

premised on the belief that memory is a multi-faceted, if not multi-staged, system of connections and representations that encompass a lifetime's accumulation of perceptions.

Eliasmith (2001) defines memory as the “general ability, or faculty that enables us to interpret the perceptual world to help organise responses to changes that take place in the world”. It is implied by this definition that there must be a tangible structure in which to incorporate new stimuli into memory. The form of this structure has been the source of much debate, and there seems to be no absolute agreement on what shape a memory structure actually takes, but there are many theories on what constitutes both the memory structure and the knowledge unit.

Winn and Snyder (2001) attribute the idea that memory is organised into structures to the work of Sir Frederick Charles Bartlett. Bartlett's work established two consistent patterns regarding recall. First, memory is inaccurate. His second finding, though, brought about somewhat of a revolution in traditional thinking about memory. Bartlett suggested that the inaccuracy of memory is systematic. A systematic difference makes allowable the scientific study of inaccuracy, and this suggestion led to an entirely new mode of thought on memory. What accounted for systematic inaccuracies in memory were the intervening influences of previous information and the experiences of the person. This demonstrates that knowledge units are not simply stored and then left alone, but that they are retained, manipulated, and changed as new knowledge is acquired.

#### **2.4.1 Cognitive Information Processing Model (CIP) of Learning**

Information theorists approach learning primarily through a study of memory. The following Cognitive Information Processing model (CIP) of learning presents a well-established paradigm of cognitive-behavioural psychology. The model articulates the limited capacity of “working memory.” Working memory is tasked with the burden of processing incoming information, transferring information to long-term memory and retrieval of information from long-term memory. The concept of “cognitive load” — the amount of work imposed on working memory by a learning task — is based on observations of the functions of working memory.

Information processing in memory can be viewed from a computer model perspective. Like the computer, the human mind takes in information, performs operations on it to change its form and content, stores the information, retrieves it when needed, and generates responses to it. Processing involves *encoding* (gathering and representing information); *storage* (holding information); and *retrieval* (getting the information when needed). The entire system is guided by a *control process* that determines how and when information will flow through the system. Some theorists suggest that the operation of the brain resembles a large number of computers all operating at the same time (in parallel).

#### **2.4.2 Development of Memory and Information Processing**

As previously stated, cognition is the encoding, structuring, storing, retrieving, using, or otherwise learning knowledge (Neisser, 1967). There are important developmental aspects for each of these activities. According to Flavell et al. (2002), from an information processing perspective some of the most important are: