
UNIT 4 LEARNING AND MEMORY: DEFINITION; CHARACTERISTIC FEATURES; OBSERVATIONAL, EXPERIMENTAL LEARNING; SENSORY, SHORT TERM AND LONG TERM MEMORY; INFORMATION PROCESSING MODEL

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4.0 INTRODUCTION

You have acquired many good things in your life-time, such as, you know how to read, write and perform other functions in socially desirable manner. You have acquired these through experience in your life time. Such an experience has remained interactive. These skills help you in adjusting in life in appropriate manner, you behave in descent manner with others in social situations and in personal life. How have you acquired such behaviour patterns? This is through the process of learning. Learning process is crucial to all organisms which eventually results in proper adaptation in different situations. This way, living becomes comfortable. Similarly, you remember many things, incidences etc. which help you to manage your daily routine and future planning. If you start

forgetting things which you have encountered during your day-to-day interaction, you may face difficulty in discharging your important duties assigned to you in personal and social situations. You remember things as you have a special power called 'memory'. Memory helps you in proper adjustment in life. You will be able to know in this chapter the meanings of learning and memory, the two very important aspects of life. You will also know the learning processes and their characteristics. Similarly, you will also understand as to how memory works in retaining our experiences. A few things you retain for a short time and others for a long time in your memory. How this retention process takes place? Forgetting is opposite to memory. Description of memory functions will give you definite idea about process of forgetting as well. This chapter, this way, will deal with very important aspects of human existence. You will find it interesting as this will help you in understanding yourself and others in the manner a common man does not know. The theories and other related facts will be presented in simple and clear-cut manner so as to help you the pick-up and retention more easily.

4.1 OBJECTIVES

After reading this unit, you will be able to:

- Define learning and memory;
- Identify the characteristics of learning and memory;
- Describe the concept and process of the observational and experimental learning;
- Identify the salient features of the sensory, short term and long term memory; and
- Describe the information processing model.

4.2 LEARNING: DEFINITIONS AND CHARACTERISTICS

We develop different skills and adapt to changing conditions of the world around us. Our experience help in shaping our behaviour suitable to the needs. This experience we get through the process of learning. Since birth many new features are added to our behaviour which more or less form the part of our life. This is almost permanent in nature. The *learning* is defined as 'any relatively permanent change in behaviour, or behavioural potential, produced by experience.' This definition has the following characteristics:

- i) learning does not apply to temporary change in behaviour
- ii) the behavioural changes due to maturation process does not form part of learning.
- iii) learning can result from *vicarious* as well as from direct experience
- iv) learnings are not always positive in nature. We learn bad habits as well in the process

Learning is the key factor in behavioural change of an organism. Through learning we make changes in our behaviour. These are many processes through which we get experience in life. Psychologists have found out such processes.

All modifications of behaviours are not learned. Some modifications do take place due to physical maturity. In most of the cases the distinction between learning and maturation is very clear but in some places this distinction is less obvious. You take an example of infant's walking. Normally, infant does not walk before the age about 12-15 months. They walk when they are physically fit and ready, perhaps, without learning. So walking here does not have the role of learning. But in children recognition of colour is the outcome of learning. This way, the impacts of learning and maturation on modification of behaviour are different.

Learning plays an important role virtually in every activity we perform. Psychologists believe that learning takes place in several basic forms. These basic process are observations learning, classical conditioning and operant conditioning. *Observational learning* is a form of learning where organisms learn by observing behaviours and the consequences of behaviour of others around them. *Classical conditioning* is a form of learning in which two stimulus events get associated in such a way that the occurrence of one event reliably predicts the occurrence of the other. Classical conditioning is a form of learning in which organisms learn association between behaviours and stimuli that precede them (antecedents) or follow them (consequences) you will come to know about these basic procedures of learning in paragraphs to follow. The classical conditioning and the operant conditioning will form the portions of experimental learning as these two forms have the characteristics of experimentation.

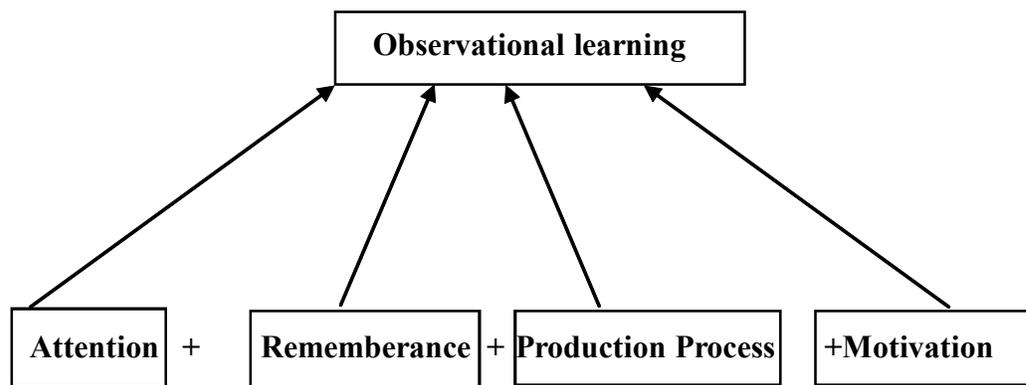
4.2.1 Observational Learning

While watching television you must have witnessed many aggressive scenes. Many detective stories present as to how the murders and thefts are committed in a planned manner. Many serials of social importance you may have seen as well as television. There is a discussion that such serials or shows need not be shown on televisions as children get influenced by it and start behaving in the same manner. Many criminals, caught by police, confessed that they committed crime by viewing a particular movie or a serial of the same type. Many researches are available in the literature which reveal that young people learn aggression through watching the actions of others.

