

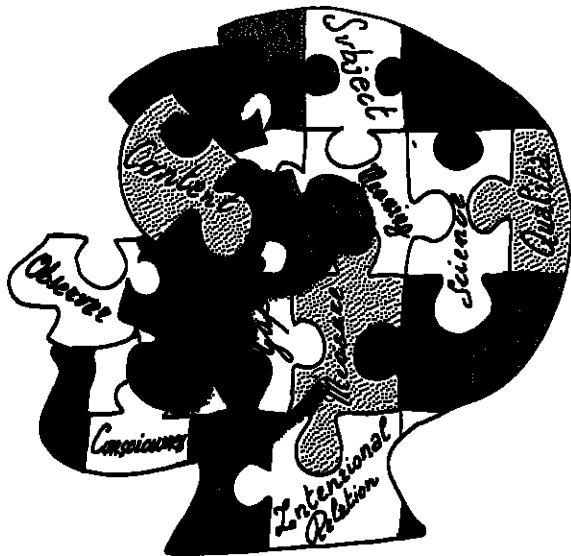
Using Technology to Influence Higher Levels of Learning

By

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Information Processing

To begin we will explore some basic concepts of the human memory system and how it can be applied to new innovations in technology. When we compare memorizing a list of words with recalling facts about an actual experience we notice a fundamental difference between the two tasks. The second task, recalling an experience is easier. Details of an experience allows for a



stronger recall of information like, people, places and sensations are embedded in our memory. Even though the recollections may fade in our memory system over time we naturally retain vast amounts of ordinary information that we can retrieve at anytime. Education that focuses on memorization disregards the natural memory system that are retrieved and stored from experiences. The key to education is to find ways to have both ordinary information and natural memory work together.

From cognitive psychology and the “Information Processing Model” memory is divided into three separate stores that include sensory, short-term, and the long-term memory. To better understand the Information Processing Model we first have to review each stage of the memory system for clarification of how it affects student learning. Sensory memory refers to the preliminary, short-lived recording of information in our sensory systems. The two types of sensory memory are iconic, and acoustic. When a sensation enters the visual sensory system, they linger briefly in *iconic memory* Iconic memory refers to the brief visualization of information as it is being interpreted by the cortical visual area of the brain. Auditory or Iconic is

also inclusive to sensory memory and is a mental echo that is briefly preserved after information has been heard. The sensory memory involves in the learning process what is both seen and heard through both visual and auditory senses.

Sensory memory refers to items detected by the sensory receptors which are retained temporarily in the sensory registers and which have a large capacity for unprocessed information but are only able to hold accurate images of sensory information momentarily. The sensory memory has unlimited capacity and lasts for a few seconds. Even though sensory memory may only last 300 milliseconds it becomes important in the retention of short-term memory as it relates to actual experiences.

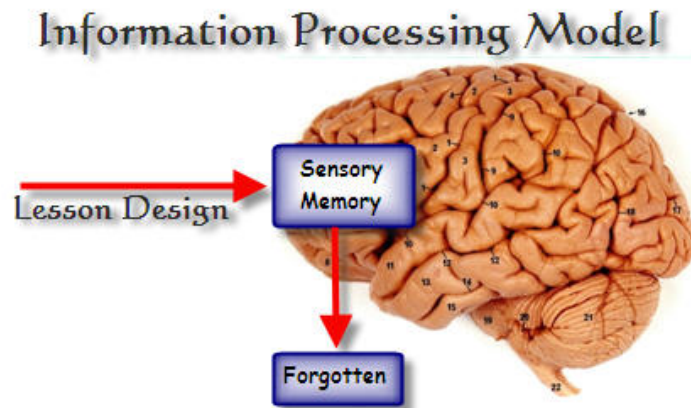
To influence sensory memory as it is transferred into short-term memory lesson designers need to recognize and develop ways to stimulate the two fundamental operations of sensory memory. For this to occur an experimental approach to multi-media integration of lesson design will be explored in the latter parts of the chapter. The idea behind the multi-media approach is that if short stimulations of visual and auditory introductions occur at the onset of a lesson then working memory will be enhanced when transferring information to the short-term system. In the traditional model of sensory memory as seen in Figure 1 sensory memory is easily forgotten before it is transferred to short-term memory.

Short-Term Memory or Working Memory

After entering sensory memory, a limited amount of information is transferred into short-term memory through two basic operations of iconic, acoustic processing formulating the working memory system. Working memory refers to the structures and processes used for temporarily storing and manipulating information. The specific parts of the brain that is responsible for working memory is divided into four separate regions. The frontal cortex, parietal cortex, anterior cingulate, and parts of the basal ganglia are crucial functioning's of the brain as it relates to working memory. Short-term memory is the ability to remember information over a brief period of time (in the order of seconds). Working memory overtime has replaced the older concept of short-term memory, by making a stronger emphasis on the notion of manipulation of information instead of passive maintenance. There are several theories on why information is lost

as it is transferred from sensory memory to working memory. Each of these hypotheses on the limitation of cognitive resources as information is transferred to working memory plays an important role in lesson design.

