

BOOK REVIEW

Note : The Journal of Engineering Education has started a feature "Book Review". The first Book Review was published in Oct.93 issue on the book "Organisational Behaviour in Education", by Owens R.G. the second book review on the Book "Cognitive Psychology" by Solso R.L. is being presented in this issue. Thus, we propose to present book reviews on important books on all subjects related to Engineering Education I.g. Educational Psychology, Philosophy of Education, Sociology of Education, Educational Technology, Curriculam Development and so on for the benefit of Engineering Teachers. -

Editor

**TITLE OF THE BOOK : SOLSO R.L. Cognitive Psychology (2nd)1988,
Boston : Allyn & Bacon**

INTRODUCTION

This is the age of life long learning. Even in the industrially advanced countries like USA, Germany and U.K., the management thinkers write in prestigious journals like Harward Business Review or Sloan Management Review about the need to learn continuously not only individually, but also by the organisations as well as nations as a whole. "Learning" has become a buzz word. Internationally famed writers like Alvin Toffler, Tom Peters, Peter Senge, Hammers and Chompy talk incessantly about need to learn continuously to face the challanges, in this competitive society.

'Learning' therefore, is no more restricted to formal educational system being carried out in schools and colleges but also in the work places where people work to earn living.

Psychology in general and educational psychology, in particular, provides fundamental theoretical framework in understanding "Learning process in adolescents and adults". Psychology studies human beings from various approaches : neurobiological, behavioural, cognitive, psychoanalytic, humanistic approaches. Cognitive psychology is one branch of psychology which inquires into : How people perceive,

represent, remember and use knowlede.

Between the few stages of firstly attending to external stimuli and responding, lot of internal activities take place in the brain. Cognitive psychology deal with these internal processes. The Book under review is a comprehensive text book which gives a sufficiently broad as well as deeper understanding of the human's internal processing of information.

CONTENT DESCRIPTION :

The book is divided into five broad parts. Part I deals with "Detection and interpretation of sensory signals and comprises three chapters i.e. 2,3,4. Part II describe "Memory" and contains three chapters i.e. 5,6,7 dealing with memory models, its structures and pressures and semantic organization and memory. Part III discusses "Mnemonics & Imagery" and contains two chapters 8 and 9 describing "Mnemonic & Memory" and "Mental Imagery".

Part IV deals with "Language & Development of cognition" with its three chapters 10,11,12 dealing with words and reading structure and abstractions, and cognitive development. Part V described "Thinking & Intelligence - real and artificial" in chapters 13,14,15 i.e. concept formation, logic and decision making,

problem-solving, creating and human intelligence and artificial intelligence.

The chapter on 'introduction' defines cognitive psychology as the discipline which describes how knowledge is acquired, transformed, represented, stored and retrieved and how that knowledge directs what we attend and how we respond to people, objects, events and ideas.

The sensory signals in order to be detected must be above absolute threshold in its intensity, which is influenced by the signals magnitude, nature of task, observer's expectancy and its rewards or consequences. The sensory signals are started in iconic or echoic form. The capacity to store signals in the form of image helps person to detect relevant information from the environment, in future.

The sensory signals are recognized as patterns which are organised according to principles of proximity, similarity, direction and objective set. It also indexes visual analysis at the input stage with the help of long term memory storage.

The nature of pattern recognition depends upon "attention function" which is defined as this concentration of mental effort on sensory or mental events. This is a conscious effort done at two levels: One for language functions associated with the brain's hemisphere and one for spatial relations associated with the right hemisphere.

The next major topic handled is "Memory". The memory is supposed to have two fixed structures: a short term memory (STM) a long term memory (LTM) each having distinctive functions. STM capacity stores incoming stimuli and has a limited capacity up to seven items. But the density of information can be increased by changing information from LTM i.e. comprising

incoming information into broader category and remembering that category only. Coding in STM is visual, acoustic and semantic type. However, visual coding occurs before acoustic and semantic coding. Coding in LTM is multi-dimensional involving semantic (in the form of words) and other sensory codes. The information which is coded in LTM is retrieved by the STM for processing incoming information. But the retrieval process efficiency depends upon the phenomenon called forgetting. Forgetting is the inability to access information from the LTM due to i) decay of storage through disuse ii) interference of event in between original learning and later recall and iii) improve cueing of encoding and retrieval process.