Bandura et al; (1963) reported one study known as 'Bobo doll' study. One group of nursery-school children saw an adult engaged in aggressive actions against a large inflated Bobo doll. The adult who was serving as model knocked the doll down, sat on it, insulted it verbally, repeatedly punched it in nose. Another group of children were exposed to another model who behaved in a quiet, non-aggressive manner. Afterwards, both the groups of children were put in a room where several toys including a Bodo doll were available. The behaviours of children were observed carefully and found that those children, who had seen aggressive model, started behaving in the same way. They punched the toy, sat on it and uttered verbal abuse similar to those of the model. The control group children did not show any kind of aggression and played peacefully. The results of this observation clearly indicate that children do shape their behaviour by observing others in social situations around us.

No doubt, observational learning exists where one adheres to the bahviours of a model, the liked person. You may now be interested to know as how and to what extent we acquire behaviours, information or concepts from others. Bandura

(1986) described the four conditions which facilitate behaviour change through observation. The four conditions are — *attention, retention, production process* and *motivation*. For learning through observation one must pay attention to the persons performing activities which one likes, people attractive to them, the behaviours which are desirable in the eyes of the observer, suiting the needs and goals of the person observing the behaviours. In other words, the extent to which one focuses on others' behaviour is attention. Another factor is remembrances i.e. the extent to which one remembers what the other person has done or what did he say? More the remembrance, more quick is the adaption of actions. Suppose, you try to copy the tune of a song. It will be easily ready if you correctly remember the musical details of the song. The third factor is production processes. You may remember the song and its musical details but if you can not perform due to voice disability or lack of knowledge of musical principles, you can not make a change in your behavioural pattern. Hence, observational learning does not take place. Production process, hence, depends on two main bases — the physical ability of the person getting learning and the capacity to monitor the desired behaviour till perfection is achieved. The fourth factor, motivation, is extremely powerful in behavioural learning. If the action, information received by a model is not useful for the observer, then it will not be used and easily forgotten. Motivation keeps the observer in the state of readiness to accept the things they need. Only such behaviours are borrowed from others in the world about which the observers feel it is a must for them. This motivation level results in increased efforts to achieve success by observing others in the society. In most of the cases, some people become role models due to this process:



Basic determinants

Both positive and negative behaviours are adapted through observational learning. People easily get influenced by other people around them. The social, moral and other values are mostly absorbed by behavioural learning model. This is why, the parents see that their children always play with good children, see only socially desirable behaviours. You may remember in joint families old ladies mostly used to tell religious, moral, social stories so that in open environment children should try to follow the same pattern and be good children. Suppose, you visit some friend's house. You get a cup of tea. When the tea is over, you keep your cup yourself on the table. Children are keen observers. If some child observes your behaviour, on her visit to any other house, if sweet is given to her, she will try to keep the empty plate on the table herself. This way, observational learning takes place. Aggression, or normal behaviour, in higher degree is supposed to be a negative behaviour. Many studies have shown that when aggressive behaviour

gets re-enforcement by observation in movie or television, it is accepted by children or even adults. Aggressive is added to their repertoire. Later when angry or frustrated they use such aggressive behaviours towards others.

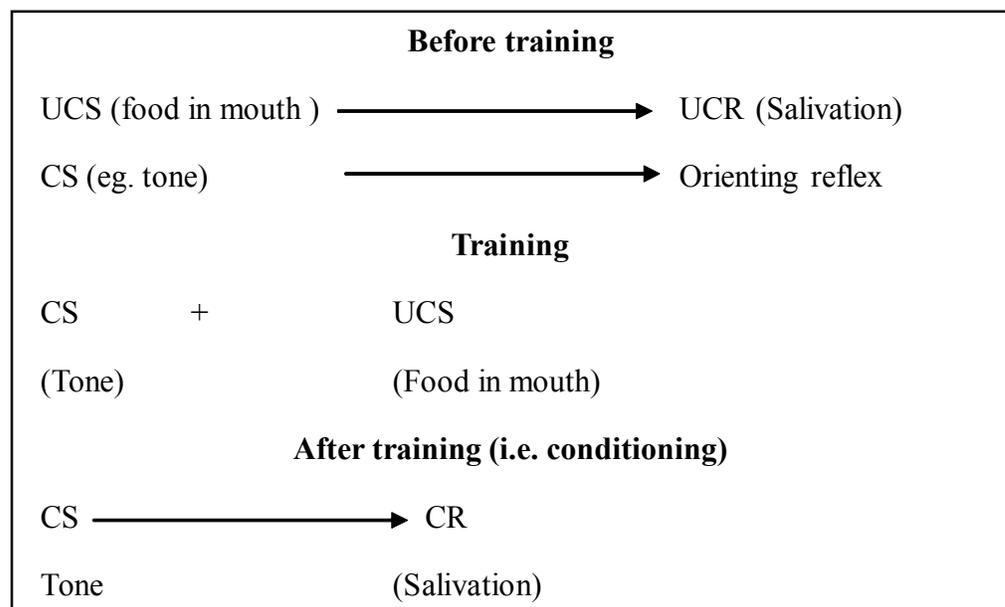
Observational learning is a complex process - more complex than mere imitation. A child develops in a society which may have a different cultural-social values than a place where, in adulthood, gets a job. To adjust in a new situation is comparatively difficult and sometimes gets a 'culture shock'. Such a person may be given cross-cultural training through experimental approach based on behavioural modeling. Here, trainees first watch films in which models exhibit the correct behaviours in a problem situation. They, then, take part in role-play exercises to test their knowledge. Finally, they receive constructive criticism regarding performance in role-play. Studies have found it very effective in altering behaviours in the desirable direction (e.g. Harrison, 1992). The concept of social learning is fully based on observational learning in which one observes determined by cognitive processes. While deciding the model, one considers the outcome from different angles. If cognitively one is satisfied then particular behaviour of the model is accepted. Such accepted behaviour stays in the person for a long period. Observational learning, in a way, shapes our lives effectively.

