Psychology of Learning

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Lecture – 11

Memory and Cognition

Hello viewers, welcome back to this NPTEL course on the Psychology of Learning. In the last classm we have discussed about major theories of learning. So, today we will discuss a new topic that is memory and cognition. So, let us start the discussion about what is actually memory, what is memory that is the question. Suppose if we ask this question to ourselves how can you and we narrate it, describe it, define it. What is memory? We say that that means, in general, in layman's concept, it is the capacity of our brain to hold many things that is the thing. But in psychological analysis. in psychological terms, if we narrate it, if we explain it, then there are many facets of memory.

So, let us discuss and explore what are these definitions, what are these concepts, what are these dimensions of memory. So, memory. as you see, refers to a psychological process of acquiring, storing, retaining and later retrieving the information. Very often, we discuss that means whenever we refer back to our past experience and past learning experience, we try to retrieve something from our repository, which is long-term memory and try to use it for the present purpose. So, similarly, so, the memory begins the process again. It is also a way of the learning process.

The first thing is that after attaining certain stimuli and perceiving them, we acquire the relevant information that we think are relevant and important for us. So, then we acquire the information store it which are relevant suppose, for example, related to our content our educational content or subject content or classroom content or pedagogical content so, so many things. So, we acquire the information, store it, retain it. Store it means not just for the momentary purpose, only for a short term period, but rather suppose we intend to remember it is for a longer period of time then we need to work up on it. So, retain it then later on to retrieve it. For example, you take the example of an examination.

So, before the examination we just go on preparing, mugging up. So, in memory we are trying to remember all the important things etcetera etcetera, but well in the examination while we start reading out the question paper then we try to recollect. We try to you know recollect and retrieve all the relevant information that could be the possible answer for these things. So, this is the best example that means, before the exam, how do we prepare, and at the time of the moment of exam, how do we retrieve the whole thing and narrate it? Of course, there are other factors which are also there that we will discuss later on.

So, that is the human memory. Human memory involves the ability to both preserve and recover the information. So, here is that after acquiring the information and storing it that is we need to preserve it for a long terrm. We often reject the unnecessary things which are not relevant for us we often forget that is a tendency to forget the irrelevant things unused things etcetera. So, there are two major task that is how to preserve the content and how to recover

the information whenever it is required. So, again we have already discussed two major approach to cognition or learning theories that one is the brain metaphor that is in a cognitive neuroscientist's domain another is the information processing approach that is researchers have adopted the computer metaphor.

So, here even this memory has also been explained by the neuro cognitive neuroscientist also. So, researchers have long believed that memories form due to the changes in the brain neuron. So, the brain the cognitive neuroscientist who worked on brain operations and functions they think that memories happen we retain certain things in our brain because of some changes in the neural network because of some structural changes in the neural network. So, that means, we can say that due to the cognitive restructuring or restructuring of the brain network or neural network or the information structure then the memory takes place or similarly the learning also takes place. So, changes in this connection between the nerve cells that is the trans synapses between both the synapses there are the ender towards the end of the all the neural cells that neurons neurons the end at the end point the synapses are there when there is two neurons are more than two neurons are get connected.

And the similar kind of thing the similar that means, the neurons they form the groups of the patterns from time to time depending on the depending on the content depending on the situation that means, as per the similarity similarity of the features of the stimulus. So, when these nerve cells or synapses they get associated connected and form a pattern or the network then learning and retention of the new information takes place. So, for already as because already we are having the old ideas of the past learning ideas and experiences about certain things. When we are exposed to the new situation new information a new problem then we start thinking on it in this problem process also we collect different information we try to analyze the thing from various different dimensions then we use our new analytical scale our reflective thinking scale our may even critical analysis scale all these things we try to find out sort it out whether this answer is the correct on or not. So, we try to resolve the conflict or the problem or the challenge by utilizing all our abilities capacities like language skills or you know your analytical skills reflective thinking skills all kinds of all kinds of higher order thinking skills we use it at that moment to get the actual idea actual answer to the thing.

