Information Processing Theory in Language Learning among Students

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Abstract:

We are aware that the computers get the information as input, process it and give results in forms of output. It was analyzed by educational psychologists that like computers, human mind also gets the input in the form of information received, process it in our brain and then gives the output in the form of our knowledge, reaction, behaviour etc. Any learning in human happens due to this information processing. This paper deals with the understanding the concept of information processing during language learning, especially among students. Language learning needs lots of information processing though Listening, Speaking, Reading and Writing (LSRW). Schools plays an important role in developing the language skills in students, thus the paper focus on the processing of information during language learning by students.

Key Words: Information Processing, Long term memory, short term memory

Information Processing Theory:

Information processing theory describes the process of information being received, processed, and stored in the human brain and the way it is retrieved. This theory compares processing of information by humans with computers. American psychologist George A. Miller (1956) developed the information processing theory which explained that the mind receives the stimulus, processes it, stores it, locates it, and then responds to it. The information processing theory is an approach to the cognitive development of a human being, which deals with the study and the analysis of the sequence of events that occur in a person's mind while receiving some new piece of information (Miller, G.A. 1956). He compared the information processing in humans to that of a computer model. He said that learning is simply a change in the knowledge that has been stored by the memory. In short, it is the analysis of the way a human being learns something new. There is a fixed pattern of events that take place in such a situation, and by knowing this pattern we can enable children and adults with special abilities to learn new things faster. (Miller, G.A. 1956).

There is need to make learning meaningful. People learn better when they can relate new learning to something they know. They attend to environmental events, encode information to be learned and relate it to knowledge in memory, store new knowledge in memory, and retrieve it as needed (Shuell,1986).It was believed by the psychologists that 'Humans are processors of information. The mind is an information-processing system. Cognition is a series of mental processes. Learning is the acquisition of mental representations.' (Mayer, 1996, p. 154). Information processing theorists challenged the idea inherent in behaviorism that learning involves forming associations between stimuli and responses. It does not reject associations, but postulate that forming associations between bits of knowledge helps to facilitate their acquisition and storage in memory. Rather, these theorists are less concerned with external conditions and focus more on internal (mental) processes that intervene between stimuli and responses. Unlike behaviorists who said that people respond when stimuli impinge on them, information processing theorists contend that people select and attend to features of the environment, transform and rehearse information, relate new information to previously acquired knowledge, and organize knowledge to make it meaningful (Mayer, 1996).

Information Processing is an analogous to Computer Processing:

There is an assumption that information processing is analogous to computer processing. The human system functions similar to a computer: Cognitive processing in human is remarkably efficient. It is concerned with programming computers to engage in human activities such as thinking, using language, and solving problems. Researchers believe that information processing is involved in all cognitive activities like perceiving, rehearsing, thinking, problem solving, remembering, forgetting, and imaging (Farnham-Diggory, 1992; Matlin, 2009; Mayer, 1996; Shuell, 1986; Terry, 2009). As in computers we have RAM and ROM, human mind has Short Term Memory and Long Term Memory. STM stores information for shorter duration. But if the same event will be repeated again and again, than that will get transformed into long term memory which is more permanent. The information can be retrieved from whenever similar event occurs or such information is needed by the external or internal environment.

Language Comprehension

Language is one of the most important developmental features of mankind. Human language is continuously modifying and developing. Language is an important part of any curriculum. It has always been the focus point in teaching learning process. Language comprehension is highly relevant to school learning and especially in light of the increasing number of students whose native language is not English (Fillmore & Valadez, 1986; Hancock, 2001; Padilla, 2006). Usually it has been observed that students presented with confusing information may misunderstood or relate it to the wrong context. Teachers need to present clear and concise information and ensure that students have adequate background information to build networks and schemata. Teachers must explain, demonstrate and model what they want their students to do comprehending spoken and written language represents a problem-solving process involving domain-specific declarative and procedural knowledge (Anderson, 1990). It has three major components: perception, parsing, and utilization.

Perception involves attending and recognizing the sound patterns that are translated into words in working memory. It can be any language, but the primary need is to unfold the sound pattern to learn the language.

Parsing: Linguistic research shows that people understand the grammatical rules of their language, even though they usually cannot verbalize them (Clark & Clark, 1977). When people are exposed to language, they construct a mental representation of the situation. They recall from propositional knowledge about the context into which they integrate new knowledge. Effective parsing requires knowledge and inferences (Resnick, 1985). When exposed to verbal communication, individuals access information from long term memory about the situation. People often miss-construct communication because they fill in missing information with the wrong context. As with many other linguistic skills, interpretations of communications become more reliable with development as children realize both the literal meaning of a message and its intent (Beal & Belgrad, 1990).

Utilization: It is to use the buildup memory about the language. The listener receives the sound and encode it in words and further in the form of language. Students link the communication with related information in long term memory. It is very important for the listener to correctly interpret the meaning of the speaker. While speaking, the speaker uses the verbal as well as nonverbal cues to explain the content. They visualize the content in the form of image and connect it with the long term memory.

