

CHAPTER

5 - Cognitive Learning Theories

LEARNING OUTCOMES

After studying this chapter, you should be able to:

1. Explain what is cognitive revolution and the cognitive perspective on learning and how it differs from other theoretical perspective;
2. Discuss the origins of the contemporary cognitive perspective including the Gestalt psychology and the role of perception;
3. Describe the Information processing model to learning and distinguish the features of 'Multistore model';
4. Explain what is schema theory;
5. Link schema theory to cognitive structuralism and examine the role of insightful learning and meaningful learning; and
6. Discuss application of cognitive theories in the classroom.

INTRODUCTION

Sometimes you wonder why the teacher use colourful chalk with some of the words written on the board. Sometimes the teacher write in capital letter with important words.



These are useful as guides for the students to differentiate the important and unimportant facts. In other words, accurate perception is important in good learning. It is part of the Gestalt principles. Clearly, these principles are useful as guide for teachers as they organize their materials and learning activities. So in this chapter, we will discuss the origin and features of cognitive theory and relate them to cognitive constructivism and meaningful learning. Figure 5.1 give you some ideas related to cognitive learning theory covered in this topic.

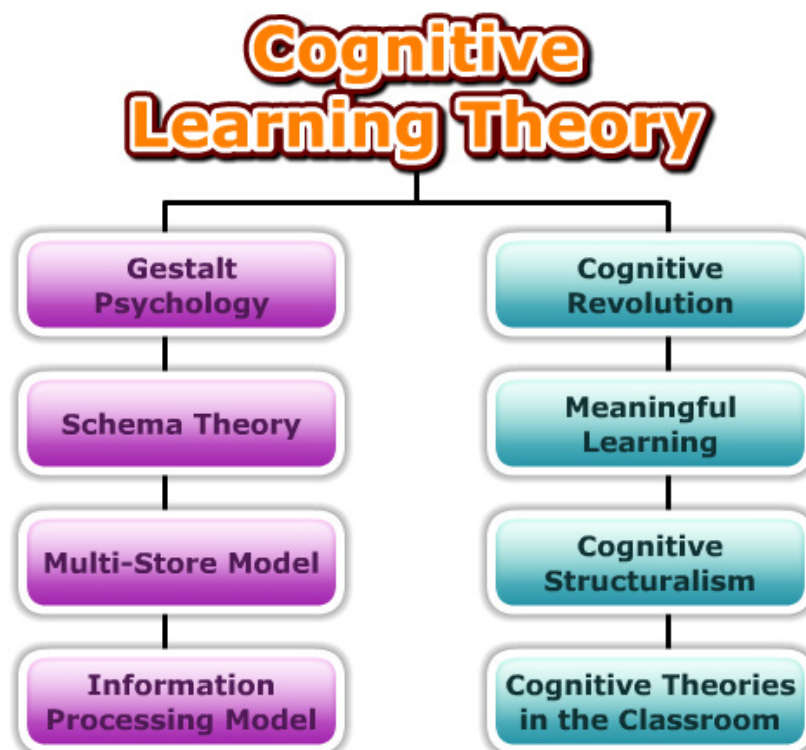


Figure 5.1: Cognitive learning theory covered in this topic.

5.1 COGNITIVE REVOLUTION

The “**Cognitive revolution**” is the name for an intellectual movement in the 1950s that began with what are known collectively as the cognitive sciences. It began in the modern context of greater interdisciplinary communication and research.

The relevant areas of interchange were the combination of psychology, anthropology and linguistics with approaches developed within the then-nascent fields of artificial intelligence, computer science and neuroscience. Two of the prominent figures in cognitive psychology are Jean Piaget (1896 – 1980) and Lev Vygotsky (1896 – 1934).

Figure 5.2 shows the relevant areas of interchange that know as cognitive revolution.

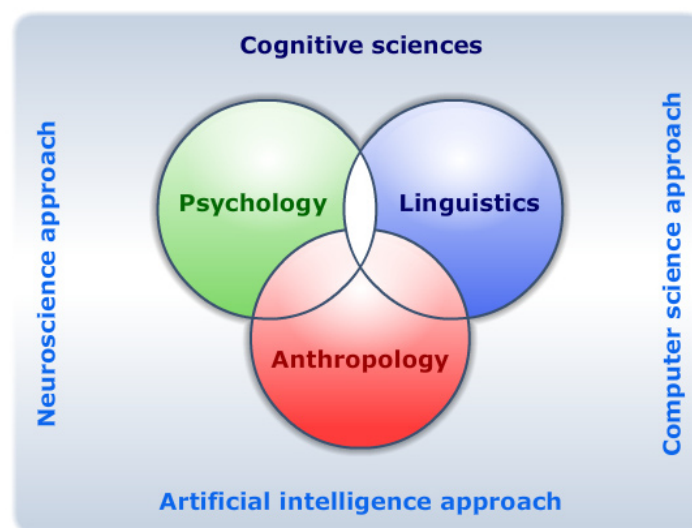
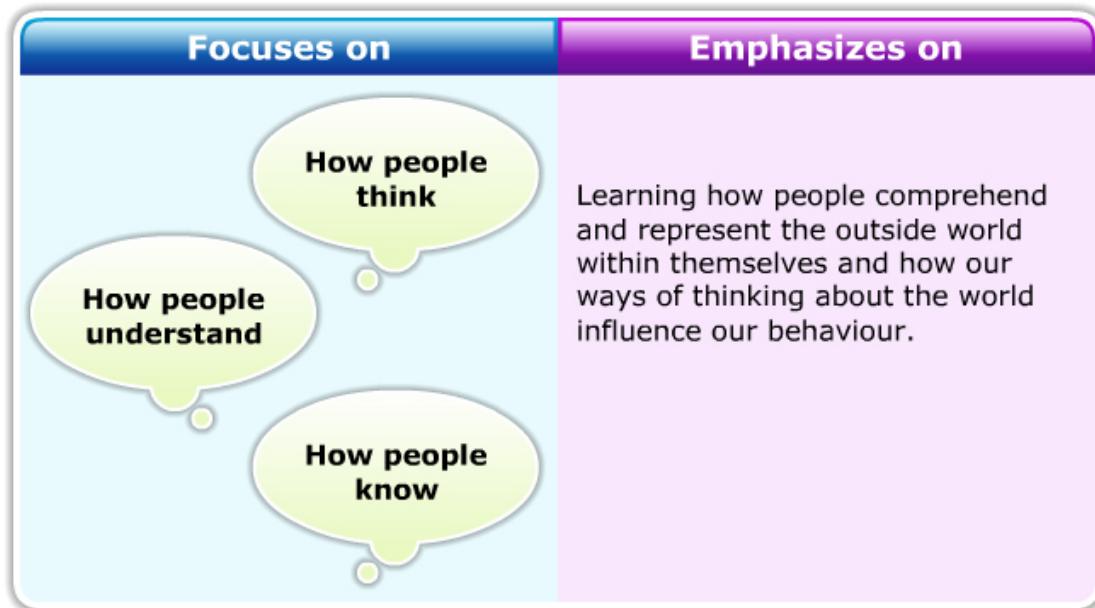


