Background

- This learning theory originated in the Mid 20th century
- Developed as a reaction to behaviorism
- George Miller is the originator
- Atkinson and Shiffrin (1968) have furthered this theory to include “stages”

- There are 2 theoretical ideas that are fundamental to information processing framework

  1) **Chunking** – short-term memory can only hold 5-9 chunks (digits, words, people’s faces) of meaningful information
  2) **Computer** – used as a model for human learning
      * mind takes in information
      * mind performs operations on it to change its form and content
      * mind then stores and locates it and generates responses on it

Definition

- Learning is a change in knowledge stored in memory
- The focus of this learning theory is memory (the storage and retrieval of information)

Principles

1) **Assumption of a limited capacity of the mental system**
   - bottlenecks, or restrictions in the flow and processing of information occur at very specific points
2) A control mechanism is required to oversee the encoding, transformation, processing, Storage, retrieval and utilization of information
3) There is a two-way flow of information as we try to make sense of the world around us
   - we constantly use information that we gather through the senses and information we have stored in memory in a dynamic process as we construct meaning about our environment and our relations to it
4) The human organism has been genetically prepared to process and organize Information in specific ways
“stage theory” is based on the work of Atkinson and Shiffrin (1968)

Information is processed and stored in 3 stages

1) Sensory memory (STSS)
   * one or more of the body’s receptors (e.g. sight, smell, touch, sound and taste)
     Senses the information
   * immediately after sensing information, act of selective perception takes place
   * in the process of transduction a memory is created
   * memory is very short (less than ½ second for vision; 3 seconds for hearing)

2) Short-term memory (STM)
   * STM is also called working memory
   * it relates to what we are thinking about at any given moment in time
   * created by paying attention to an external stimulus, an internal thought, or both
   * STM will initially last around 15-20 seconds unless it is repeated
     (maintenance rehearsal) at which point it may be available for up to 20 minutes
   * Major limit on information processing in STM is in terms of numbers of units
     that can be processed at any one time
     -Miller (1965) gave numbers $7 \pm 2 \rightarrow chunking$

Two major concepts for retaining information in STM

1) Organization
   *organization used in instructional design:
     -component (part/whole) – classification by category or component
     -sequential – chronological; cause/effect; building to climax
     -relevance – central unifying idea or criteria
- transitional (connective) – relational words or phrases used to indicate qualitative change over time

*chunking (grouping pieces of data into units) is a major technique for getting and keeping information in the STM

2) Repetition (rote rehearsal)
* to be effective, it must be done after forgetting begins
* simply memorizing something does not lead to learning

3) Long-term memory (LTM)
* encoding takes place upon rehearsal of information to be stored and information is permanently stored in LTM

- **Two processes most likely move information into LTM**

  1) **Elaboration**
  * examples
    - imaging – creating a mental picture
    - method of loci (locations) – ideas or things to be Remembered are connected to objects located in familiar location
    - pegword method (number, rhyming schemes)
    - rhyming (songs, phrases)
    - initial letter – first letter of words used to create sentence

  2) **Distributed practice**

- As information is stored in LTM, it is organized using one or more structures: declarative, procedural, and/or imagery

  1) **Declarative Memory** (generally refers to information we can talk about)
  * semantic memory – facts and generalized information (concepts, principles, rules: problem-solving strategies; learning strategies)

  - Schema/schemata – networks of connected ideas
  - Proposition – if/then statements
  - Script
  - Frame – “Frame of Reference”
  - Scheme – organization of concepts, principles, rules that define a perspective and presents specific action patterns to follow
  - Program – set of rules that define what to do in situations
  - Paradigm
  - Model

  * episodic memory – personal experience (information in stories And analogies)

  2) **Procedural Memory** – how to (driving a car, riding a bike)

  3) **Imagery** – pictures

  4) **Search and Retrieval**

  * if learning occurred, information is retrievable from LTM
  * forgetting information, or the inability to locate and retrieve information, may be attributable to the way it was initially sequenced and encoded
  * learned information may interfere with recall of older data and is referred to as retroactive interference
Information Processing in the Classroom

Using the Information Processing Approach in the Classroom Table

Some implications

- **Provide organized instruction.** Make the structure and relations of the material evident to learners, such as through concept maps or other graphic representations.
- **Link new material with what is currently known.**
- **Recognize the limits of attention (sensory register).** Help learners focus their attention through techniques such as identifying the most important points to be learned in advance of studying new material.
- **Recognize the limitations of short-term memory.** Use the concept of chunking. Use elaboration and multiple contexts.
- **Match encoding strategies with the material to be learned.** For example, don’t encourage the use of mnemonic techniques unless it’s really essential to memorize the material. If you want it to be processed more “deeply,” then find encoding strategies that are more inherently meaningful.
- **Provide opportunities for both verbal and image encoding.**
- **Arrange for a variety of practice opportunities.** The goal is to help the learner generalize the concept, principle, or skill to be learned so that it can be applied outside of the original context in which it was taught.
- **Help learners become “self-regulated.”** Assist them in selecting and using appropriate learning strategies such as summarizing and questioning.

References

- [http://education.indiana.edu/~p540/webcourse/cip.html](http://education.indiana.edu/~p540/webcourse/cip.html)
- [http://chiron.valdosta.edu/whuitt/col/cogsys/infoproc.html](http://chiron.valdosta.edu/whuitt/col/cogsys/infoproc.html)