the object is sensation.

Perception

- A process that makes sensory patterns meaningful.

learning

- Learning occurs by setting up particular pathways between neurons and modifying their strength at the physiological level and between stimulus and response at the behavioural level.

Memory

- A cognitive process
- Stages: Encoding; Storage, Retrieval

Encoding

- Is the first stage which refers to a process by which information is recorded and registered for the first time so that it becomes usable by our memory system

Storage

- Refers to the process through which information is retained and held over a period of time.

Retrieval

- Refers to bringing the stored information to one's awareness so that it can be used for performing various cognitive tasks such as problem-solving or decision-making.

Information Processing Approach: The Stage Model

- According to this model, human memory is seen as a system that processes information in the same way as a computer does.
- This model was proposed by Atkinson and Shiffrin in 1968, 1971. It is known as Stage Model.
- According to the Stage Model, there are three memory systems : the Sensory Memory, the Short-term Memory and the Long-term Memory.

Sensory Memory

- The incoming information **first** enters the sensory memory.
- Sensory memory has a **large capacity**.
- However, it is of **very short duration**, i.e. less than a second.
- It is a memory system that registers information from each of the senses with reasonable **accuracy**.
- Often this system is referred to as sensory memories or sensory registers because information from all the senses are registered here as exact replica of the stimulus.

Sensory Memory

- The sensory memory register is specific to individual senses:
 1. Iconic memory for visual information
 2. Echoic memory for auditory information
- The general purpose of the sensory information stores seems to be to keep information around, for further processing.
- Information is passed from the sensory memory into short-term memory via the process of **attention**, which effectively filters the stimuli to only those which are of interest at any given time.

Short Term Memory

- Information that is attended to enters the second memory store called the short-term memory (STM), which holds small amount of information for a brief period of time (usually for 30 seconds or less).
- Atkinson and Shiffrin propose that information in STM is primarily encoded acoustically, i.e., in terms of sound and unless rehearsed continuously, it may get lost from the STM in less than 30 seconds.

Long Term Memory

- It is a permanent storehouse of all information.
- Once any information enters the LTM it is never forgotten because it gets encoded semantically.

How does information travel from one store to another?

- Atkinson and Shiffrin propose the notion of **control processes** which function to monitor the flow of information.
- Selective Attention – the first control process that decides what will travel from sensory registers to STM.
- Maintenance rehearsal
- Chunking
- Elaborative rehearsals.

Critically Understanding the Modal Model:

- Tulving and Patterson (1968) argued against the notion of information being transferred from one store to another.
- Shallice and Warrington (1970) presented evidence against the idea that information must necessarily “pass through” STS to enter LTS.
- Limited capacity – a essential feature of STS not adequately explained. Whether the limitation refers to the storage capacity of a memory register or to the rate at which the processor can perform certain operations.

Critically Understanding the Modal Model:

- STS coding can sometimes be visual as well as semantic depending upon the material to be remembered.
- Rates of forgetting are a function of the type and depth of encoding.

Levels of Processing Model

(Craik and Lockhart, 1972)

- Many theorists now agreed that perception involves the rapid analyses of stimuli at a number of levels or stages (Treisman, 1964).
- Preliminary stages are concerned with the analyses of such physical or sensory features as lines, angles, brightness, pitch and loudness, while later stages are more concerned with matching the input against stored abstractions from past learning; that is later stages are concerned with pattern recognition and the extraction of meaning. This conception of a series or hierarchy of processing stages is often referred a “depth of processing”, where greater “depth” implies a greater degree of semantic or cognitive analysis. After the stimulus has been recognized, it may undergo further processing by enrichment or elaboration.

Levels of Processing Model.....

- Memory trace persistence is a function of depth of analysis associated with more elaborate, longer lasting and stronger traces.
- Retention is a function of depth, and various factors, such as the amount of attention devoted to a stimulus, its compatibility with the analyzing structures, and the processing time available, will determine the depth to which it is processed.

Levels of Processing Model....

- Memory is viewed as a continuum from the transient products of sensory analyses to the highly durable product of semantic associative operations.
- At deeper levels, the subject can make greater use of learned rules and past knowledge, thus material can be more efficiently handled and more can be retained.

Levels of Processing Model....

- Craik (1973) defined “depth” as

“the meaningfulness extracted from the stimulus rather than in terms of the number of analyses performed upon it”

Unlike the multistore model it is a non-structured approach. Memory is just a by-product of the depth of processing of information, and there is no clear distinction between short term and long term memory.

Levels of Processing Model....