Figure 5.2: The combinations of cognitive revolution

The cognitive revolution in psychology was a response to **behaviourism**, which was the predominant school in experimental psychology at the time. This school was heavily influenced by Ivan Pavlov, B.F. Skinner, and other physiologists. They proposed that psychology could only become an objective science if it is based on observable behaviour in test subjects. Since mental events are not publicly observable, behaviourist psychologists avoided description of **mental processes** or the **mind** in their literature.

Psychoanalytic theories on the other hand stress the importance of the unconscious while cognitive theories emphasize on conscious thoughts. 3 important cognitive theories are Piaget’s cognitive developmental theory, Vygotsky’s sociocultural cognitive theory and information processing theories, which we have discussed in previous chapter.

Cognitive Psychology focuses on the study of how people think, understand, and know. They emphasizes on learning how people comprehend and represent the outside world within themselves and how our ways of thinking about the world influence our behaviour.



From a **cognitive learning perspective**, learning involves the transformation of information in the environment into knowledge that is stored in the mind. Learning occurs when new knowledge is acquired or existing knowledge is modified by experience. Among the main issues studied and discussed by cognitive psychologists are:

- The cognitive theories present a positive view of development, emphasizing conscious thinking.
- The cognitive theories (especially Piaget's and Vygotsky's) emphasize on the individual's active construction of understanding.
- Piaget's and Vygotsky's theories underscore the importance of examining developmental changes in children's thinking.
- The information processing theory offers detail descriptions of cognitive processes.

SELF-CHECK


What are the differences between Behavioural and Cognitive perspective pertaining to human learning.

WEB-SITE


<http://dakota.fmpdata.net/PsychAI/PrintFiles/Cognitive.pdf>

5.2 GESTALT PSYCHOLOGY

Gestalt is a perspective focuses on the belief that human consciousness cannot be broken down into its elements. This approach to psychology was founded on the concept of the *gestalt*, or **whole**. Gestalt psychologists led by Max Wertheimer (1880 - 1943), Wolfgang Kohler (1887 – 1967) and Kurt Koffka (1886 – 1941) have made substantial contributions to our understanding of perception. Gestaltists pointed out that perception has meaning only when it is seen as a whole.

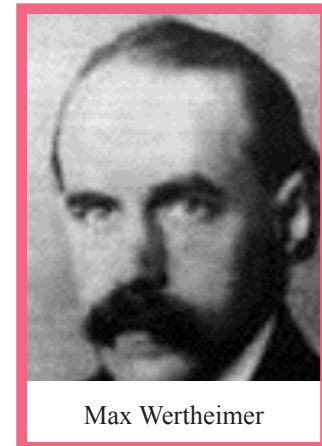


Figure 5.3 illustrated the gestalt perception which saw that the whole is different from the sum of the parts.

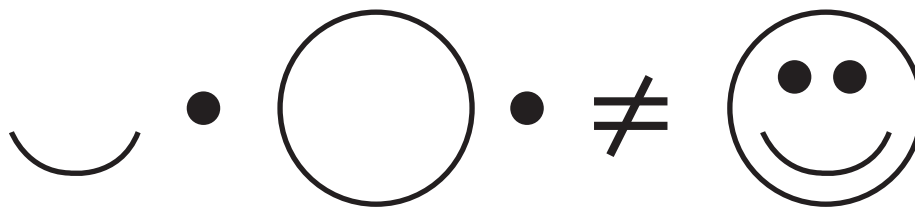


Figure 5.3: Gestalt saw that the whole is different from the sum of the parts

Gestalt psychology(also Gestalt of the Berlin School) is a theory of mind and brain that proposes that the operational principle of the brain is holistic, parallel, and analog, with self-organizing tendencies, or that the whole is different from the sum of its parts. The Gestalt effect refers to the form-forming capability of our senses, particularly with respect to the visual recognition of figures and whole forms instead of just a collection of simple lines and curves. Figure 5.4 shows an example of picture that contains the gestalt theory.

The word Gestalt in German literally means “shape” or “figure”. Gestaltists performed many researches on perception and human learning. They believed learning is the result from good perception, which enable an individual to form correct concept in their mind. Later on they proposed the principles or law for perceptual organization. Henceforth, we will discuss these principles, which consisted of six principles, which are good form, figure or ground, similarity, proximity, closure, and continuity.



Figure 5.4: What did you see in this picture? A saxophone player or a lady?

i) The Law of Good form or Pragnanz

The word ‘Gestalt’ means ‘**form**’ or ‘**shape**’. Gestalt psychologists were of the view that psychological organization will always be as ‘good’ as prevailing conditions allow. For Gestalt psychologists, form is the primitive unit of perception. When we perceive, we will always pick out form. Our perceptions are influenced by our past experiences. This principle is also called **Pragnanz Law**. (Tan Oon Seng et al., 2003).

ii) The Law of Figure – Ground Discrimination

The Rubin vase shown in Figure 5.5 is an example of this tendency to pick out form. We do not simply see black and white shapes, we also see two faces and a vase. What about Figure 5.6? Do you see a young lady or an old lady?