4.2.2 Experimental Learning

Under this heading you will come to know about two-classical and instrumental conditioning. These two kinds of learning exist is a matter of fact, not of theory. You will also know if all kinds of learning can be understood in these terms. These two concepts of learning gave the explanation of learning procedures an experimental shape.

4.2.2.1 Classical Conditioning

Whenever there is a lunch time you feel hungry, if you have a set-sleep time you feel a sleeping mood. How is it felt? These activities do take place when a particular time is fixed and if the time-table for such purposes is flexible and irregular, then feelings may not be strong enough. This type of behaviour or similar one has been explained by the classical conditioning. Ivan Petrovich Pavlov (1849-1936), while conducting experiments on dogs about various digestive reflexes, found out that salivary reflex could be set off by stimuli which at first were totally neutral. The experiment he conducted was simple but controlled. The dog was put in a laboratory with a system where the saliva discharged can be measured by the dog each time. When hungry, saliva comes out in mouth if food is present. He paired a buzzer sound to food i.e. a buzzer sound was produced before the food was provided to the dog. After a few trials it was seen that when buzzer was produced without food the salivation took place in the dog. Repeated buzzer-food pairings led to salivation to the buzzer alone. This process was known as classical conditioning. In most of the reflexes this process explains the learning procedures. The whole experiment can be explained in the following manner:



Relationship between CS, UCS, CR and UCR in classical conditioning

The first step in the experiment was to attract attention to a neutral stimulus such as buzzer. The dog had a reaction ‘what-is-it?’ type, what Pavlov called *orienting reflex*. The dog paid attention to it by turning head towards the stimulus i.e. buzzer. The next step was the repeated buzzer food pairing leading to salivation to the buzzer alone. In each trial the buzzer was produced and then food. After a few trials only buzzer was produced and no food. Yet salivation took place only with buzzer tone. Pavlov explained the whole process by making a distinction between unconditioned and conditioned reflexes. Unconditioned reflexes, he held, to be essentially inborn which can be elicited unconditionally by the appropriate stimulus, like salivating to food in the mouth. Conditioned reflexes were acquired based on organism’s past experience. In this case, salivating to buzzer. *Unconditioned reflex* is based upon a connection between unconditioned stimulus (UCS) and unconditioned response (UCR), in this case, food-in-the-mouth (UCS) and salivation (U.C.R.). *Conditioned reflex*, on the other hand, are condition stimulus (CS) and conditioned response(CR), in this case, buzzer(CS) and salivation (CR.) The CS is initially a neutral stimulus (the buzzer) that is paired with UCS; the CR (salivation) is the response elicited by the CS after some pairings of CS and UCS. The pairing is said to *reinforce* the connection; trials on which UCS occurs and on which it is omitted are called *reinforced* and *unreinforced* trials respectively.

Classical conditioning in human’s daily life is very common. You tend to feel hungry at meal-times and less so during the periods in between, this is so even if you fast the whole day. It has a role in formation of various emotional reactions and fear is the best examples. Fear is developed in children through conditioning. Phobia, the intense fear, is the outcome of conditioning. Normally, all basic needs of human are conditioned in nature.

4.2.2.2 Higher-order-Conditioning

On many occasions when the CS-UCS relation is solidly established, the CS can serve to condition yet another stimuli. Pavlov, for example, on one occasion conditioned a dog to salivate to the beat of metronome, using meat powder as the UCS. After many such trials, he presented the dog with a black square followed by the metronome beat but without ever introducing food. Sight of the black

square, after a few pairings, was enough to produce salivation. This process is called *higher-order-conditioning*. The higher order conditioning is comparatively very weak and stays for a short period. The reason is clear – it does not stay for a long as it gets a weak relationship as compared to original one.

