Memory
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Lecture – 2
Introduction to Memory

Hello everyone, again I welcome you all in the lecture series of memory. Today we are going to talk about the three major approaches in the study of memory. In the previous lecture, we studied about, understood the historical perspective of memory and we understood how different philosophers and people from different period talked about memory research and the contemporary research in memory and the start of Hermann Ebbinghaus' experiment in 1883 laid the foundation of the memory research. In this, we will talk about the major approaches which researchers have adopted over a period of time. Three major approaches which researchers have adopted over a period of time.

One is the social learning method, another cognitive psychology and cognitive neuroscience. There is a significance and relevance behind these three major approaches. One such motivation is to understand how people communicate, how people interact, how people mingle, how people build a society. To understand this thing, it is very important for us to understand how social learning, social communication, social memory is being formed. And this social learning theory, which was being proposed today in the modern world, is known as social cognitive theory because it involves the cognitive aspects. So it was being developed to study how people learn by watching what is happening to the others and by imitating the their success.

To understand this thing, Albert Bandura conducted a study on Bobo doll experiment, which we are going to see shortly. Imitation of the behavior, mimicking the behavior suggests the social learning behavior of an individual. The second approach is the cognitive psychology approach, where we try to understand the higher mental activities such as attention, memory, thinking, language, decision-making, problem-solving methods. Now the human cognition can be divided into basic cognition and higher cognition. But broadly all the cognitive research is under the hood of cognitive psychology.

In cognitive psychology, people paid lot of attention towards the reaction time and accuracy. The other aspects, the underlying neuromechanism of those underlying cognitive processes were being unaddressed. As a result, cognitive neuroscience approach came into light where people would like to understand how brain is producing these cognitive functions or cognitive processes. What are the different brain functionalities playing role in these cognitive processes? We know that there is a memory center, there is a decision-making center, there is a visual center, there is an auditory center, there is a language center in the brain.

The coordination of these different brain centers, working independently or working in coordination plays a major role in human cognition and in human behavior. Talking about the social learning theory or social cognitive theory, the classical experiment done by Albert Bandura with the Bobo doll experiment suggested that the students who watched the adults playing with the Bobo doll when the adults were throwing the Bobo doll up, kicking, hitting, punching, the kids saw these video recordings and they tried to imitate the behavior the way adults have done. The simple bobo doll experiment hinted, suggested, and affirmed that we humans learn with imitation by observation. In this social learning theory, people understood clearly that the humans have tendency to learn behavior with imitation. And they use cognitive abilities in understanding that. More than that, people also compare their behavior.

The act of comparison, how we have performed in comparison to the others. Am I performing in the same way as the others have performed? So this social comparison is a key act, is a key role, playing a key role in such setting and in such places. So social learning theories in detail also addressed about the social comparison. Then the point is social equity.

Am I equal in the society? The society like India, where the higher class, middle class, lower class exist together. But there is an unequal distribution. In this, the context plays a major role. And then people assume how am I being evaluated in this different context, the different scenario of social hierarchy.

How am I going to be evaluated? I am going to appear for an interview. Hundreds of people are then in that interview. How will I be evaluated in relation to the others? These are the social learning aspects and which people learn over a period of time and which is a major approach in learning and theories.

Then expectation, what am I expecting? The expectation is the motivational force or driving force in an individual to learn and remember the things. The expectation of a person, what to do with the Bobo doll? When the Bobo doll is there on the screen with me, how adults are behaving, am I supposed to behave in the same similar fashion? Am I supposed to kick?

Am I supposed to hit? Am I supposed to throw? Punch? That is an expectation. When a child is starting his engineering degree or bachelor's degree, what is expected from me?

It is expected from me to score good marks and clear the degree with the flying colours. Then also the evaluation. The belief system, our own ability, that is self-efficacy to perform a task. Can I complete the task? Do I have necessary skill and ability to complete the task?

These aspects, these parameters contributed a lot in the social learning and plays a major role in this social learning approach method, where the observation and imitation is a key factor.