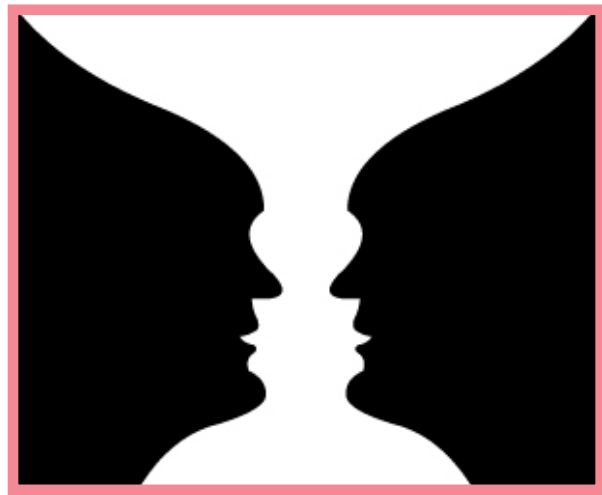


Figure 5.5: Two faces or a vase? (From Spooner, 1992 p.35)



Figure 5.6: Young Lady or Old Lady? (From Spooner, 1992 p.35)

The problem here is that we see the two forms of equal importance. If the source of this message wants us to perceive a vase, then the vase is the intended **figure** and the black background is the **ground**. The problem here is a confusion of **figure** and **ground**.

iii) The Law of Proximity

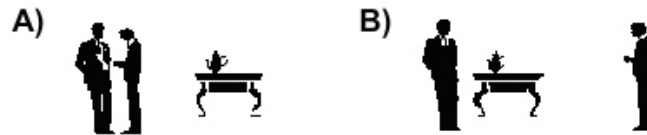


Figure 5.7: Two men and the table.

When you look at a you see (a man + a man) + a table.

When you look at b you see (a man + a table) + a man.

Things, which are close together in space or time, tend to be perceived as grouped together. Thus, if you want your audience to associate the product with the presenter, put them close together; if you want them to perceive two ideas as associated, present them in close proximity.

iv) The Law of Similarity

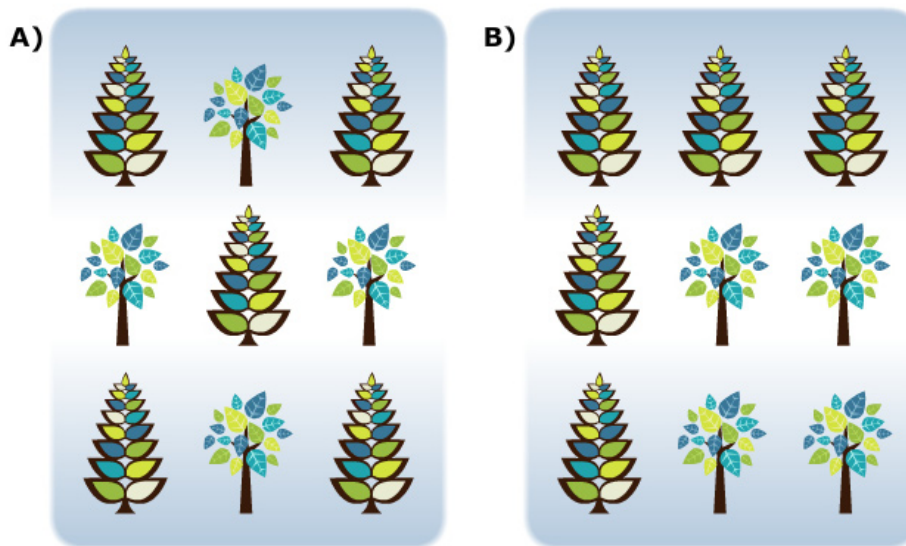


Figure 5.8: Trees in different shapes

Things that are similar are likely to form ‘Gestalten’ as groups. So, in the graphic labelled with A (on the left), you probably see an X of fir trees against a background of the others. In the graphic labelled with B (on the right), you may see a square of the other trees, partly surrounded by fir trees. The fact that, in picture labelled with A, we see an X while in the picture labelled with B, we can see a square, incidentally, an example of good form or Prägnanz.

iv) The Law of Closure

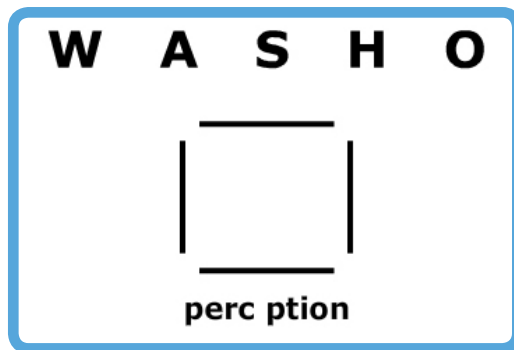


Figure 5.9: Words and shape

Perceptually, we have the tendency to fill in the gaps. In other words, we can still read WASHO, see the square and read 'perception' despite the missing information. You probably know that redundancy can be deliberately added into messages to increase the likely fidelity of reception, but the Gestalt psychologists' law of closure suggests that it certainly is not always necessary.

vi) The Law of Continuity

When you see figure 5.10(1), you are much more likely to see it as consisting of two lines like 5.10(1a), rather than of the two shapes 5.10(1b). This is the Gestalt principle of continuity which saw a single unbroken line is likely to be seen as an entity.

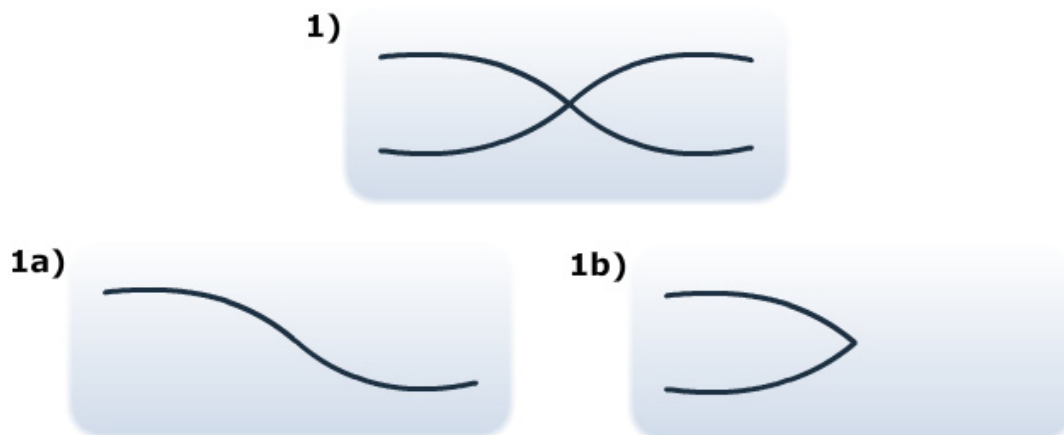
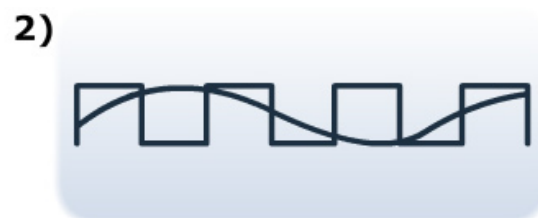


Figure 5.10: Lines and figures

When you see figure 5.11(2), you are much more likely to see it as consisting of two lines like 5.11(2a and 2b), rather than as the series of shapes 5.11(2c).