So, in these process what happens the neural network new neural network also get constructed. So, in this way so, new neural network constructed when the new neural network or synapse that means, along with the grouping of the synapses and that brings the certain changes in the brain structure and reframing and pattern new pattern development then the new retention of the new information takes place. So, from time to time as we go on learning experiencing, reflecting, gathering more information analyzing all these things continuously brain functions and this brain functions and operations what happens when we learn new things and new pattern develops or because that new pattern causes some kind of some changes in the neural network or the synapses. So, that is the viewpoint of the cognitive neuroscientist and strengthening these connections actually helped to helps commit the information to the memory. So, when suppose we have learned something new unless and until we practice is unless and until we rehearse it practice it use it then we use we quickly forget it.

So, that is in order to strengthen that new connection new information etcetera. So, we need to do certain things we need to practice certain things. So, then only it will be retain in our memory. So, in this process how can we retain the information for a longer period how what are the different types of memory what are the mechanisms through which we retain. So, these are the some of the things that we will discuss and primarily these are the when and here we

are   adopting   the   information   processing   approach.

So, three major processes takes place in this process of you know process of encoding that process of acquiring the information and retrieving it. So, these are these three major processes called as the encoding, storage and retrieval. First is the after receiving the information then how do we encode it ok. So, pass intelligence model we have already discussed like receiving the information then simultaneous and successive process we encode. Similarly, here we encode the information then we store it for the safe storage for storage in the storing it in the long term memory or in our working memory we need to practice it we need to use some strategies then after once it is there in the long term memory and then we can retrieve it with less   effort.

So, here we can say so, now, so, memory how memory has been defined by the information processing theorist. So, they say that that memory that is information must be changed to a usable form which occurs which occurs through a process no encoding. So, so, this encoding then this encoding then you know encoding then retaining and retaining encoding retaining that is storage and retrieval these are the three basic processes. So, here so, they said that the information must be changed into usable form which occur through the process not the encoding. At the time of encoding when we are that means, encoding is the method through which   we   want   to   store   it   we   want   to   retain   it.

So, in this process we need to or that means, do certain things to consolidate that so, that the material the content would be encoded properly. So, that we can store it for a longer period of time. Once the information has been successfully encoded it must be stored in the memory for a later use, but if you if we become very casual or we do not work on this or there is no proper way of encoding the information then we can easily forget it. So, here the encoding that the entry point when we receive the information perceive certain things attained to the stimulus and perceive the stimulus is an important vital for us maybe the learning content or any information or any event whatever may be the thing. So, we in order to encode it properly we need   to   do   certain   things.

So, once the information is encoded successfully then it will be retained with us. So, here a cognitive system for storing and retrieving the information then after encoding takes place the storing. So, here we can say encoding or registration encoding or registration is that the receiving the information receiving the receiving processing the information and combining the received information. Then also at the time of encoding also we also do some kind of groupings also we may we try to find out some kind of you know logic or some kind of you know heuristic method. So, that we can receive that we can receive maximum information we can   store   the   maximum.

So, we also for we also apply our own some heuristic logic also. So, receiving processing and combining the received information maybe group wise in class wise maybe date wise we store the information. Then the storage is the creation of the permanent record of the encoded information in short term or the long term memory. So, here we will be discussing about the how it is short term memory what is long term memory, but once it is encoded properly then registered properly then it will be stored either in the long term memory or in the short term memory. So, then thereafter the next process is the retrieval recall or the recollection.

So, suppose and in case we want the we refer we want to refer it in the context of some problem some situation some learning content etcetera then we try to retrieve it remember. For

example, suppose same topic we have been taught in class 8 or 9, but again we are coming across similar topic in class 12. Then definitely suppose definitely whenever we are exposed to that topic then we try to recollect what we have studied what we try to retrieve and remember what exactly we have already learned in the past. So, that is called the retrieval and the recall process recall. So, similar kind of thing similar kind of thing we always try to collect recollect and recapitulate or retrieve from our past experiences past memory that means, already which is already there in the repository.

So, here encoding or registration storage and retrieval of the information is the as the 3 major processes functions of this memory system. Then after this then again then reviewing and rehearsing the information involves the ability to remember it. So, at the time of encoding also at the time of encoding we always go through review it and they summarize it, rehearse it, rehearse the information. So, that it can be better understood better understood and better remembered. So, suppose casually suppose the superficially you have read something definitely after sometime we will forget it, but suppose if we think that no the theme of the main idea of this content should be remembered for a longer period then we do initially.

