An Epistemological Reflexion on Knowledge Representation

Sangeetha M Reveendran

Living systems are cognitive systems and it living as a process which is known as the process of cognition. Cognitive process or acts are mainly sensing, judging, doubting, imagining, concerning, intuiting, recollecting, introspecting, comparing, compounding, distinguishing, abstracting, synthesizing, schematizing, generalizing etc. All cognitive processes are mainly related to the human brain function or nervous function such as perception, memory and knowledge representation. Therefore our mental thoughts and activities are related to our cognitive process. Some times cognitive process and brain functions are used in the same manner. Through this paper mainly I consider the following issues. They are:-

1. Epistemological analysis of cognitive process of knowledge representation.
2. Relevance of perception and memory in knowledge acquisition
3. Cognitive content of knowledge representation

1. Epistemological analysis of cognitive process of knowledge representation

Knowledge representation is an epistemological concern in the cognitive process. Epistemology analyses the knowledge representation with the knowledge sources such as perception,

memory etc. Even though, perception, memory etc are not knowledge, it is considered as the means of knowledge acquisition. Therefore both memory and perception are culminated in the realm of knowledge and representation. Human cognition involves a constant interaction between incoming information and the information (that already existed as long –term memory). Such an existed information is known as representation of experience. This cognitive representation of experience plays an important role in epistemology.

In Piaget's theory, representation of experience takes the form of motoric and kinetic representation as visual or auditory, imagery, linguistic and other types of symbolization. Most of the epistemologists considers representation is the intermediate source of knowledge because the "object" which is stored and acted upon to become knowledge. In the broader sense, ideas and knowledge itself may be conceived as representation of reality. Hence, in Piaget's system, representation is the final product of a process of knowledge acquisition, and not the origin of knowledge. The symbolic representation has two aspects, they are the figurative (that is involving some sensory or motor event) and the operative(referring to meaning that is, to it's significance). Both of these two aspects make some possibility for the person to represent himself to the events and actions but it is not directly in his sensory or perceptual experience. Piaget considers these representations or systems of representation are instrument in the service of thought and not as thought itself.

Representation is associated with sensory imaginable and abstract symbols. The significate of the symbol is a concept. It is only through the concepts that symbolic thought can be said to represent external reality. The concept itself is not thought, but the product of a symbolic thought process. In this sense, concepts make it possible to have representation of both the particular and the general. In a narrow sense, images may 'represent' a particular object, but they too are only a product of the symbolic function and not merely a trace of perception. Thus representation is the product of an active process of mind.

2. Relevance of Perception and Memory in Knowledge Acquisition

Perception and memory are important aspects of human cognition. Both of these are related and helps to the process of knowledge acquisition in both Indian and Western concept. Both Indian and Western concept, perception gives direct knowledge of reality because in it we are face to face with reality, but they considered memory as past or re-collective knowledge. Generally Indian thinkers consider memory as non-valid cognition, but some thinkers believes that memory as valid cognition. These two statements (valid or non-valid cognition) raise two views about memory. The main argument made by the Naiyāyikas against the validity of memory, they noted, memory is diferent from direct apprehension (anubhava). According to them, valid knowledge is *tattvānubhūti* (direct apprehension of a thing's tattva, i.e. this-ness or that–ness) or *yathārthānubhava* (direct apprehension of an object as it really is). Since memory is not *anubhava* or *anubhūti* so it cannot be valid cognition. But some thinker's philosophy notices, Madhva's philosophy accept memory as a kind of internal perception or *mānasapratyakṣa*. Jaina philosophy accepts memory as a variety of empirical perception.

Perception and memory kept the two-way relationship in the knowledge acquisition field. That is "Stimulation with lists of words or displays or spatial or figurative material by which memory capacity of strategies are to be assessed, requires perceptual activity. Conversely, the perceptual act requires a search of appropriate long-term memory data in order to retrieve the best –filling match for the stimulus material that has entered a sensory or very short-term memory stage".[1] Identify the stimulus, we require past knowledge which is available only in memory.

In his work, *The Logic of Perception,* Irvin Rock explains different stages of perception and perceptual out puts. The first stage he calls "form perception", the perceptual output of form perception characterizes the stimulus as round, 'elongated' or the like. Other stages involve the accessing of memories that lead to

further perceptual descriptions. For example, the stimulus is seen as a dog. Rock emphasizes that description is involve in both form perception and higher-order perceptual stages, but description is different sorts or groups. That means, form perception is the description of an external stimulus descriptions having certain shape, organization, orientation and the like.

In the years of 1960 and 1970s the feature analysis had been used as a popular approach to perception in the knowledge acquisition field. According to this model "Stimuli are thought of as combinations of elemental features. For example, features for the printed English alphabet might consist of horizontal lines, vertical lines, lines at approximately 45 degree angles and curves. Thus the capital letter 'A' can be seen as consisting of two lines at 45 degree angles and a horizontal line. The pattern for 'A' consists of these lines plus a specification of how they should be combined".[2] Feature analysis process are two types:- Bottom-up and Top-down process. In the Bottom-up process, information flows from little perceptual pieces to larger units. For example, words out of letters, and sentences out of words. Top-down process or Higher-level knowledge processes use the psychologists as the *pattern* context. For example "We perceive the stimulus as THE CAT, interpreting the middle letters of the words as *H* and *A* respectively. But in fact the 'H' and 'A' are identical stimuli. Presumably these identical stimuli are interpreted differently because of our knowledge (beliefs) about adjacent letters and our knowledge or beliefs about which letter sequences are most likely to be presented".[3]

Cognitive psychologists generally believe that perception uses mixture of bottom-up and top-down process. But epistemological thesis is obviously hinges on facts of perception, and it point out, "Not all theories and background beliefs are capable of shaping perception"[4]. For example, Muller- Lyer illusion, this illusion notices the familiar stick in the water case. Even when a person knows that a particular stick is straight, it still looks bent when immersed in water. Here the person's background theoretical beliefs do not penetrate his perceptual processing so as to make the stick look straight.