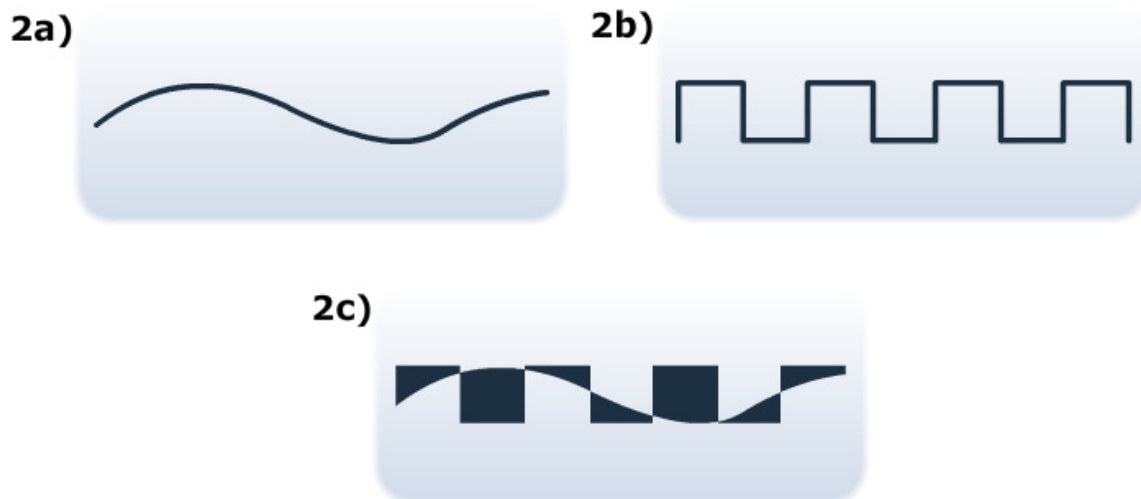


Figure 5.11: Lines and Figures

Perceptually, where figures are defined by a single unbroken line, they tend to be seen as an entity. This principle is of course of particular importance in teaching. Even something as simple as drawing a squiggle to link up apparently disparate elements on a page can be helpful in suggesting to the reader that they are parts of a whole.



According to Gestalt psychology perceptual organization influence good learning. Explain the six perceptual law regarding human perception by Gestaltists.

5.3 INFORMATION PROCESSING MODEL (IPM)

The Information Processing Theory approach to the study of cognitive development evolved out of the American experimental tradition in psychology. Information processing theorists proposed that like a computer, a human mind is a system that processes information through the application of logical rules and strategies. The mind has a limited capacity for the amount and nature of the information it can process.

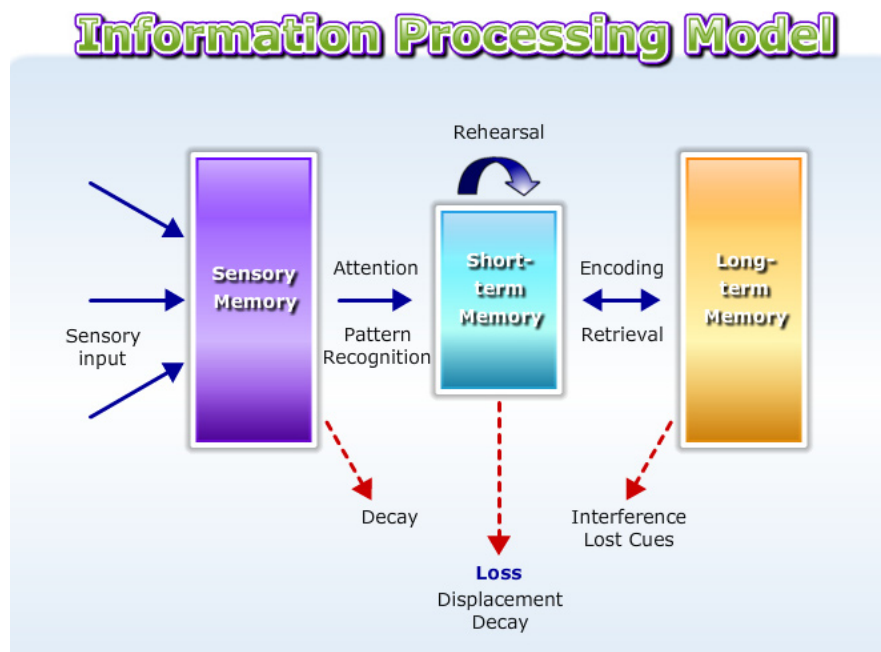


Figure 5.12: Information processing model

The terminology of the Information Processing Model as illustrated in Figure 5.12 emphasizing the significance of “encoding” (input) of information, the “storage” of information, and the “retrieval” (access) of information. The language and the metaphor often used is one of the minds of as computer. IPM theorist, U. Neisser, maintains that the correlation between cognition and computers is a powerful one (Benjafeld, 1992 in Tan, 2003). Most IPM theorists see the computer as only a metaphor for human mental activity.

Finally, just as the computer can be made into a better information processor by changing its hardware and its software (programming), so do children who become more sophisticated thinkers through changes in their brains and sensory systems (hardware) and in the rules and strategies (software) that they learn.



Describe the features of three stages of memory storage in Information Processing model.

5.4 MULTI-STORE MODEL OF MEMORY

One of the major issues in cognitive psychology is the study of memory. The dominant view is labelled the “stage theory” and is based on the work of Atkinson and Shiffrin (1968). The Atkinson-Shiffrin model(also known as the Multi-store model, **Multi**-memory model and the Modal model) is a psychological model proposed in 1968 by Richard Atkinson and Richard Shiffrin as a proposal for the structure of memory. It proposed that human memory involves a sequence of three stages, which are sensory memory, short-term memory and long-term memory as shown in Figure 5.13.