4.2.2.3 Temporal Relations between CS and UCS

The order of presentation of the CS and UCS plays a significant role in conditioning process. In the pairing of CS and UCS, CS may precede UCS (forward pairing), it may follow UCS (backward pairing) or it may occur at the same time (simultaneous pairing). The different procedures of presentation have differential effect on conditioning. Conditioning is the best when CS preceded UCS by about half a second; presenting CS and UCS simultaneous is least effective and backward pairing procedure is just as bad as worse (Spoooner and Kellogg, 1947). Pavlov further stated that conditioned reactions (CR) can be undone if the CS is repeatedly presented without being reinforced by the UCS. In such a condition, conditioned reflex undergoes *experimental extinction*. Similarly, a conditioned response that has been extincted can be resurrected. It is through *reconditioning*, where further reinforced trials are presented. Conditioning is also *generalised* on stimuli sufficiently similar in nature or activity. *Discrimination* is also available in conditioned responses. This classical conditioning, you have discussed over here is one of the two main forms of simple learning.

4.2.2.4 Instrumental Conditioning

Instrumental conditioning is also known as operant conditioning. It is a form of learning in which a reinforcer (e.g. food) is given only if the animal performs the instrumental response (e.g. pressing a lever). In effect, what has to be learned is the relationship between the response and the re-inforcer. Edward L. Thorndike (1874-1949) conducted controlled experiments in which the entire course of learning could be carefully securitized. On the basis of the experiments *law of effect* was advanced. The law of effect asserts that the tendency of a stimulus to evoke a response is strengthened if the response is followed by reward and is weakened if the response is not followed by reward. This theory, applied to instrumental learning, states that as trials proceed, incorrect S-R bond will weaken while the correct bond will be strengthened.

The theory was derived from a simple experiment. The cat was put in a *puzzle box*, an enclosure from which it could escape only by performing some simple action that would open the door, such as pulling a loop or wire or pressing a lever. When the cat came out, it was given a small portion of food and then placed back in the box form further trials. This continued till the mastery in opening the door was achieved. How the cat learned to open the door of the puzzle-box? Thorndike noted actions of the cat and found out that it was based on trial and error basis. The curve drawn of the responses made it more clear that it was not based on any insight. Had it been on insight, the next trial after the solution would have been more straight- forward taking very little time in opening the door. This was not so.

Thorndike explained it on the S-R bond basis that the animal learned was an association between the total stimulus and a motor reaction. In the beginning of the experiment there were many unrewarded responses which gradually weakened and ‘stamped out’ and correct responses were ‘stamped in’. This is S-R theory

and basic components of learning are stimuli and responses which become forged together as training proceeds. This theory is based on the law of effect. The law of effect is an analogue of the law of the survival of the fittest. In the life of humans learning provides another adaptive mechanism through the law of effect which decrees that only the *fittest responses* shall survive. Thorndike (1899) put it “it is a process of selection among reactions... by eliminating the unsuitable reaction directly by discomfort, and also by positively selecting the suitable one by pleasure... It is of tremendous usefulness... He also learns and runs away, will live to learn another day.”

Thorndike talks of two types of reinforcement – primary reinforcement and secondary reinforcement. Reinforcement used in animal studies are normally food, water or termination of the electric shocks. There are instances of primary reinforcements. You see a child behaving in desirable manner. You do not normally reinforce the behaviour through primary reinforcements but say ‘good’ to her. How this ‘good’ is reinforcing according to Thorndike’s view? The answer is that a stimulus can acquire reinforcing properties if it is repeatedly paired with a primary reinforcer. It will then provide *secondary reinforcement* if administered after a response has been made. It has been proved by several other studies by other investigations as well.

4.2.2.5 The Operant Approach

The modified behaviour theory was developed by B.F. Skinner. Skinner underlines the distinction between classical and instrumental conditioning. Animal’s behaviour is elicited by CS is classical conditioning; the salivation appears to be set off from the outside, thus justifying the reflex analogy to some extent. But in instrumental conditioning, the organism appears to be less at the mercy of external stimulation. It’s reactions are *voluntary*, as it seems to come from within. Skinner defined such instrumental responses “operant;” they *operate* on the environment to bring about some change that leads to reward (Skinner, 1938). He conducted experiments in a properly controlled and monitored box named after him “Skinner Box”. Animals in the box got reinforced if they peck or press and in return got some food grain. In operant conditioning a given behaviour will occur on the consequences that follow it. Some consequences will be positive that strengthen the behaviour where as some negative which suppresses the behaviour.

Strengthening the behaviour is called *reinforcement* and suppressing the behaviour is called *punishment*. The operant conditioning is a process through which organisms learn to repeat behaviours that yield positive outcomes or permit them to avoid or escape from negative outcomes. Positive reinforcement increases the probability that the action will occur again in the future. Some positive reinforcers are related to basic biological needs and called primary reinforcers. We need food when hungry, need water when thirsty. Some other events acquire their capacity to act as *positive reinforcers* through association with primary reinforcers and called conditioned reinforcers viz., money, status, grades, trophies and praise from others. Negative reinforcers are those that strengthen responses that permit an organism to avoid or escape from their presence. Such negative reinforcers may be heat, extreme cold, electric shock. Positive reinforcers are stimulus events that strengthen the responses that precede them, where as negative reinforcers are aversive (unpleasant) stimulus events that strengthen responses that lead to their termination or at least avoidance. The operant conditioning is based on these principles.

