Semester-II
Course-1.2.3: Learning and Teaching
First Half

Unit 1: Remembering and forgetting

Memory is an information processing system that we often compare to a computer. Memory is the set of processes used to encode, store, and retrieve information over different periods of time. Memory is a noun; the real fact is a verb, remembering.

Definition of Memory

The power that we have to 'store' our experiences, and to bring them into the field of consciousness sometime after the experiences have occurred, is termed memory. (Ryburn, 1956)

Memory is the ability to retain information or a representation of past experience, based on the mental processes of learning or encoding, retention across some interval of time, and retrieval or reactivation of the memory. (American Psychological Association, 2018).

Encoding is the process through which information enters into the memory system. Once we receive sensory information from the environment, our brains label or code it. We organize the information with other similar information and connect new concepts to existing concepts. Encoding information occurs through both **automatic processing and effortful processing**. For example, if someone asks you when you woke up today or what you wore when you came to college yesterday, more than likely you could recall this information quite easily. This is known as **automatic processing**, or the encoding of details like time, space, frequency, and the meaning of words. Automatic processing is usually done without any conscious awareness.

But when asked what was discussed in class yesterday? It probably required a lot of work and attention on your part to encode that information; this is known as **effortful processing**. When you first learn new skills such as driving a car, you have to put forth effort and attention to encode information about how to start a car, how to brake, how to handle a turn, and so on. Once you know how to drive, you can encode additional information about this skill automatically.

Storage refers to holding information in the memory over a period of time. Once the information has been encoded, we have to retain it. Our brains take the encoded information and place it in storage. Storage is the creation of a permanent record of information. In order for a memory to go into storage (i.e., long-term memory), it has to pass through three distinct stages: Sensory Memory, Short-Term Memory, and finally Long-Term Memory. These stages were first proposed by Richard Atkinson and Richard Shiffrin (1968).

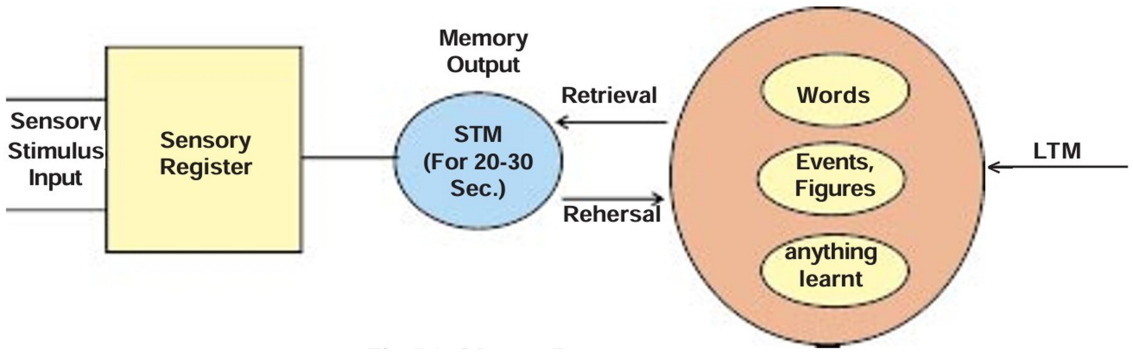
Retrieval is the recovery of the stored or retained information at a later occasion. Our ability to retrieve information from long-term memory is vital to our everyday functioning. You must be able to retrieve information from memory in order to do everything from knowing how to brush your hair and teeth, to answering questions at the time of the examination. In order to retrieve information from long-term storage there are two ways- recall and recognize. **Recalling** is the process of accessing information without any ques. For example, writing answers of essay type questions needs recalling. **Recognition** happens when you identify information that you have previously learned after encountering it again. It involves a process of comparison. For example, MCQ type of questions.

Information Processing Model of Memory

Information processing views of memory used the computer as a model. Like the computer, the human mind takes in information, performs operations on it to change its form and content, stores the information, retrieves it when needed, and generates responses to it. Thus, processing involves gathering information and organizing it in relation to what you already know, or encoding; holding information, or storage, and getting at the information when needed, or retrieval. The whole system is guided by control processes that determine how and when information will flow through the system.