Figure 1



For example, if it is widely accepted by cognitive scientist that memory decays within a few seconds, unless refreshed through rehearsal, and because the speed of rehearsal is limited, then limited amounts of information can be retained it becomes imperative that rehearsal is one key to retention. Secondly, if

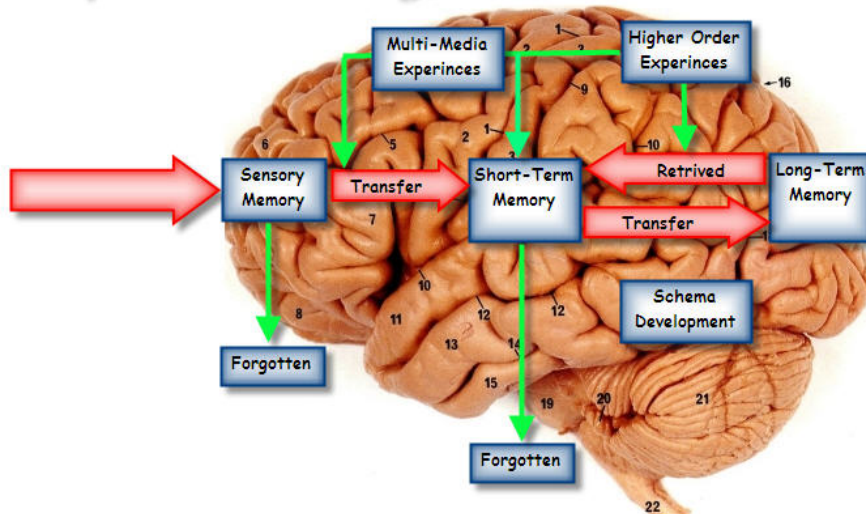
representations held in working memory capacity interfere with each other by replacing older representations then sensory receptiveness becomes the key to retention. Knowing and understanding how short-term memory retains limited information through the two basic operations of sensory memory becomes important when designing a lesson as I will discuss later. Designing lessons that expose the learner to using their two basic operations of short term memory of iconic (the ability to hold visual images) acoustic (ability to hold sounds) and short-term working memory establishes truer processes to long term retention of information.

It should also be noted here that retention of information through short-term memory is not a function of time, that is, the longer information stays in the learners' short-term memory; the more likely it will be placed into long-term memory. Short-term memory is essentially affected by the organization of complex information through the operations of sensory memory and working memory before it can be encoded into long-term retention of information. Working memory is the active process of using the information from the lesson as it is moved from short-term memory to long-term retention. As discussed next, working memory is the active process of using the information from the lesson as it is moved from short-term working memory to long-term retention.

Long-Term Memory

The information that is stored in long-term memory affects the perceptions of the environment, and influences what information in the learning process that the learner relies on. Long-term

Information Processing Model



memory provides the learner with the framework to which new knowledge is attached. On the other hand long-term memory is contrasted with short-term perceptual memory which can be stored for extended periods of time. The objective

then is to design lessons that are multi-media integrated allowing the learner to experience numerous impacts on sensory memory. These multiple sensory impacts will theoretically provide larger amounts of images and sound transfers to occur as they are retained in for longer periods of time in short-term memory. The key is not only impacting short-term memory but also in the design of having the learner to construct schemas through higher order complex task. The pivotal point in lesson design is in the understanding schema development. To design lessons that affect deeper roots of retention there is a need in the understanding of the Information Processing Model and how learning occurs when information is transferred from sensory memory to short-term memory into long-term memory. This understanding of the process of learning helps lesson designers' impact higher retention rates among learners. Long-term memory or retention of information can be affected through lesson design that require higher order processes like analyzing or synthesizing of both sensory and short-term memory operations.

Schemas

Schemas are mental models of existing knowledge that become meaningful to the learner. A preliminary definition to meaningful learning refers to the storage of schemas that has multiple connections that can be accessed appropriately in everyday context. Information in long-term memory is stored in interrelated networks of these schemas and become retrievable and enhanced over time when subject to higher order thinking activities. Schemas, in turn, form intricate knowledge structures and related schemas are linked together forming bodies of knowledge. These interrelated bodies of knowledge are how an individual can relate new and similar information that strengthens existing schemas. These schemas guide us by redirecting an individual learner's attention to relevant information and allow the learner to ignore information that is not important. Since long-term memory is prearranged into schemas, lesson developers' should call upon pre-existing schemas before presenting new concepts.