If you summarize the difference between the two important methods of conditioning by a rough description of what is learned in each; you will find a difference. In classical conditioning the organism must learn about the relations between two stimuli, the CS and the UCS: Given CS and UCS will follow. In instrumental learning, the organism has to learn the relation between a response and a reward: Given this response, there will be reinforcement. These two theories have accounted for all types of learning in our life. On the basis of these theories many therapeutic procedures have been developed where undesirable behaviours are eliminated and new desirable behaviours are developed in humans.

4.3 SENSORY, SHORT TERM AND LONG TERM MEMORY: INFORMATION PROCESSING MODEL

4.3.1 Definition of Memory

Memory is defined as a cognitive system for storing and retrieving information. The memory has three main stages – *acquisition*, *retention* and *retrieval*. To remember, one must first have learned something and the relevant experience left some enduring record in the nervous system, the *memory trace*. During retention the information is filed away for later use. Retrieval is a point at which one tries to remember. Many failures to remember are failures of retrieval and not of storage. A previously retained item can be retrieved in two ways – *recall* and *recognition*. In recall, the person has to remember and produce the learned material verbally while in recognition, one has to recognise the learned material from amongst many other present over there. Recognition, therefore, is easier than recall. When some crime is committed, police asks the person to tell the features of the criminals who has seen them. On the basis of the recall, a portrait is prepared and circulated is public. Sometimes, the person, who witnessed the crime, is called by Police to recognise them in a group of persons. This is recognition. You may find easy to answer multiple-choice, or true-false item tests in the examination as it is a case of recognition. Essay type examination needs recall, therefore, a little difficult.

You usually think of the memory in terms of the past, may be an hour, a day, a month, a year or long. But memory comes into play the moment the stimulus registers on the senses. Someone tells you a mobile number and you remember it till you complete the dialing. The interval between acquisition and retrieval is of a second or two. In fact, several memory systems come into play in human life. This may be the sensory register, short term memory and long term memory. You will come to know about these types of memory in the following discussions.

The sensory registers:

Sensory registers is the first link between an individual's present and the past. This sensory information remains for a fraction of a second or so. Sperling (1960) conducted a study on sensory register in vision. An array of nine letters arranged in three rows of three letters were presented to subjects for 50 milliseconds.

	S	F	O
M	T		B
F		Z	N

The subjects were asked to recall the letters. They reported about half of them. But Sperling believed that they saw many more letters than they were able to report. The subjects had a vivid mental picture or *icon* of the array after the stimulus went off. The icon fades away very rapidly. In fact, the visual sensory carries a good deal of information but only for a fraction of a second. This visual information appears like a printed page which turns blank within a second or so. Such a registration occurs in audition as well known as *echo*.

4.3.2 Short Term Memory (STM)

In your normal life you require much more than sensory register gives you in case of memory. Some memory holds information for fairly short intervals – say up to a minute and this is known as *short term memory*. The *duplex theory* of memory describes two types of memory – *short term memory* and *long term memory*. This theory explains that these two types of memories – one relatively recent and the other remote past – differ in *three* ways. One is the *manner* in which memories are consciously experienced, second is the *form* in which they are stored and third relates to *storage* capacity. Short term memory is perceived and not remembered as gone and done with. Items in short term memory (STM) are not *fully processed* as in long term memory (LTM) but not as *raw* and *unprocessed* as the contents of *sensory register*. STM for verbal materials tends to be in acoustic form even if the material is presented visually. If a subject is shown a series of letters, the immediate recall shows acoustic rather than visual confusions. Letters of similar sounds produce more confusion in recall than the letters of similar writing structures. The STM and the LTM differ also in storage capacity. STM storage capacity is very limited and LTM storage capacity is enormous. According to one estimate the size of an average college student's reading vocabulary is about 50,000 words. The storage capacity of the STM is determined by the *memory span*, the number of items (either letters or words) one can recall just after one presentation visually or orally. Miller (1956) found that a subject can recall 7 items, give or take about 2. This is known as *magic number*. This indicates the capacity limit of STM. Information entering STM are forgotten quickly. One reason may be the *decay*, the memory trace may be eroded over time. Another reason may be *interference*, new items somehow may be pushed out of STM.

When you ask subjects to recall a particular list of words shown to them can you tell from which storage system – LTM or STM - the item was taken? It has been shown that when *free recall* takes place the subjects describes enhanced recall of items presented in the beginning and of the end of the list. These are known as *primary* and *recency* effects. Primary effect is related to LTM and recency effect is related to STM as they could see the last few items in the immediate past. How retrieval from STM takes place? In another words, suppose an item is still in short term memory, neither forgotten nor transferred to the LTM. How do we retrieve it? The answer is simple. The retrieval from STM is not instantaneous, but requires some mental search and comparison. This may be done by *parallel search*, in which search is made and compared to each items in the memory set; or through *serial search*, in which comparisons occur successively.