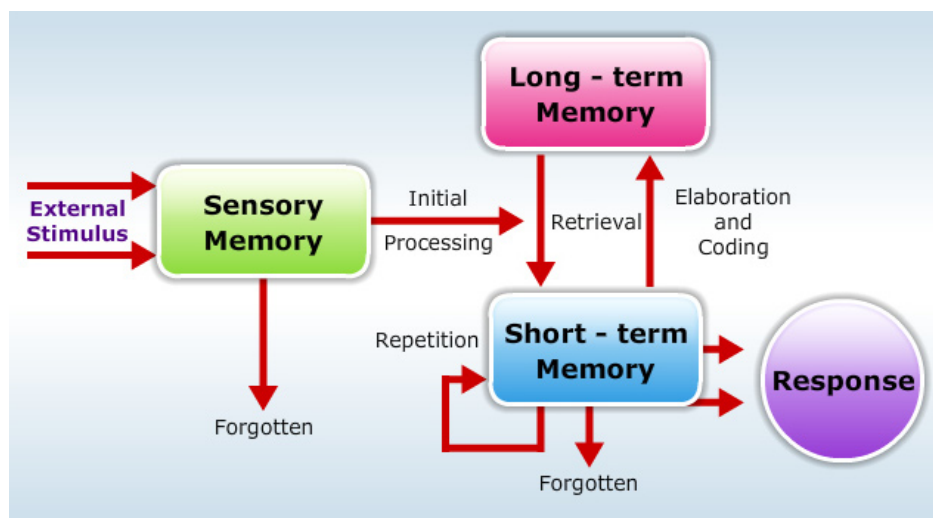


Figure 5.13. : Multi-store model of memory(also known as the, Multi-memory model and the Modal model)

The multi-store model is a very common model of memory assuming that there are different types of memory used for different tasks. It is an explanation of how memory processes work. You hear, see and feel many things, but you can only remember a few. These link together in an effective sequence as explained below.



a) Sensory Memory

The first stage is sensory memory, which contains **receptors** that briefly hold on to only that information that enters through our senses. Sensory memory is affiliated with the transduction of energy(change from one form of energy to another). The environment makes a variety of sources of information(light, sound, smell, heat, cold, etc.) available, but the brain only understands electrical energy. The body has special sensory receptor cells that transducer(change from one form of energy to another) this external energy to something the brain can understand. In the process of transduction, a memory is created. This memory is very short (less than 1/2 second for vision; about 3 seconds for hearing).



Figure 5.14: Sense organ

The sense organs have a limited ability to store information about the world in a fairly unprocessed way for less than a second.

Example:

- The visual system possesses iconic memory for visual stimuli such as shape, size, colour and location (but not meaning)
- The hearing system has echoic memory for auditory stimuli.

Coltheart et al (1974) have argued that the momentary freezing of visual input allows us to select which aspect of the input should go on for further memory processing. The existence of sensory memory has been experimentally demonstrated by Sperling(1960) using a tachistoscope.

b) Short-term memory

The second stage is short-term memory, a temporary storage facility. Short-term memory is also called working memory and relates to what we are thinking about at any given moment in time.

According to Freudian:

"Short term memory is conscious memory. It is created by our paying attention to an external stimulus, an internal thought, or both. It will initially last somewhere around 15 to 20 seconds unless it is repeated (called **maintenance rehearsal**) at which point it may be available for up to 20 minutes".

Freudian

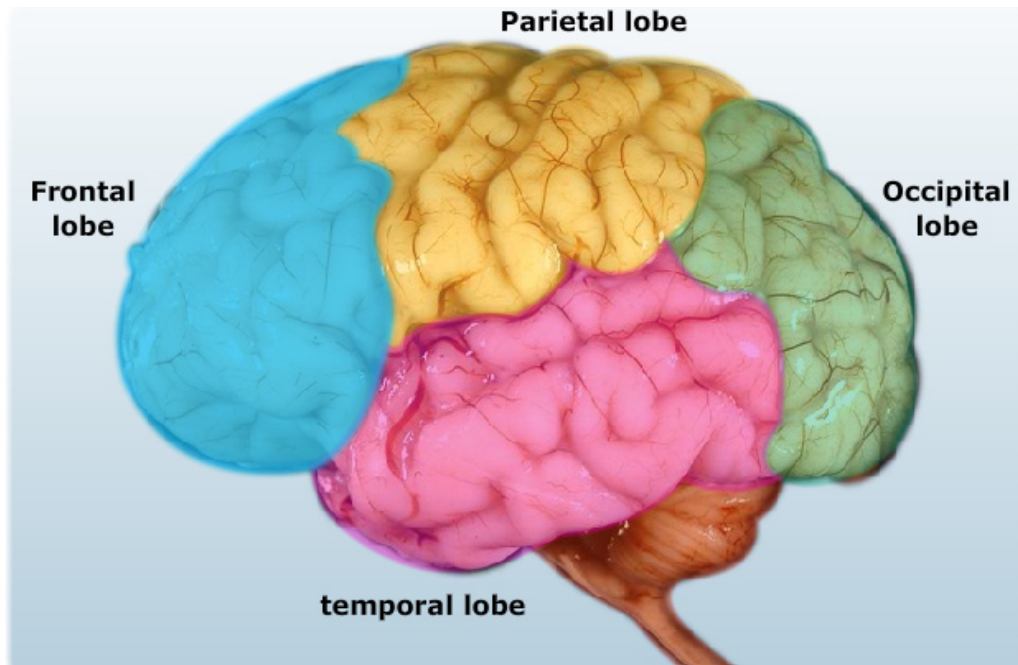


Figure 5.15: The frontal lobe, the structure associated with working memory.

The hypothalamus is a brain structure thought to be involved in this shallow processing of information. While the frontal lobe of the cerebral cortex as labelled in Figure 5.15 is the structure associated with working memory.

For Example

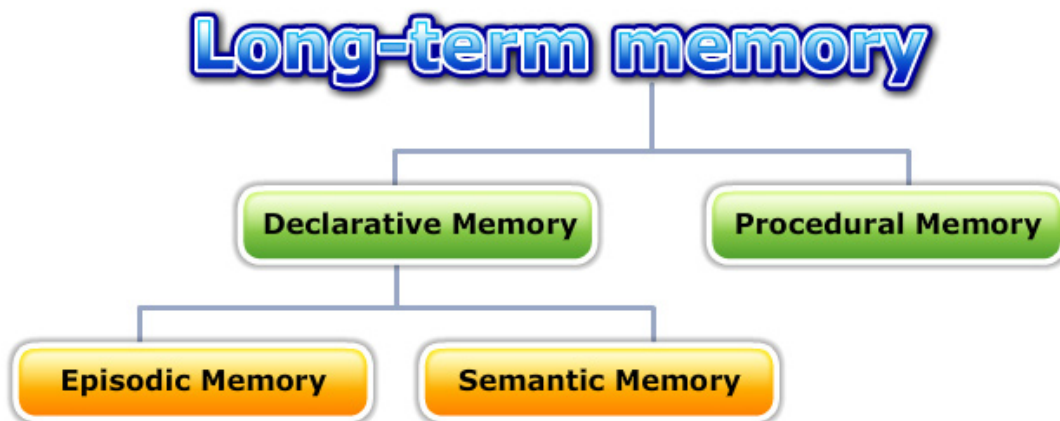
You are processing the words you read on the screen in your frontal lobes. However, if I ask, "What is your telephone number?" Your brain immediately calls that from long-term memory and replaces what was previously there.