Another parameter to this is the information processing theory. How are we processing the information? The information processing theory talks about the three key functions or three key processes. In any context, at any time, we are bombarded with thousands of stimuli, with thousands of information.
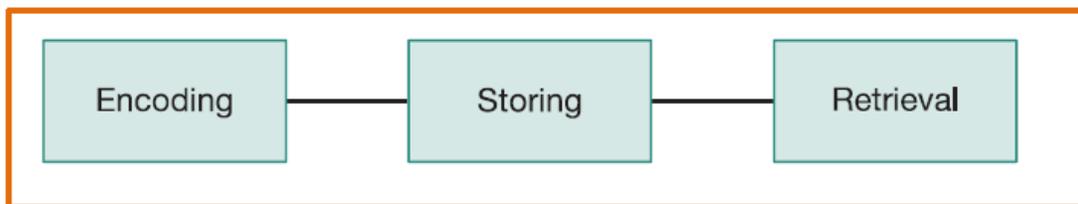

Figure 1: Three key functions

And not all information we encode because it comes with its own cost. We have to minimize the cost. To minimize the cost of encoding, we become selective. We do the selection of information. So if you see the cartoon standing at the zebra crossing waiting for the traffic signal to be green.

What we are encoding here? We are encoding here the red color. The red color which indicates that we are not supposed to cross the road. At what time we are going to cross the road? When there will be a green color. But encoding the red color into our memory system and storing this information for future retrieval and retrieving the information in the right context, which means that retrieving the information about the red color when we are standing at traffic signal is meaningful. So, while processing the information, it is crucial for us to understand when to encode the information, when to store the encoded information and when to retrieve the encoded stored information. From context to context, from time to time, this information varies.

So, encoding is nothing but it is sensing some stimuli in the environment. How we are through sensation, through perception, we are acquiring the information and assigning meaning to the incoming sensory information during the categorization, which is perception. And once it has been done, then we encode that information. Once the information has been encoded, then we store that information for a period of time, till its usage. If it is important for us to process, then we keep this information for longer period of time. If we believe this information is not very useful for us, then we do not store this information. Just like the color of the door of your classroom is not meaningful to us, so we do not save that information. Sometimes we save that information for period of time if it is wet.

The door has been freshly painted. It is wet. So we store that information. But in the long run, it is not going to be wet. It will be dry.

And then we do not have to store that information. Retrieval. To remember some information which may play a role in our life. Such model gives us a very clear understanding that we encode the incoming information and we store the information and

do the retrieval from time to time. So which information we encode, an individual has to decide.

And from individual to individual, this encoding varies. In 1968, Richard Atkinson and Richard Shiffrin, they proposed a model, multi-store memory model. This multi-store memory model, they proposed it because there were different types of memories involved here. The arrow indicates the incoming sensory information which is entering into the sensory memory. The sensory memory is registering the information for a very brief period of time, less than a second.
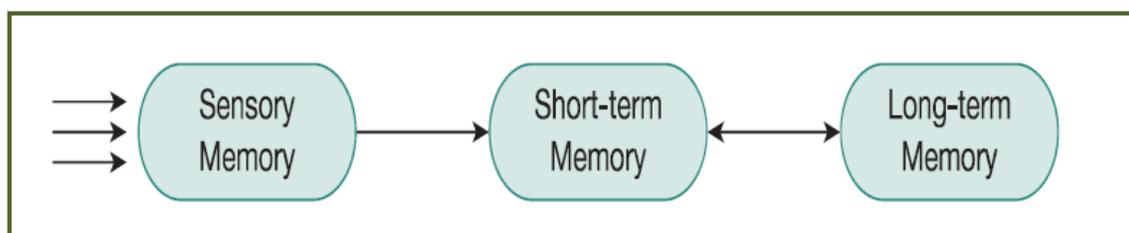

Figure 2: Atkinson-Shiffrin (Multi-store Memory) Model

There are different types of sensory memory based on the different types of sensory system. What are these different types of sensory system? Visual system, auditory system, tactile system, olfactory system and many more. These different types of sensory system register information differently. But in the literature, in the scientific approaches of memory research, you will find that two types of sensory systems people have paid more attention to, or two types of sensory memory people have paid more attention to.