4.3.3 Long Term Memory (LTM)

You have seen that sensory register and STM provide a bridge to our very recent past. It is long term memory (LTM) through which you perform many activities

in life and adapt with different situations. It is LTM to which you refer when you speak, read, recognise faces, play football and suddenly remember where you put key of the room that you could not find before. What governs the *acquisition*, *storage* and *retrieval* of long term memory (LTM) you will come to know in the following details. Most of the experiments related to memory are based on memorisation of verbal materials.

Two main view points are available in relation to LTM – association and organisation. The birth of an association was first studied experimentally in 1885 by Hermann Ebbinghaus (1850-1909). Ebbinghaus developed not only experimental techniques to investigate how associations in memory are established and utilized but also developed standard material of learning i.e. *Nonsense syllables*. He put two consonants with a vowel in between which do not constitute a word and meaningless. He also developed methods of learning viz., simple, serial, paired- associates and prompting and anticipation. On the basis of his experiments he plotted a curve which showed the nature of forgetting – known as *forgetting curve*. Retention is measured in percentage saving, that is, the present decrease in the number of trials required to relearn the list after an interval of no practice. If the percentage of saving is 100 per cent, retention is perfect – no trials to relearn are necessary. If the percentage saving is 0 per cent, there is no retention at all, for it takes just as many trials to relearn the list as it took to learn initially. Curve shows that retention declines (forgetting takes place) as the interval between original learning and retention test increases. Ebbinghaus stated that when we learn we have some memory traces formed. When memory traces become weak or blurred, forgetting takes place. This way, he stated that memory is a reproductive process. If memory trace is fresh, the recall is better and vice-versa.

Modern investigators in the field of human memory gave credit to the experimental base of the study of memory by the S-R associationists but simultaneously advocated that this approach can not provide a foundation for a general theory of human memory. They advocated the concept of *memory organisation*, a different approach to long term memory. These investigators believe that organised materials are better learned and remembered than the unorganised ones. Take one simple example: suppose a subject is asked to memorise the series:

2 4 7 1 1 1 6 2 2 2 9 3 7 4 6 .5 6

If one treats it as a series of seventeen digits unrelated, much effort is needed to remember perfectly. But if a pattern is found out it will be easy to remember. For example: add the first digit to 2, the next is 4 and add 3 to 4 next is 7. This way keep on adding gradually, 4, 5, 6, 7, 8,9,10 then it will come out to be

2 4 7 11 16 22 29 37 46 56

Organisation affects both acquisition and retrieval and such examples are representative of human memory functions generally. To enter LTM, items must first pass through STM. Materials in LTM are stored greater in number as it is organised. In the example given before the person organises the material through *recorded inputs* into larger units, sometimes called *chunks*, which help in putting much information into memory. *Subjective organisations* and *rehearsal* have powerful effect on recall. In subjective organisation one memorises a virtually

endless list of items by appropriate hierarchical schemes of one's own. Rehearsals are of two types where organisation takes place – *maintenance rehearsal* and *active rehearsal*. In maintenance rehearsal, the subject merely holds materials in short term memory for a while and then transfer to the LTM. In active rehearsal, the subject organises the item during the time they are in short term memory store and then transfer to the LTM.

Material organisation may help in explaining another phenomena of verbal learning: *Intentional* and *Incidental Learning*. You do one experiment with two of your friends comparable in abilities. Prepare a list of 25 words and serially put on a piece of paper. Show the list to one friend for five trials – showing words one by one for about 10 seconds each. When the trials are over take a recall. Again present the list to another friend in the same manner with the instruction that he will be tested in the end of the experiment on recall. Get the recall in the end of the experiment. You will find that the second friend has recalled more words as compared to the first one. Why so? The reason is that one who was given information about the recall test, rehearsed the items and the other one did not. The learning where not informed of the recall test was *incidental one*; and where recall test was informed earlier, the *intentional one*. This is one example of the role of rehearsal is organisation in memory.

Retrieval cues play an important role in memory. Sometimes it is seen that memory is stored but not easily traceable. In such a case memory trace is said to be presently *inaccessible*. Access to the trace may be done by an appropriate *retrieval cue*. For this purpose, the critical requirement is an adequate match between the retrieval cue and the way the material was organised at the time it was stored. It is done by *memory search* where retrieval is generally preceded by an internal process. *Mnemonics*, a device for improving one's memory, is based on some of the principles of storage and retrieval. The methods of *loci* and *pegs* are most common. The method of *loci* requires the learner to visualise each of the items she wants to remember in a different spatial location. In recall, each location is mentally inspected and the item is retrieved. The *peg method* requires creation of a set of mental pegs to which the items to be memorised could be attached. It helps in retrieval. The underlying principles in method of loci and pegs are obviously similar.

4.3.4 Forgetting from LTM

Forgetting means failure of memory. It has different causes. One theory of forgetting believes that memory traces gradually *decay* as time passes. Memory trace is compared, as per this theory, to a negative of a photo-film. So long it is intact, the print will come out clearer, otherwise it will not be clear. This is true to memory. As time passes, it does not remain vivid, hence, recall is poor and forgetting takes place.