Between the three codes mentioned above, semantic memory is the most important from the learning point of view. It is the way, concepts are organized and structured in memory. Concepts are organized by, number of sets of informations called categories their defining and descriptive attributes. These concepts are then inter-related by specific meaningful connections. Some theorists claim that the concepts are stored by a complex association network of propositional construction that is the smallest unit of meaningful information.

Mnemonics are the techniques that facilitate storage i.e. encoding and recall of information in the memory. The techniques are imagery, mediation and semantic organisation.

Mental imagery describes how information is represented in memory. It is assumed that the information is stored both through conceptual coding and imaginal level.

Having dealt with sensory detection

and memory processes, the book moves on to explain the role language plays in improving understanding of the environment, helps communication, develop thought, perception and representation of information and higher order cognition i.e. thinking.

Reading causes interaction between reading material and the memory which helps the reader to decode new terminologies, integrate clauses to make meaning and draw inferences.

Sentences in the language are stored in the combined form. Stories are converted into structural components of the text, narratives are remembered in terms of gist and special details are forgotten.

Cognitive development is a process in which a persons organizes complex mental representations of operations he performs, adopts his cognitive structure through accommodation and assimilation. Such cognitive development is the result of both biological and learning process. Thought process develops with age, the language which aids thought develops through learning. Cognitive development is also associated with the improvement in "attention" and "memory" process and ability to respond. Transfer of information from sensory register to STM through systematic organized rehearsals chunking of information improves with age.

Higher order cognitive i.e. thinking depends upon how well information is organised in LTM and cued for retrieval. With age and practice, one shifts more and more from imagery to semantic representation.

Thinking of structural level results in new mental representations, as the proces transforms information directed at problem solving. The first step in the thinking process is concept formation

through rule learning, associations and hypothesis testing. The next step is to think deductively or inductively to develop new reference frames for decision making. The third step is decision making for solving problem. Ability to think depends upon the development of representational memory as against sensory memory.

Creativity is a cognitive activity in which people can be trained if they know the basic processes involved viz. preparation, incubation, illumination and verification.

COMMENTS :

Attempt has been made in the foregoing paragraphs to give a broad overview of the discipline of "Cognitive Psychology". The idea is to convey the message to all those managing educational system i.e. teachers, heads of the dept., principals, officers of the directorate or technical education that it is possible to improve students learning if they are equipped with the basic knowledge of "Psychology" in general and "Educational Psychology" in particular. In addition to the current positions created in the educational institutions, new posts like educational technologists, curriculum specialist, institutional planners, macro-level educational planners and managers are being created in the context of various educational development projects. These are specialists who are supposed to be proficient in educational subjects. In my view, the cognitive psychology is the first building block of these subjects.

Designing scientifically new curriculums, improving old and developing new teaching methods, inventing new evolution methods and above all training students to learn new subjects effectively and efficiently and in "learning to learn" skills will have basis in

the concepts and principles developed by cognitive psychology.

For example, a teacher presents his lectures in such a way that facilitates students sensory detection and storing it in usual, echoic and episodic form. He can resort to chunking in facilitating students handling his STM, create rehearsal opportunities to facilitate transfer of information to LTM, facilitate student to prepare semantic organization by giving him chance to consciously associate concepts, to create networks; use monemics to facilitate retrieval of information from LTM.

Understanding process of thinking will help teacher to ask questions to help students to form new concepts, learn skill of deductive and inductive thinking, accomodating and assimilating new information in the existing cognitive structure.

Understanding the role the language plays in thinking, teacher can help

students to read and listen systematically quickly comprehend written or spoken material and store it properly and retrieves it when needed for decision-making and problem-solving.

In changing environment, "creativity" is gaining attention of both the employees and educationist. It is now accepted that given a reasonable background, any student can be trained in creativity.

It is hard to find a good text books which deals with cognitive psychology comprehensively. This book fills up the gap. It is all the more useful, because of the end of each chapter, there is a summary, a lot of key words, recommended readings with lot of connotations in addition to detailed list of references.

It also contains glossary of terms which build up the discipline of cognitive psychology.