So, we also do a preview then review then go through the things then summarize it then make a comprehensive note of certain the main points after that. So, if we do all these kind of exercises that is the rehearsal of the information then it will be then it will be retain in our memory for a longer time. So, then the practice this practice strengthens the connection. So, these are the practices that is called we can say the mnemonic practices mnemonic strategies that practices through which we try to consolidate it. That means, solidify the information that yes now at the end of the day then we are going to remember this the theme the essence of these things.

So, this practice also strengthens the connection between the synapses. It also this rehearsal this practices also change brings the brings the changes in the neural network. So, much of our stored memory lies outside the awareness because even though we are not consciously aware of some of the things in the in the environment, but that actually are also contributes to these things. So, memory retrieval process also allows us to bring the stored memory into the conscious awareness. So, memory so, whenever we try to retrieve the memory retrieve some information may be in the context of retrieving one information there may be similar information may also come up to our awareness that can also be possible.

So, to use the information that has been encoded into the memory it has to be first be retrieved information that has been encoded in the memory it has to it first has to be retrieved. So, like how can we another thing is the unless and until we retrieve we try to find out try to assess try to remember the what has been what has been what we have already experienced what has been learned or what we have already gone through etcetera unless and until we try to retrieve it we also cannot assess that cannot find out that whether really it has been encoded or not have you really understood have you really remembered or not. So, this is the information unless and until it is retrieved it is it we cannot be very sure about that it has been properly encoded. So, there are many factors that can influence this process the information that has been encoded into the memory and how it is going to be retrieved in this process there are different factors and influences are there that influences this process. You can say the retrieval cues are there for example, exactly we are not being a sometime we are not being able to exactly narrate or spell out or give the statement of or explain the exact things, but if given the situation given provided given the situation given the some kind of clue clue then we can recollect the whole information altogether.

So, that is that so, the type of information being used the type of information being used and the retrieval cues that are present. So, it has a it has an educational implication also like for example, so, when we are preparing for the examination and long long notes of contents are the different subject different difficult subject of course, it depends on the nature of the subject with the mathematics or the science scientific or engineering or calculator math based subjects our preparation will be little bit different like we use we can remember it for a longer time with a with extensive practice with extensive you know practice of the solution similar kind of thing that is practice can ensure it. But in case of the theoretical thing in case of the social science social science topics etcetera which is very narrative which is very descriptive and very lengthy how to remember things. So, whenever we are preparing for the for example, the whenever we are preparing for UPSC exams or very tough exams. So, we what after going through the things we our self prepare a note of it like these we categorize them we classify them and we also use different different methods our own method of remembering the things may be by changing the location, by changing the color coding like underlining in different colors may be making some brief notes besides the content.

So, in this way we try to remember it by using our own key own mnemonic cues also. So, those cues act as a you can say z act as an booster agent booster boosting the boosting the whole thing. So, that we can exactly remember later on the same thing. So, these are the things. So, these are the some mnemonic cues that we will discuss how to strengthen our memory because every individual has the limited capacity, but we never know what is our capacity.

So, but we have to ensure that whatever we are learning we are acquiring it must be strengthened it must be learned properly. So, that we can retain it for the future ok. So, that is the thing. So, on the basis of that there are different types of theories how that means, the theories they have defined how what are the main different types of memories are there and which context memory that we can we can remember the maximum thing. So, in this context Atkinson and Sifrin's model is very popular because it is it follows that information processing approach.

However, neural network model is as we know that is the brain based learning cognitive neuroscientist model and level of processing theories is also one more theory that is through which at what level actually we have process the information. So, now we will discuss about the Atkinson and Sifrin model thereafter we will discuss the other two things. So, Atkinson Sifrin model before that before that going to. So, cognition why you are using this cognition and what is the memory and what is learning why very often we are changing the this concept because everything all these related concepts are the parts of the cognitive activity. So, here in when we talk about information processing means information how it is in it is being processed in our brain in our brain is one concept one domain, that is the neuro psychological concept the equivalent concept is the cognition.