Another theory relates to *interference*. According to this view, a forgotten memory is neither lost or damaged, but is only misplaced among a number of other memories which interfere with the recovery of the one that was sought. Memorial interference can be easily demonstrated in laboratory. The major examples of interference are *retro-active inhibition* and *pro-active inhibition*. When a new learning hampers recall of the old, it is known as 'retro-active inhibition' and when earlier learning hampers recall of the new one, it is known as 'pro-active

inhibition'. In earlier case interference is in backward direction and in the next case it is in forward direction.

The experiments of the both types may be conducted in the following way:

Retro-active inhibition

Groups	Original learning	Interpolated activity	Recall
Control	Learning of list A of 10 Nonsense syllables	Rest for 5 minutes	List A
Experimental	Learning of List B of 10 Nonsense syllables	Learning of list C of 10 Nonsense syllables for 5 minutes	List B

Pro-active inhibition

Groups	Original learning	Interpolated activity	Recall
Control	Learning of list A of 10 Nonsense syllables	Rest for 5 minutes	List A
Experimental	Learning of List B of 10 Nonsense syllables	Learning of list C of 10 Nonsense syllables	List C

4.3.5 Varieties of LTM

There are many varieties of long term memory. Some of them are *Episodic memory*, *Generic memory*, *Semantic memory* and *Visual memory*. Episodic memory is the memory for particular events (episodes) of one's own life; what happened when and where. Generic memory is memory for items of knowledge, independent of particular occasion in which you learned them, such as capital of India, multiplication of 3×4 and so on. Semantic memory is related to meanings of words and concepts. Visual memory may be of two types – iconic memory and eidetic imagery. Iconic memory is one which you have encountered before. It is certainly picture like, but obviously not a part of long term memory as it lasts only for fraction of a second. Eidetic imagery on the other hand, is relatively long lasting and detailed images are very clear.