The most widely used model of information processing is the **stage theory model, based on the work of Atkinson and Shiffrin (1968).** The key elements of this model are that it views learning and memory as discontinuous and multi-staged. It is hypothesised that as new information is taken in, it is in some way manipulated before it is stored. The types or stages of memory are-

a. Sensory memory
b. Short-term memory
c. Long-term memory



In the Atkinson-Shiffrin model, memory starts with a sensory input from the environment. This input is held for a very brief time – several seconds at most in a sensory register associated with the sensory channels (vision, hearing, touch, and so forth). This occurs in as little as ½ second for visual stimuli, and about 4 or 5 seconds for auditory stimuli. The

transfer of new information quickly to the next stage of processing is of critical importance, and sensory memory acts as a portal for all information that is to become part of memory.

Capacity, Duration and Content of Sensory Memory

- The capacity of sensory memory is very large
- Duration is very small, only 1-3 seconds
- The content resembles the sensations from the original stimulus i.e. images, sounds, smells etc.

The two very critical processes working at this stage of memory are- perception and attention. The process of detecting a stimulus and assigning meaning to it is called perception. We do not attend all the sensory information we get. What we pay attention to is guided by what we already know and what we need to know. For example, in the classroom not every student attend the same sensory information available. There are a number of sensory information in a classroom such as lights, noise, heat or cold; the students choose to focus their attention on the content that is being discussed in the classroom.

Information that is attended to and recognised in the sensory register may be passed on to second stage of information processing, i.e. short-term memory (STM) or working memory. This stage is often viewed as active or conscious memory because it is the part of memory that is being actively processed while new information is being taken in. For example, the information you have displayed on your computer screen—a document, a spreadsheet, or a web page. Information in short-term memory either goes to long-term memory (when you save it to your hard drive) or it is discarded (when you delete a document or close a web browser).

Capacity, and Duration and content of STM

- Information held for perhaps 20 or 30 seconds.
- George Miller (1956), in his research on the capacity of memory, found that most people can retain about seven items in short-term memory. Some remember five, some nine, so he called the capacity of short-term memory **the range of seven items plus or minus two.**
- The content in STM maybe sounds, images and abstract information based on meaning.

Some of the information reaching short-term memory is processed by being rehearsed – that is, by having attention focused on it, perhaps by being repeated over and over (**maintenance rehearsal**), or perhaps by being processed in some other way that will link it up with other information already stored in memory (**elaborate rehearsal**).

Through elaborative rehearsal information is moved from STM to Long-term Memory (LTM). When items of information are placed in long-term memory, they are organised into categories, where they may reside for days, months, years, or for a lifetime. When you remember something you are retrieving the information from the LTM and bringing it to the consciousness level.

Capacity, and Duration of LTM

- The capacity of LTM is practically unlimited
- The information stays at the LTM for years and even till death

Organisation of LTM

Each of the memory unit or structures represented in the mind is distinct and serves a different operational function. However, it is evident that some type of very specialised categorisation system exists within the human mind. Most cognitive psychologists distinguish two categories of long-term memory – **explicit memory** and **implicit memory.** Explicit memory is knowledge from long-term memory that can be re-called and consciously considered. We are aware of these memories we know we have remembered them. Implicit memory, on the other hand, is knowledge that we are not conscious of recalling, but that influences behavior or thought without our awareness. Explicit memory can be either **semantic** or **episodic**. Semantic memory is memory for meaning i.e. words, facts, theories and concepts. This type of memory is very important for studying. Semantic memory is not easily forgotten as the information is stored in highly organized way in logical hierarchies, from general to specific ones. Such organization makes it possible for us to make logical inferences from the information stored in semantic memory. Memory for information about a particular space and time especially information about the events or episodes of your life is called episodic memory. Our memory of habits, skills and how to do things is called **procedural memory** and it is an implicit memory.

Through the process of recalling and recognizing we retrieve information from long-term memory.

How to improve memory?

Transferring Information from Short-Term Memory to Long-Term Memory- Below are some strategies to facilitate this process:

- **Start reviewing new material immediately**: Remember that people typically forget a significant amount of new information within 24 hours of learning it.
- **Study frequently for shorter periods of time**: If you want to improve the odds of recalling course material by the time of an exam or in future class, try reviewing it a little bit every day.
- **Rehearsal:** One strategy is rehearsal, or the conscious repetition of information to be remembered.
- **Incorporate visuals:** Visual aids like note cards, concept maps, and highlighted text are ways of making information stand out. These aids make the information to be memorized seem more manageable and less daunting.