- We can process information in the following ways:

1. **Shallow Processing**

This takes two forms: **Structural processing** and **Phonemic processing**

Shallow processing only involves **Maintenance Rehearsal**.

2. **Semantic Processing.**

Semantic processing only involves **Elaborative Rehearsal**.

Tulving's Model of Memory

- One major classification within the LTM is that of **Declarative** and **Procedural** (sometimes called **nondeclarative**) memories.
- Tulving has proposed yet another classification and has suggested that the **declarative memory** can either be **Episodic** or **Semantic**.

Episodic memory

- Episodic memory contains **biographical details** of our lives. Memories relating to our **personal life experiences** constitute the episodic memory and it is for this reason that its contents are generally **emotional** in nature.
- Episodic memory was defined as “an information processing system that (a) receives and stores information about temporally dated episodes or events, and about temporal-spatial relations among these events, (b) retains various aspects of this information, and (c) upon instructions transmits specific retained information to other systems, including those responsible for translating it into behavior and conscious awareness” (Tulving, 1972, p. 385).

Semantic memory

- Semantic memory, on the other hand, is the memory of **general awareness and knowledge**. All concepts, ideas and rules of logic are stored in semantic memory.
- Semantic memory refers to relative permanent store of general world knowledge that persists over the years and is not related to specific events, episodic memory refers to specific personal past events (Tulving, 1983, 2005)

According to **Tulving** (2003), the **three types of memory** are characterized by different types of **consciousness**.

- Procedural memory is characterized by **anoetic** consciousness,
- semantic memory by **noetic** consciousness, and
- episodic memory by **autonoetic** consciousness.

Anoetic consciousness

- Anoetic consciousness means, literally, nonknowing consciousness, and contains information that is temporally and spatially bound to the current situation.
- This information is called anoetic since we are not aware of processing it, but still it allows us to behave appropriately in relation to the environment (Tulving, 2003).
- When riding a bicycle, for example, we are not aware of how we keep balance, or what the exact mechanism is behind steering and so on. But we are able to ride the bicycle anyhow, since the information required is processed in procedural memory.

Noetic consciousness

- Noetic consciousness means, literally, knowing consciousness. This type of consciousness allows us to be aware of, and to cognitively operate on, objects and events and their relations, in the absence of the objects and events (Tulving, 2003).
- Noetic consciousness allows us to imagine a bicycle and relate it to other things, such as a helmet, and to events such as the knowledge that one can ride a bicycle during summer. The noetic knowledge of objects and events is general and is not connected to any personal past events, as is the information in autonoetic consciousness.
- Thus, the events in semantic memory differ from those in episodic memory.

Autonoetic consciousness

- Autonoetic consciousness means, literally, self-knowing consciousness, and is necessary for the remembering of personally experienced events.
- It is autonoetic consciousness that allows us to relate the bicycle in the previous examples to specific events in our personal past, such as remembering a specific bicycle ride (Tulving, 2003).

Procedural Memory

Anoetic Consciousness

Keeping balance; steering.

Semantic Memory

Noetic Consciousness

Vehicle; helmet; summer.

Riding a Bicycle

Episodic Memory

Autonoetic Consciousness

My experiences of riding a bicycle.

Connectionist Models

- ❖ Refer to a class of models that compute by way of connections among simple processing units.

PDP Model

- Instances of Connectionist models that stress the notion that processing activity results from the processing interactions occurring among rather large number of processing units.

PDP Model

- In Connectionist models, the building blocks are **Units** and **Connections**.
- **Units** are simple processing devices which take on activation values based on a weighted sum of their inputs from the environment and from other units.
- **Connections** provide the medium whereby the units interact with each other; they are weighted, and the weight may be positive or negative, so that a particular input will tend to excite or inhibit the unit that receives it, depending on the sign of the weight .

PDP Model

- In PDP models, processing takes place by the propagation of activation among simple, neuron-like processing units.
- Semantic information is not stored as such, but instead it is reconstructed in response to probes, in a process called pattern completion.
- Memories are stored and retrieved in a system consisting of a large number of simple computational elements, all working at the same time and all contributing to the outcome.

-
- In a PDP System, processing occurs by the propagation of activation from one unit to another via connections among the units.
 - A connection may be excitatory, then the activation of the receiving unit tends to increase whenever the sending unit is active. If the connection is inhibitory, then the activation of the receiving unit tends to decrease. But each unit may receive connections from many other units. The actual change in activation, then, is based on the net input, aggregated over all of the excitatory and inhibitory connections.

-
- Learning occurs through adjustments of connection strengths. Memory storage is just a form of learning, and also occurs by connection weight adjustment