Another process that is sometimes used to expand the capacity of short-term memory is called chunking. **Chunking** is a process by which we group individual bits of information into some types of large, more meaningful unit.

c) **Long-term memory**

The third stage is long-term memory(LTM). LTM provides the lasting retention of information, from minutes to a lifetime. Long-term memory appears to have an almost limitless capacity to retain information, but it could never be measured, as it would take too long.

Contemporary psychologists agree that long-term memory can be divided into subtypes of declarative and procedural memory(Santrock, 2008). Declarative memory is subdivided into episodic memory and semantic memory.



Procedural memory

- Procedural memory is nondeclarative knowledge in the form of skills and cognitive operations.
- Procedural memory cannot be consciously recollected, at least not in the form of specific events or facts.
- Procedural memory is sometimes called “**knowing how**,” and recently it also has been described as “**implicit memory**.”
- When students apply their abilities to perform a dance, their procedural memory is at work.

Declarative memory

- Declarative memory is the conscious recollection of information, such as specific facts or events that can be verbally communicated.
- Declarative memory has been called “**knowing that**” and more recently has been labelled “**explicit memory**.”
- Demonstrations of student’s declarative memory such as describing a basic principle of math.

Episodic

- **Episodic** memories are the memories we have for times and places (like first day Aidilfitri celebration).
- Information encoded in our episodic memory is in the form of images.

Semantic memories

- **Semantic memories** are our memories for general facts and concepts. Most of what we learned in school (instructional content) is stored in our semantic memories.

Long-term memory is also called preconscious and unconscious memory in Freudian terms.

- **Preconscious** means that the information is relatively easily recalled (although it may take several minutes or even hours) while
- **Unconscious** refers to data that is not available during normal consciousness.

It is the preconscious memory that is the focus of cognitive psychology as it relates to the long-term memory. The levels of processing theory, however, has provided some researches that attest to the fact that we “**know**” more than we can easily recall.



According to Brynes,

There are two process in appear in facilitating our efforts, they are rehearsal (practice) and elaboration.

(Byrnes, 1996).

Elaboration of information processing strategy emphasizes links between the information stored in the long-term memory and the new information. When we talk about information processing model, we cannot avoid discussing memory and forgetting, how to enhance student’s long-term memory and what factors contribute to forgetting. We will discuss it later in the next chapter.

5.4.1 Steps To Enhance Long-Term Memory

According to Santrock,

"Long term memory meaning information is retained in the long term memory over time".

(Santrock, 2007)

In order to retain information it has to go through stages mentioned earlier, encoding, storage, and retrieval. Teacher can help students store the information in the long-term memory using methods such as positive transfer, dual coding theory, rehearsal, instructional strategies, mnemonics, and memory gadgets or devices. Descriptions of these methods are explained in Figure 5.16.

<p>Positive transfer</p>	<ul style="list-style-type: none"> • Teacher may transfer learning using appropriate strategies or activities. • Schema theory suggest teacher to activate prior knowledge and make connection with new knowledge to enhance student's learning.
<p>Dual coding theory</p>	<ul style="list-style-type: none"> • In dual coding theory, theorist suggest that we remember better when two processes are engage such as visual learning and verbal learning. • For example, a teacher guide young children to write the digit "8" may provide verbal instruction as well as visual presentation. She may begin with pencil on the chil's paper saying, <i>"Let's start by writing the letter S and then curving back to join the open end joining something like that looks like two circles touching each other on the side."</i>
<p>Rehearsal</p>	<ul style="list-style-type: none"> • Student may use two types of rehearsal that is maintenance and elaborative. <ul style="list-style-type: none"> - Maintenance rehearsal is rote repetition of the information in STM, like repeating phone number a few dozen times. - Elaborative rehearsal is not based on mere repetition but occurs when the information is expanded, embellished on, and related to other concepts already in LTM.
<p>Instructional strategies</p>	<ul style="list-style-type: none"> • Teacher may use instructional strategies that actively involved students in learning such as group discussion, singing and reading aloud, cooperative learning, inquiry, discovery, experimenting or leaning by doing.

Mnemonics	<ul style="list-style-type: none"> • Teacher may use mnemonic devices such as acronyms whilst teaching important facts. <ul style="list-style-type: none"> - Example of acronym is SMS for short messages service or FELDA for Federal Land Development Authority. • Another type of mnemonic such as peg word.. <ul style="list-style-type: none"> - Example of pegword is "Emak Suka Pizza" for types of memory in long term memory that is Episodic, Semantic, and Procedural.
Memory gadgets or devices	<ul style="list-style-type: none"> • Students may use memory device such as mind mapping, graphic organizer, fish – bone diagram, tree diagram, etc to enhance their understanding and good memory.

Figure 5.16: List of methods to help students store the information, in the long-term memory

5.4.2 The Information Processing Theory of Forgetting

According to Sprinthall & Sprinthall

"Forgetting is defined as the inability to retrieve information"
(Sprinthall & Sprinthall, 1994)

Figure 5.17 is an Information Processing Model. This model shows the two major reasons of inability to retrieve information in long-term memory. The 2 major reasons are decay and interference.