Cognition it embraces all kinds of activities all kinds of cognitive activities we can this being attentive at starting from the attention to memorization to learning to thinking to in all kinds to analyzing to synthesizing all kinds of cognitive activities which are one or other type of cognitive activities that is that comes under the umbrella of cognition. Because then the cognition has been has been propounded by the researchers when there was a very there was a debate continuous debate on intelligence whether it is IQ whether intelligence is product or process or is long term debates were going on at the time of when you know defining whether general intelligence is general ability or specific ability all that in the during the era

of the intelligence theories. So, that at that moment as the terminology intelligence it could not satisfy all researchers about its definition about its application etcetera then the all the researchers consensuously they found this concept equivalent concept of intelligence that is the cognition. And cognition which is consensus which is overarching which is acceptable to all that means, cognition anything related to brain activity that refers to cognition it may be simple understanding it may be simple memorization it may do it creative thinking. So, there are again cognitive hierarchies in the cognition also there are different as per the difficulty label as per the level of processing etcetera there are different hierarchies also that comes under the cognitive architecture that we will discuss later on.

So, here that is at the word cognition. So, cognition embraces all the mentalistic concept like the learning the memory then remembering the forgetting all kinds of things the planning decision making all kinds of things. So, the here just to begin with the cognition is the mental activities associated with the thought decision making language and other pair mental processes. So, that is at the concept cognition comes into the existence. So, cognition it refers to the range of mental processes starting from acquisition to storage to manipulation to retrieval to decision making to planning all kinds of thing. And it also in underpins many of our daily activities in health disease health disease across the spine etcetera it also gets affected by the other activities of our daily life.

So, now, the cognition as we can see the cognition is here that that the major domains of cognition. Cognition includes any kind of all kinds of any kind or any type any kind of mental activity. So, starting from the attention. Attention followed by the perception then memory then understanding it intelligence is also a part of intelligence when we say intelligence is the general aptitude to learn certain thing general aptitude to perceive the situation general aptitude to grasp the problem and understand the problem. So, intelligence is there then executive functions executive function how do that means, we work on this on the different data different information etcetera how we take the decision how we plan how we formulate the hypothesis how we execute that is the executive function that is implementing or executing our planning function the plan whatever plans and hypothesis or the decisions that we have taken that is the executive function.

Then social cognition social cognition that means, how could we learn how could we acknowledge how could we know certain things in the social context that is the social cognition. Then the judgment judgment is again the type of evaluation that we make about ourselves about others that is a judgment. So, all these kind of activities are under it comes under the cognition domain of cognition. So, cognition you can say it is an overarching umbrella under which all the mental activities takes place. So, now social cognition social cognition similarly that for example, we are living in a society.

So, all the individuals are different all the individuals are different, but however, when we talk about like in philosophy and social science we talk about the collective consciousness collective consciousness that when the group of people they think in the similar way. So, individual every individual is different in his thought and action and the planning etcetera etcetera, but when a group of a group of people start thinking of in a similar kind of thing or a similar way maybe in maybe there are individual differences, but the similar thought similar or they that is in cooperatively collectively they think about one issue then the collective knowledge collective wisdom wisdom comes in comes in. So, similarly it is called that collective consciousness. So, the ability to develop the healthy friendship and partnership is the vital skill for the success in life. So, when we call about the social cognition then we have

to develop what the people are thinking about us what is the type of relationship what are their expectation what are their emotion what is the degree what are their values attitude.

So, we start thinking of other people's attitude behavior etcetera that is how we try to acquire the knowledge about the society about the people. So, from here it begins a social cognition. So, individually we that is the intra personal intelligence we talked about that is we try to understand our self, but when you talk about the living in a society in a group in a community and establishing a healthy relationship in the community bonding with others etcetera then we start understanding others perspective their perception their views attitude. So, there begins another our effort to understand others. So, that is the wisdom because in order to establish cooperation collaboration partnership or any kind of thing then we need to have a knowledge about   others.

So, here it begins the social cognition that means, knowing about others expression others feeling others emotion others behavioral patterns and their perceptions about it. And similarly how they are what others are viewing you how others are rating you. So, this in this is that is the we can say in a in a comprehensive way we can say that is the collective consciousness collective awareness collective wisdom about the community about the society about some challenging issues etcetera. So, now, becomes the information processing view of learning that we have already discussed like memory stories and coding stories memory retrieval all these things   similar.