Building Image for language learning:

Mental imagery is central to the study of long term memory (Matlin, 2009). Images are the core of learning. They certainly last for long in our mind and helps to retain our memory. It refers to visual knowledge. Imagery has been valued as far back as the time of the ancient Greeks. Plato felt that thoughts and perceptions are impressed on the mind as a block of wax and are remembered as long as the images last (Paivio, 1970). People use imagery to represent spatial knowledge comes from studies where participants were shown pairs of two-dimensional pictures, each of which portrayed a three-dimensional object (Cooper & Shepard, 1973; Shepard & Cooper, 1983). To the extent that students use imagery to represent spatial and visual knowledge, imagery is germane to educational content involving concrete

objects. Imagery can be used in classroom to increase student language learning. Usually it is difficult to use imaginary in language, but it can definitely be used.

Instructional Application of Information Processing:

Information processing principles has been increasingly applied to school learning. Three instructional applications that reflect information processing principles **are advance organizers, the conditions of learning, and cognitive load.**

a) Advance Organizers

Advance organizers are broad statements presented at the outset to connect new material with prior learning (Mayer, 1984). Organizers direct learners' attention to important concepts to be learned, highlight relationships among ideas, and link new material to what students know (Faw & Waller, 1976). Organizers also can be maps that are shown with accompanying text (Verdi & Kulhavy, 2002). The learners' cognitive structures is so organized that they can imagine the image and adds up new knowledge based on that concept.

b) The conditions of learning

The condition of learning is something on which there is need to ponder upon. When can a learner learn language? What is the right age and circumstances? How much the learner needs to listen, visualize and store in the memory at a time? All these questions need to get answer before any learning takes place. The right circumstance is the foremost requirement for learning. Adequate listening is required and then visualizing the context is very important to retain it in long term memory. Than only it gives the required learning outcome. Gagné (1984) identified five types of learning outcomes: intellectual skills, verbal information, cognitive strategies, motor skills, and attitudes. **Intellectual skills** include rules, procedures, and concepts. They are forms of procedural knowledge or productions. This type of knowledge is employed in speaking, writing and reading. **Verbal information** involves facts or meaningfully connected prose. **Cognitive strategies** include information processing skills such as attending to new information, deciding to rehearse information, elaborating, using long term memory, retrieval strategies, and applying problem-solving strategies. **Motor skills** are developed through gradual improvements in the quality of movements attained through practice (Ericsson et al., 1993). **Attitudes** are internal beliefs that influence actions and reflect characteristics such as generosity, honesty, and commitment to healthy living.

c) Cognitive Load

The information processing system can process specific amount of data at a time depending upon the mental ability of the learner. If too much information will be uploaded in the form of input to the human brain, it will not be able to process it. It processes data or information in the form of bits and bytes just like in computers. For any learner, it is important to understand their capacity to learn. Because information processing takes time and involves multiple cognitive processes, at any given time only a limited amount of information can be held in week memory. Cognitive load theory takes these processing limitations into account in the design of instruction (DeLeeuw & Mayer, 2008; Schnotz & Kürschner, 2007; Sweller, van Merriënboer, & Pass, 1998). Those who give clear presentations help to minimize extrinsic cognitive load, whereas those who explain these concepts poorly increase extrinsic load.

Conclusion:

Information processing theory is being focused for language learning. It is easy to visualize any content, but little difficult to imagine language. The key idea is that instructional methods should decrease extraneous cognitive load on students during language learning. The scaffolding can help in doing so. As learners develop a schema to work with the information, the scaffold assistance can be phased out and information will get enough time to get processed in the minds of students . Information can also be processed through simple-to-complex sequencing of material (van Merriënboer et. al., 2003). Complex learning is broken into simple parts that are acquired and combined into a larger

sequence. This procedure minimizes cognitive load, so learners can focus their cognitive resources on the learning at hand. Another way to improve learning is through proper and effective instruction. Tasks that have real-world significance help to minimize extrinsic load because they do not require learners to engage in extraneous processing to understand the context.

Information processing theories focus on attention, perception, encoding, storage, and retrieval of knowledge. It has been influenced by advances in communications, computer technology, and neuroscience. Although there is a register for each sense, most research has been conducted on the visual and auditory registers. At a time, only a limited amount of information can be attended. Attention may act as a filter or a general limitation on capacity of the human system.

The basic unit of knowledge is the proposition organized in networks. An area that illustrates the storage and retrieval of information in LTM is language comprehension, which involves perception, parsing, and utilization. Effective language comprehension requires that listeners possess adequate propositional knowledge and schemas and understand the context. To integrate information into memory, listeners identify given information, access it in LTM, and relate new information to it. Language comprehension is a central aspect of literacy and relates strongly to academic success, especially in subjects that require extensive reading. Although much evidence exists for information being stored in memory in verbal form; evidence also exists for storage of images. The image system primarily stores concrete objects and events and the verbal system stores more abstract information expressed in language. Developmental evidence shows that children are more likely than adults to represent knowledge as images. Thus, to improve the language, image building through information processing theory is best accepted.

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