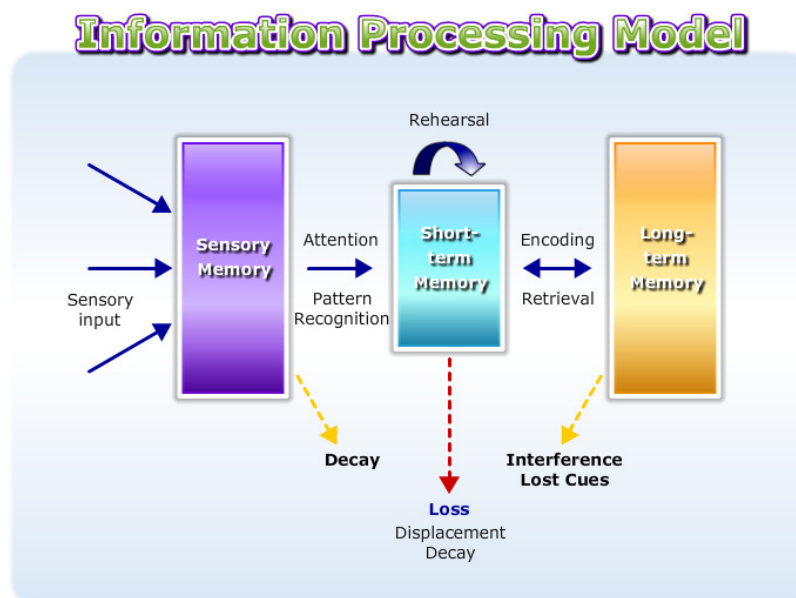


Figure 5.17: Decay and interference in the Information Processing Model

Decay

- Decay is the passive loss of the memory trace due to inactivity or lack of rehearsal. Actually this is not a new idea.
- Thorndike has postulated three major laws of learning and one of it is law of exercise. In this law, Thorndike stated that the more an S – R connection is used, the stronger it becomes; conversely, the less it is use the weaker it becomes.
- Hence, through inactivity, the S – R connection simply weaken over time.

Interference:

- Interference takes place when the recall of one event is inhibited by the incursion of another event.
- There are two types of interference that is **proactive and retroactive interference**.
- Proactive inhibition occurs when you fail to learn subject B because of subject A, which you learned earlier, because it disrupted your recall of the facts in subject B.
- Retroactive interference occurs when the learning of new material (B) prevents the recall of the older material (A).

SELF-CHECK



Explain briefly the three stages multi-store model of memory by Atkinson and Schriffin. Discuss how teacher can help student memorize important facts.

5.5 THE SCHEMA THEORY

R. C. Anderson, a respected educational psychologist, developed schema theory. This learning theory views organized knowledge as an elaborate network of abstract mental structures which represent one's understanding of the world. The term schema was first used by Piaget in 1926, so it was not an entirely new concept. Anderson, however, expanded the meaning.

Contemporary learning theory embraces schema theory in an attempt to explain how information is best encoded in the long-term memory. The theory emphasizes the nature and purpose of schemata as the fundamental elements of cognitive processing (Douchy & Bouwens, 1990 in Tan et. al. 2003). They are **prior knowledge linkages**, and they influence the amount and proficiency of our learning. Research by schema theorists indicates that abstract concepts are best understood after a foundation of concrete and relevant information has been established (Schallert 1982:26). The general knowledge provides a framework into which the newly-formed structure can be fitted.

Figure 5.18 lists some characteristics of schemata according to Anderson (1977:418--419):

- Schemata are always organized meaningfully, can be added to, and, as an individual gains experience, develop to include more variables and more specificity.
- Each schema is embedded in other schemata and itself contains subschema.
- Schemata change moment by moment as information is received.
- They may also be reorganized when incoming data reveals a need to restructure the concept.
- The mental representations used during perception and comprehension, and which evolve as a result of these processes, combines to form a whole, which is greater than the sum of its parts.

Figure 5.18: Characteristics of schemata

Diagram of a sample schema

Figure 5.19 shows a diagram that describes how a person’s schema of “egg” might include.

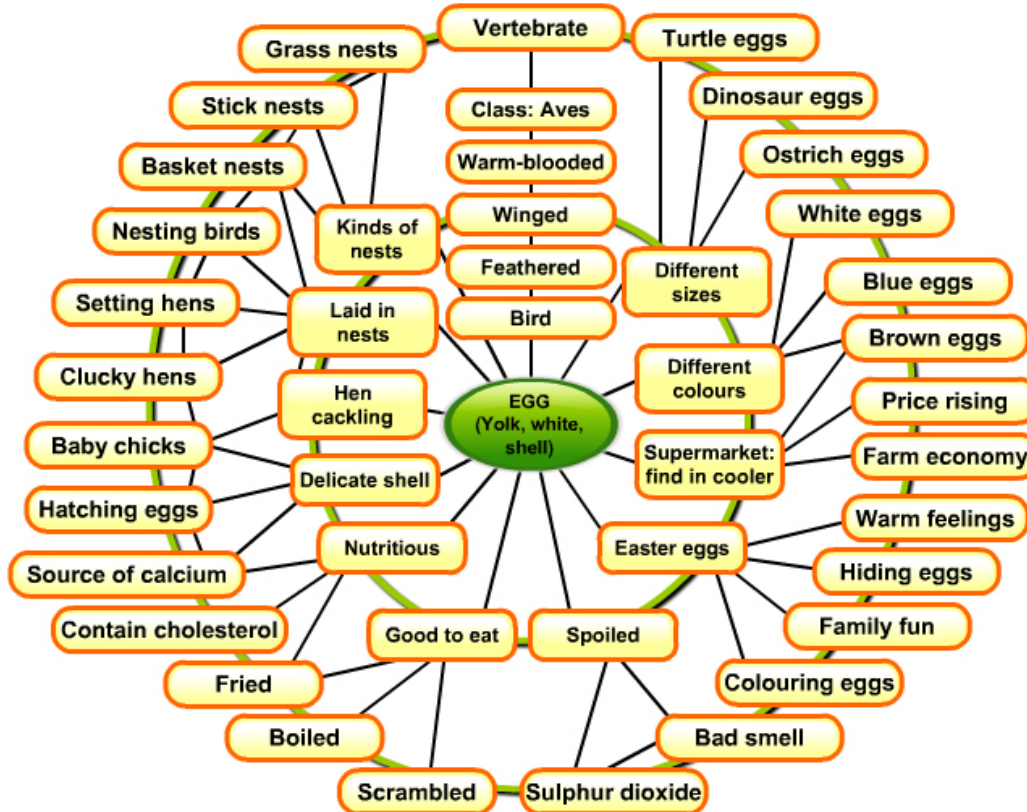


Figure 5.19: A diagram that describes “egg” using the schema theory

Schemata are an effective tool for understanding the world. Through the use of schemata, most everyday situations do not require effortful thought which absolutely automatic thought is all that is required. People can quickly organize new perceptions into schemata and act effectively without effort.

Example:

- Most people have a stairway schema and can apply it to climb staircases they've never seen before.

This theory would suggest that our prior knowledge can facilitate or enhance transfer of a learning task. It is also true that prior knowledge can inhibit or interfere with our acquisition of new information (Leinhardt, 1992 in Tan et. al. 2003).