Another central component of cognition and the main source of knowledge are memory. Always we are depending upon our memories because; we can remember a new something for few seconds without write down it. Hence our dependence on memory is often notices only when memory fails us, for example, forgetting the name of a new acquaintance, forgetting to buy the milk or forgetting during a final exam lead one to under how memory work and how it can be improved. Here epistemology is rightly concerned with properties of memory with the power and reliability of memory. Memory is an important item for epistemologies agenda and an important aspects of human cognition.

According to the "Duplex" theory of memory, the mind has two memories, they are long term and short –term or active memory. Perceptual information's are stored in our brain as both of these two memories. In the long-term memory (LTM) information can be stored for very long periods that mean its decay is very slowly. Short-term memory (STM) has much faster decaying period. There is also a big difference in the amount of information retainable in LTM as compared with STM. LTM has virtually an unlimited capacity, where as STM has a very restricted capacity than LTM. During the knowledge acquisition period a kind of representation of the target information must be formed or stored. This stored representation is often called the 'memory trace'. This memory trace must have activated and utilized by some ongoing information process in the retrieval situation. Short-term memory refers to the retrieval of a new fact from working memory in this context, it is sometimes called 'Short-term store'.

John Anderson's recent treatment of memory in 'The Architecture of Cognition' departs slightly from the duplex theory. The notion of cognitive architecture (context of the computational theory of mind) (CTM) comes directly from the notion of computer architecture. It refers to the relatively fixed set of computational resources which is available to a programmer in designing a programme for a given computer system. The architecture is a functional characterization of the computer system on which the programme runs. In this view of Anderson, active memories are

not as events occupying a special location, but as activated states of LTM-Activation is something like a light bulb lighting up. Anderson's theory like a light bulb, governed by a dimmer switch: activation can take on a continuous range of levels, not just on and off.

3. Cognitive content of Knowledge Representation

Knowledge representation is a cognitive content because it is the result of cognitive process. The cognitive process are coded and represented in the brain in some form or symbols/language. Cognitive processes are also related to knowledge acquisition processes. Acquired knowledge is kept in memory which is continually related to our environment. That means, our experienced knowledge depends upon both perceiving and attending to the information that we receive, when we interest with our environment. In other words, all the cognitive activities, that we engage in geared towards obtaining information, understanding and interpreting this obtained information and it modifying our existing knowledge on the basis of new information. So that it provides an accurate description of objects and explanation for events that happen in the outside world.

Knowledge representations are directly related to our capacity of brain memories that also depended on short term and long term memories. We require past knowledge which is available only through the memory and it more helps the long term memory. Epistemologists say, knowledge representations or mental representations are coded or stored through different internal codes or code systems. A given code might be employed in at least four different phases of cognition. 1. Perception 2.LTM 3.Recallor activation from LTM and 4.Manipulation or transformation in active memory of materials generated from LTM.

Conclusion

Epistemology investigates the possibility of knowledge and it analyzes how knowledge is acquired and possessed. The article 'An Epistemological Reflexion on Knowledge Representation'

investigates our knowledge skill, that means knowing how? With this respect, perception, memory and knowledge representation have been discussed in epistemology and in cognitive science for the connection with knowledge. Here perception is one way in which we acquire knowledge and memory is the way in which we retain it. The cognitive process such as sensing, concerning, recollecting etc are mainly related with the knowledge sources and knowledge representation. Knowledge representation is possible with the association of external reality too. Therefore the main concern of this paper is the cognitive epistemic process of knowledge acquisition and it's representation in the brain is possible through the process of knowledge sources.

Notes& References

1. Vernon, Hamilton. *The Cognitive Structures and Processes of Human Motivation and Personality* p.52
2. Alvin.I, Goldman. *Epistemology and Cognitive Science*, p.185
3. ibid p.186
4. ibid p.188

Bibliography

1. Taylor, Laura. *Introducing Cognitive Development*, Psychology press, Have and New York, 2005
2. Hamilton, Vernon. *The Cognitive Structures and Processes of Human Motivation and Personality,* John Wiley & sons, New York,1984.
3. Bchtel, William & Graham George, *A Companion to Cognitive Science*, Blackwell.

4. Goldman, Alvin I: *Epistemology and Cognitive Science*, Harvard University Press,1998

5. Churchland, Patricia Smith: *Brain-wise, Studies in Neurophilosophy*, The MIT PRESS, London 2002.

6. C.D. Bijalwan: *Indian Theory of Knowledge based upon Jayantas Nyāyamañjari,* Heritage Publishers, M-116, Connaught Circus, New-Delhi, 1977.

7. Shaila Bhandare: *Memory In Indian Epistemology:Its Nature and Status*, Sri Satguru Publications, Indian Books centre, Delhi,1993.