- **Create mnemonics:** Memory devices known as mnemonics can help you retain information while only needing to remember a unique phrase or letter pattern that stands out. They are especially useful when we want to recall larger bits of information such as steps, stages, phases, and parts of a system. There are different types of mnemonic devices:
    - ✓ **Acronym:** An acronym is a word formed by the first letter of each of the words you want to remember. For example VIBGYOR for the names of colours in a rainbow.
    - ✓ **Acrostic:** In an acrostic, you make a phrase of all the first letters of the words. "বাবার হল আবার জ্বর সারিল ঔষধে" is used to remember the names of the great Mughal rulers in chronological manner.
    - ✓ **Visual:** Using a visual to help you remember is also useful. Such as the knuckle mnemonic shown in the image below to help you remember the number of days in each month. Months with 31 days are represented by the protruding knuckles and shorter months fall in the spots between knuckles.
- **Chunking**: Another strategy is chunking, where you organize information into manageable bits or chunks, such as turning a phone number you remember into chunks.
- **Connect new information to old information**: It's easier to remember new information if you can connect it to old information, a familiar frame of reference, or a personal experience.

Forgetting

Forgetting is failure to retrieve information from long term memory store. According to Munn, forgetting is the loss, permanent or temporary, of the ability to recall or recognize something learned earlier. Hermann Ebbinghaus (1850-1909) was a German psychologist who worked on the 'forgetting curve' i.e. the loss of learned information and that's why this is sometimes referred to as the "Ebbinghaus Forgetting Curve." The forgetting curve represents the normal pattern of forgetting for new meaningless information. According to this research, people tend to forget rather quickly after learning material then forgetting slowly levels out. Generally, we forget 60% of what we have just processed within 20 minutes of learning.

Although the forgetting curve is a natural process, the process itself can be disrupted. That is, although it is natural for people to forget much of what they have learned immediately following an experience, simple processes can be used to slow down forgetting and to help us retain much of the information we will need to recall at a later date (such as test time). Reviewing and rehearsing information helps us to beat the forgetting curve.

Causes of forgetting

- **Interference:** According to this explanation, what we do in the interval between learning and recall, determines the course of forgetting. Experimental studies have

shown that learning new things interferes with memory of what is learned earlier and prior learning interferes with memory of things learned later.

a. Retroactive Inhibition This is a technical name for new learning that may interfere with material previously learned. Example- Suppose you have Bengali and English grammar classes back to back and forgetting the principles of Bengali grammar after an English grammar class is due to retroactive inhibition.
b. Proactive Inhibition When prior learning interferes with the learning and recall of new material, it is called proactive inhibition. Taking the prior example if learning the principles of Bengali grammar interferes with your English grammar recall then it is due to proactive inhibition.

- **Encoding, Organization and Retrieval Problems:** If the stored information is not encoded well or organized at the time it was learned, it is forgotten. Retrieval cues are also important in memory, as we may not be able to recall 'a' information in one situation but may spontaneously remember in the other situation. Retrieval is facilitated by organisation of the stored material and the presence of retrieval cues that can guide our search through long term memory for stored information. In absence of proper retrieval cues, the sought for items stored in long-term memory are not be found. Many times, you would have experienced that you cannot recall something while actively searching for it, but after giving up that search while doing something else, you recall that object. The new activity in which you engaged, or the new context gives another set of reminders, which helps to retrieve that information. It is a good idea to give up and do something else in order to generate new retrieval cues.
- **Motivated Forgetting:** Emotional factors also play an important role in forgetting. If we encode information while in one emotional state and try to recall it while in another, our recall suffers. Many lapses of memory in daily life illustrate motivated forgetting. We may forget the names of people we do not like. Repression theory holds that we forget because the retrieval of memories would be painful or un-acceptable in some way to the person. Freud, in his book "The Psychopathology of Everyday Life" had illustrated many examples of repression in forgetting. Repression includes retrieval failure for the associations of the threatening, anxiety-provoking information. Anxiety or guilt producing material are more often forgotten than pleasant experiences.
- **Amnesia:** Forgetting during Sickness Amnesia refers to loss of memory due to disease. Amnesia is a general "disease of memory. The person may forget his past experiences or may have impaired ability to encode, store and to retrieve, thus forming of new memory is difficult.