So, here there are certain assumption. So, that certain that information is processed in step by step in stages in stages. So, remember here we are also whenever we are discussing about this memory system similarly we are also that means, computer is an example we can assimilate it with the how the computer functions. So, memory information is processed in the step by step. So, for example, one thing is the one difference is that the computer has a huge capacity of storing a large number of number of information and process it very fast. So, that is a we think that computer does the many things many things at a time that is not the issue, but computer can computer has the computer has the stories of capturing the data large number of data and store it and file it and process it very quickly that is why we think that quickly computer is being   able   to   do   it   multiple   things   at   a   time.

It is not multiple things actually, but it is one information one process one activity one process at one time at one point of time, but the speed is very high the capacity is very huge and the speed is very high, but you can we can we can understand all information processing speed and processes through by when we try to take the example of the computers. So, here information is being processed step by step and slowly at different stages by different stages. There are limits on how much information can be processed at each stage that is the thing that we the human being we have the individual capacity like at a glance of a fraction of a second how much letter we can remember how much word we can remember how much alphabet we can remember how much pictorial items we can remember. So, every individual we have the limits we have the limits that that is called the attention span. What is the span of attention it is like that attention span may be 5 plus minus 2, 5 plus minus 2, minimum 5 minuminus 2 means it can be 3 it can be 5 it can be 7.

So, similarly human human information processing system is interactive it always interacts because whenever we start retrieving or recapitulating the old idea something like that we definitely we refer to automatically it gets connected to other peripheral actors peripheral factors some environmental factors some cues some maybe when we try to remember certain

in the particular context that contextual factors also comes into the mind. So, it is very interactive with other cues and things and items. So, information processing is analogous to computer processing. So, we can assimilate it. We can say that they are similar, but the thing is that computer is manmade and we have prepared it. So, we have given it a huge capacity to hold the information and to process the information with high speed that is the power that we have given to the computer.

So, it functions like the way human information processing takes place. So, information processing is also involved in all activities be it problem solving be it remembering be it thinking be it writing be it rehearsing be it image imaging imagining or fantasizing every activity information processing this information processing is involved actively involved. So, this is the information processing model as you can see this is a basic model that here is the environment from the environment the stimuli environment stimuli input is coming up in the sensory register and we remember it through our 5 sensory organs or 7 sensory organs. So, that is the information coming through different sensory organs it is registered here sensory register. Then thereafter 2 things are here. With attention it goes to the short-term memory and also with recognition. We suppose that we recognize once. The fact is that we recognize to understand it. Also whatever we recognize, known facts known stimuli known information also goes to the short term memory and again given attention (the stimuli to which we give attention) it goes to the short term memory. But within the short-term memory further activities are also there. For example, in short term memory then suppose we want to retain it or remember it for long-term purpose then we have to elaborate it. Narrativize it, rehearse it we have to organize it, relearn. Meaningful learning takes place only after all these exercises. After doing all these activities then only it can be sent to the long term memory or be retained in the long term memory then only we can retain it in the long term memory. However, in this process also, there is one central processor CPU CPU is also control processing. It is also working on it. So, control processing is working on that. It works for the maintenance and rehearsal.

Maintenance of the information and the rehearsal algorithm it is like you can say it is a decision making unit like the computer CPU. Decision making unit control processes which regulates the all these activities. It gives how much attention it is required. It gives the command to the brain that is to give this much of attention. Similarly, here how much elaboration how much rehearsal, what should be the learning strategy, what should be the preparation level of processing all these commands are also required to be given by the control processing unit. So, in these ways it gives direction to the brain. So, it maintains the information maintenance and rehearsal takes place.

So, that is the control processor that is actually the executive control process mechanism or unit of the brain. So, then it is again after all these exercises, then it is being retained in the long term memory. Now, once it is written in the long term memory then it is also directly connected to this control executive unit. That means, once it is there in the long-term memory it has also the connectivity with the executive unit or the decision-making unit. Thus, it is a control processing unit.

So, in this process after this when it gets connected to this thereafter that command will come up and come up. From the command then the response (output) will come out. So, at the end when we try to practice it. Some will try to apply it manifest it through behavioral outcomes or performance outcome etcetera then it comes as a behavioral act or as an performance or as a response output. So, this is the basic information processing model. Now, in the next class

we will discuss about the other aspects: how it functions what are the characteristic features of short term memory and long term memory. Thank you.