One is iconic memory, another is echoic memory. Iconic memory talks about the sensory system through visual. Icon. Echoic memory, echo, the sound. The sensory system acquiring the auditory information.

Extensive research has been done with these two types of sensory memories. Hence, these two types of memory has been heavily studied. However, we cannot rule out the fact that the other type of sensory system or sensory memory is also being studied. Once the sensory system has registered the information, it goes into your sensory memory where the meaningful interpretation starts to happen. It goes into your sensory memory where the meaningful interpretation starts to happen.

Where the assigning of meaning categorization happens. Where the selection now happens. Which information I have to pass on to short term memory. So attention plays a major role here. So on this side here the attention system plays a role.

The attention system says that this information we have to pass it to the short term memory. In the short-term memory, information stays as long as desired by continually thinking. What does this mean? This means that if I want to store information for some period of time, I can do the rehearsal. Initially, the literature was talking about short-term memory being only for 30 seconds.

But later research revealed and highlighted that it depends on your rehearsal. If you do more rehearsal, if you do longer rehearsal, if you do over learning, then this may extend up to 6 hours. More or less. Because it also depends on the nature of the memory. If you are dealing with emotional memory, it is going to be stored for large period of time.

So, short term memory can go up to 6 hours without any trouble, with easiness, because emotions are there, emotional value is there. However, if the information is not emotional in nature, then it may last half an hour, one hour, may go up to two hours also. So, the ambiguity, complexity of the information plays a role here in the duration of the short term memory. Now, the short term memory, in coming lectures also we will see in detail, the short term memory is being referred as working memory also by some researchers. Why are we referring it as working memory?

This we will see in our upcoming lectures, not today. Today, we will talk about the next stage of short term memory, that is the long term memory. Once you have stored the amount of information for some period of time, then you want to save this information for long period of time. And long period of time for future reference. So for example, you can see a chef is cooking.

A good chef. Who has lot of experience in cooking. Knows retrieve and access information from his long term memory. If you are learning to be a chef, then you have to store information in your short term memory first. Then you have to store information in your short term memory first.

What you require at the moment of cooking. Is it a 2 hour cooking, 3 hour cooking or 4 hour of cooking? What ingredients you require? In what quantity? In what quantity and in what ingredients are required, you have to rely on your long term memory.

So you retrieve information from your long term memory. But if this is the first time you are cooking, then you learn and you store. Which, earlier the researchers were talking about experienced. So you are like a blank slate. You are writing.

You are writing, you are learning, you are experiencing, you are writing, you are consolidating your knowledge. After 10 years of cooking, after 20 hours of cooking, you have experienced a lot about cooking and that you have registered and you can retrieve it. So this multi-store memory model because sensory memory is there, short term is there, long term is there. Together, we call it as multi-store memory model. And because it was being proposed by Richard Atkinson and Richard Shiffrin, we call it Atkinson-Shiffrin model also.

Now, in the long-term memory, the information is stored for indefinite period of time. Here, there is no defined period. The information can be stored here for few days, few weeks, few months, few years or few decades also. The another concept and idea which people have started talking about is the metamemory. In 1970, three researchers, Flavell, Friedrichs and Hoyt coined the term as metamemory.

The metamemory came from metacognition. So as per the definition of American Psychological Association, metamemory is the awareness of one's own memory process. How is my memory process? What type of information I register? What type of information I encode?

What type of information I save? Memory of memory, often involving a conscious attempt to direct or control them. What is the movie I have recently watched where Shah Rukh Khan was the actor, where Shah Rukh Khan was a spy, or where Shah Rukh Khan was a musician, or where Shah Rukh Khan was a music director, or the missile scientist who was president of India, who was having long hairs, who was never married, who wrote a beautiful book, who inspired many researchers, a great ISRO scientist. So these aspects are the part of metamemory. In metamemory, we often test person's ability for learning material.

How many things an individual can learn? An ability to judge the memories, how it is changing. Are we able to judge our memories from childhood to adulthood? How many friends did we had that time? Now how many friends do we have?