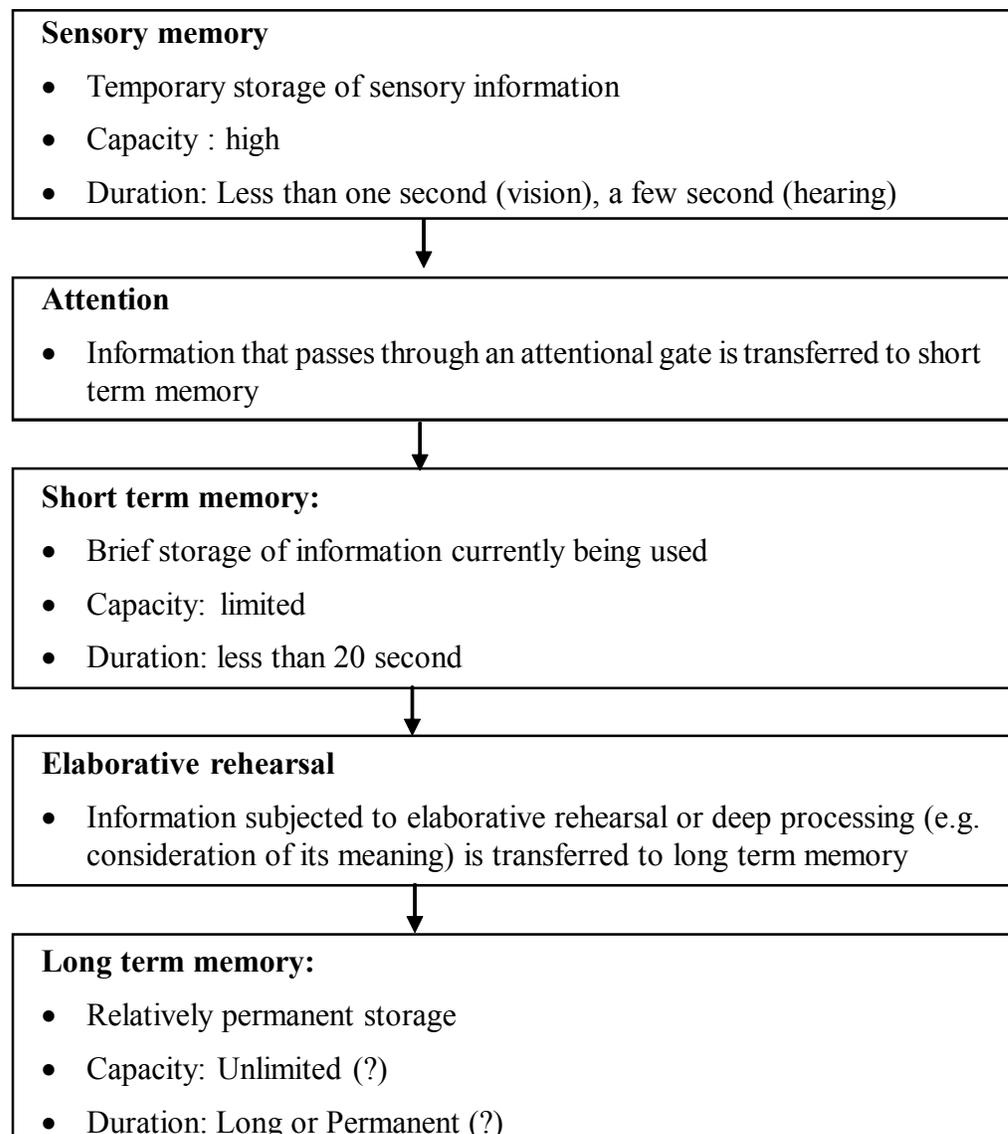
4.3.6 Information Processing Model

Many psychologists believe that human memory and computers have the same information processing systems. You have seen as to how items are first temporarily stored in STM, recoded into fewer and more compact chunks, transferred into LTM and then retrieved by various hierarchical search processes. You have seen a system in which information is systematically converted from one state into others in memory. Psychologists have described several models of human memory. Models seek to achieve two major goals – accurate description and explanation i.e. clarification of how the processes being studied operate. Models are developed on large number of empirical observations. You will come to know about one such very popular model of memory known as “Modal Model of memory” advanced by Alkinson and Shiffrin (1968). The researchers noted that both human and computer memory must accomplish three basic tastes – encoding, storage and retrieval. The meaning of these tasks you have already known in the previous details presented in this chapter. Keeping these facts in mind Alkinson and Shiffrin went on to propose a model of human memory.

Learning and Memory: Definition; Characteristic Features; Observational, Experimental Learning; Sensory, Short Term and Long Term Memory; Information Processing Model

According to this model we possess three basic memory systems: Sensory memory, Short term memory and Long term memory. Each of these systems deal with the tasks of encoding information, storing and retrieving it when needed, the details of the processes you have known earlier in this chapter. How does information move from one memory system to another? This model proposes that it involves the operation of *active control process* that act as *filters*, determining which information will be retained. Information in sensory memory enters short term memory when it becomes the focus of our attention, whereas sensory impressions that do not attract attention fade and quickly disappear. Selective attention here plays an important role. Further, information in short term memory enters long-term storage through *elaborate rehearsal*. There we think about meaning and relate it to other information available in long-term memory. Unless we engage in such cognitive efforts, information in short term memory too quickly fades away and is lost. During *maintenance rehearsal* period information does not necessarily move from short term to long term memory. This model of memory is linked to the general information – processing perspective that is an important aspect of all cognitive psychology today. Many other researchers have supported the concept of the model of Atkinson and Shiffrin, hence, very useful and scientific one.

This model can be presented as under:



4.4 LET US SUM UP

In this chapter you have come to know the nature and characteristics of learning and memory – the two most important aspects of human adjustment. How learning takes place? Is it by observation? Or by classical conditioning? Or by instrumental conditioning? You are now in a position to provide answers. Similarly, how memory functions? You have come to know. What is sensory register? Or what is short term memory? Or what is long term memory? You understand clearly. Different processes of memory, you have come to know including information processing model. Over all understanding of the contents of this chapter makes you informed about scientific facts relating to main issues of humans.

4.5 UNIT END QUESTIONS

- 1) What is learning?
- 2) What is memory?
- 3) Observational learning was advanced by B.F. Skinner (True/False)
- 4) Classical conditioning was the outcome of:
 - a) Thorndikle’s experiment
 - b) Bandura’s experiment
 - c) Pavlov’s experiment
 - d) Bartlett’s experiment
- 5) Operant conditioning is based on the relation between conditioned stimulus and conditioned response. (True/False)
- 6) What is sensory register?
- 7) What is duration of short term memory?
- 8) Ebbinghan’s work is related to
 - a) Motivation
 - b) Perception
 - c) Thinking
 - d) Memory
- 9) How information is processed in memory?
- 10) Retro-active inhibition is related to decay of memory traces (True/False)

4.6 SUGGESTED READINGS

Alkinson, R.C., and Shiffrin R.M. (1968) Human memory: A proposed system and its control process: In K.W. Spence & J.T. Spence (ed) *The Psychology of Learning and Motivation: Advances in Research and Theory*, 89-195, New York: Academic Press.

Bandura, A. (1986). *Social Foundations of Thought and Actions: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice Hall.

Baron,R.A. (2001) *Psychology(5th. Edition)*, Pearson Prentice Hall.

References

- Bandura, A., Ross, D., and Ross, S. (1963) Imitation of Film-mediated aggressive models. *Journal of abnormal and social psychology*, 66, 3-11
- Harrison, J.K. (1992). Individual and combined effects of behaviour modeling and cultural assimilator in cross-cultural management training. *Journal of Applied Psychology*, 77, 952-962. Baron, R.A. (2001) *Psychology*, Pearson Prentice Hall.
- Skinner, B.F. (1938). *The behaviour of organisms*. New York: Appleton – Century Crofts.
- Sperling, G. (1960). The information available in brief visual presentation, *Psychological Monographs*, 74.
- Spooner, A., and Kellogg, W. N. (1947). The backward conditioning curve. *American Journal of Psychology*, 60, 321-34.
- Thorndike, E.L. (1898). Animal intelligence: An experimental study of the associative processes in animals. *Psychological Monograph*, 2 (whole No.8).