Where did it go wrong? How I was social earlier, how I am social now? Monitoring, judging the memories over period of time. It could be long period of time also. Now, such aspects of memory gives us an understanding about the nature of memory consolidation, nature of knowledge, acquiring the knowledge, nature of knowledge transfer, nature of information transfer.

It even gives us an understanding about the person's ability in the information transfer. So understanding such elements and understanding some such areas, what we understand, there are three major approaches in learning and memory. The first major approach is the social cognitive learning approach, where we understand that we imitate, we observe people, which help us to be more communicative, which help us to be more interactive. Then the cognitive psychology approach, where we understand the mental functionalities, how these mental functionalities are involving, engaging themselves, high mental functions, high mental processing, high cognitive processing, attention, perception, memory, how they are interacting with each other and how their interaction help us in decision making, problem solving, reasoning. How an individual argues, communicates effectively with his or her supervisor or boss.

And then we also study about the Information Processing Model. That there is a three stage processing model. Three stages are involved. We encode information, the

information which I want to encode. And once I have encoded the information, for instance, standing at the traffic light, red, yellow, green light, what does it mean?

For instance, standing at the traffic light, red, yellow, green light, what does it mean? I store this information. And then after storing it, the time of retrieval, when I have to retrieve this information, how I have to retrieve this information? The retrieval depends upon several factors. Is the information stored at the time of encoding is robust?

And if it was very robust, then we can retrieve the information easily. If the encoding hasn't been so robust, information hasn't been stored, then the retrieval failure will be there. Social learning accounts different parameters. So, information processing model also involves the emotional value, social values. If social values are there, emotional values are there, then encoding will be more robust in nature, as you can see here.

When the social learning aspects we were talking about in the cartoon, you can see it goes into our memory system, two information we are forgetting. One information stays there in our memory system. Which information left behind, which information we forget, we do the testing. Another model which we studied is the Atkinson-Shiffrin model, multi-store model, where we talked about the sensory store. And what type of sensory store we are talking about here?

Particularly about the visual store and the auditory store. Iconic memory, echoic memory. And after paying attention to, this moves to the short-term memory. Once they move to the short-term memory, then it stays there for a small period of time. The period of time depends upon the rehearsal.

If we do the rehearsal, the short-term memory duration may be extended. If you are not doing the rehearsal, if you are not doing the over learning, then this period will decrease. And it may decrease up to 30 seconds, 20 seconds. For the list of words, remembrance of the list of words, the short term memory duration is only 30 seconds. The final stage was the long term memory, where the information gets stored, preserved for long period of time, indefinite period of time.

It could be weeks it could be days it could be months it could be decades it could be centuries also. and this we have seen in the history of memory the information has been human mind cannot restore information for centuries so what we do we document information So the documentation from Egyptian period has revealed the understanding of Egyptians about the memory system and their storage and their documentation. The last stage was our awareness about our own memory system. Our awareness about our own memory system is the metamemory, metacognition, memory of memory. How much information I am aware of?

How much information I know about my own system? How can I enhance this memory system? And if you will remember, in the social learning approach, we were talking about the self-efficacy. One's belief, our own ability to execute the task. That has a direct link with the metamemory.

Our own consciousness about our own consciousness. Such understanding, such approaches actually gives an idea to the reader, to the memory researchers to understand and help in designing a memory research. Such an understanding gives an idea to the researcher to carefully design the memory experiment and to carefully select the dependent and independent variables. Such ideas give clarity to the reader about the brain functionalities. The complexity of the memory processes to provide easiness, these approaches brings an aid.

They provide an information that how the complex nature of memory processes can be simplified and can be studied in a simpler fashion. And in recent past, what we have seen Atkinson Shiffrin model, information processing model has been a great aid to the researchers to understand the memory processes. in coming lecture series we will be addressing working memory in detail short term memory in detail long term memory in detail and also along with this we will understand different types of memory models different types of memory measures how we can test the memory how can we test the memory in the lab how can we report that memory performance is better of an individual and how they are different from one another. I will rest today this case here and we will take this lecture forward in the next lecture.

Thank you all.