Example:

- Many people have expressed difficulty learning to use a new software package because their prior familiarity with the preceding versions seem to interfere.

SELF-CHECK



What is the schema theory? Explain why prior knowledge is important in the acquisition of new knowledge.

5.6 COGNITIVE STRUCTURALISME

Cognitive structuralism was founded by Jean Piaget(1896-1980) and other cognitive psychologists. Whereas social constructivism was founded by Vygotsky(1896-1934). There are several opinions related to cognitive structuralism according to psychologists.

According to Leinhardt,

“The awareness of interrelationships between stimuli or the use of appropriate schemata are significant to cognitive learning and to teaching and classroom learning”

Leinhardt, 1992.

According to Leinhardt, Byrness

“Schemata serve several functions in learning: categorizing, remembering, comprehending and problem solving.”

“First, schemata or prior knowledge links categorize our experiences more efficiently for processing. This categorization of information facilitates the processes of remembrance (recall), and comprehension (understanding), all of which make problem solving more productive”

(Byrness, 1996)

Alba and Hasher (cf. Benjafield,) suggest that,

“Schema facilitates the selection of information based on our interests. Further, once selected, the schema enable the selected material to be organized abstractly and assist the individual in the processes of interpreting and integrating the new material, based on what he or she knows already”

Alba and Hasher (cf. Benjafield, 1992)

Clearly, the cognitive constructivists (or “connectionists”) suggest that,

“For teachers to promote more effective learning the teacher needs to link new information to familiar information selectively in as learner – satisfying a format as possible”

(Hinson, 1988; Sanchez & Lopes, 1993; Ellis et al., 1994 in Tan et al., 2003).

Although cognitivists like Jerome Bruner and David Ausubel described ways of utilizing schema theory in classroom learning, but their perspectives on the structuring of prior knowledge linkages differed. We will discuss it in the next section.

5.7 MEANINGFUL LEARNING

David Ausubel (1968) is a psychologist who advanced a theory, which contrasted meaningful learning from rote learning.

In Ausubel’s view,

“To learn meaningfully, students must relate new knowledge (concepts and propositions) to what they already know.”

Ausubel

5.7.1 Advanced Organizer

Ausubel (1968) proposed the notion of an **advanced organizer** as a way to help students link their ideas with new materials or concepts. Ausubel’s theory of learning claims that new concepts to be learned can be incorporated into more inclusive concepts or ideas. These more inclusive concepts or ideas are advance organizers. Advance organizers can be verbal phrases(the paragraph you are about to read is about Albert Einstein) or a graphic. In any case, the advance organizer is designed to provide, what cognitive psychologists call, the *“mental scaffolding: to learn new information”*.

Figure 5.20 shows an example of leaning methods (KWL method) that applied the idea of advanced organizer in meaningful learning.

K What you KNOW	W What you WANT to know	L What you LEARNED
He was Malacca’s warrior and Laksamana.	How he becomes a Laksamana?	He became Laksamana after defeating Majapahit and Pahang.
He served during Sultan Mansur Shah reign.	Does he serve other Sultan?	No, because he was too old to serve the next Sultan.
Bendahara at that time is Datuk Seri Maharaja	Is his relationship with Bendahara good?	Very good. Bendahara hid him and saved him from termination.
He led the army to defeat Pahang and Majapahit.	What tactics he used to defeat Pahang and Majapahit?	He studies their war tactic and take advantage of their weakness.

Figure 5:20: Using “KWL” as an Advanced Organizer

5.7.2 Rote and Meaningful Learning

Rote learning

Meaningful learning refers to the concept that the learned knowledge is fully understood by an individual and that the individual knows how that specific fact relates to other stored facts (stored in your brain that is). To understand this concept, it is good to contrast meaningful learning with the much less desirable, rote learning.

Rote learning is where you memorize something without full understanding and you do not know how the new information relates to your other stored knowledge. For our example, let us say we learn 5 facts in a math course during a full semester by rote learning. This can be illustrated in Figure 5.21. The 5 facts (labelled 1-5) are stored in memory as separate items although in real life they are related to each other. When a student rote learned these facts, the brain stored them as distinct, unrelated knowledge that can only be recalled individually (one fact at a time). When this student recalls 1 fact the other 4 facts are not recalled (or activated) at that moment. In other words, thinking about fact 5 does not lead the student to think about facts 1-4. Contrast that to the below discussion on recall after meaningful learning.

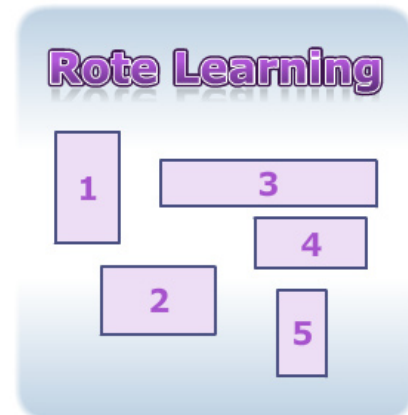


Figure 5.21: Rote learning

Meaningful learning

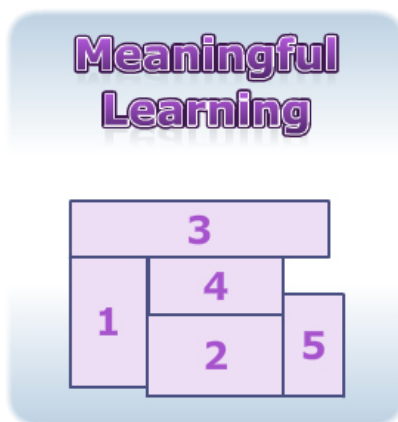


Figure 5.22: Meaningful learning

When meaningful learning occurs (using our example of 5 math facts) the facts are stored in a relational manner (see Figure 5.220). That is, the brain stores them together because they are related to each other. Now, when 1 fact is recalled, the other facts are also recalled at that moment (or shortly thereafter). In other words, recalling fact 5 activates the memory for facts 2 and 4, and this in turn leads to recalling facts 1 and 3. This phenomenon is called the **spread of activation**. This is the gist of meaningful learning. Problem-solving for this student would be easier than for the student who rote learned the same 5 facts.

5.7.3 What is Meaningful Learning Experience?

In order to effectively integrate technology into a meaningful learning experience, we must first have a clear understanding of what a meaningful learning experience is. Some ideas about a meaningful learning experience are listed below.

What is meaningful learning experience is?

- Occurs when learners actively interpret their experience using internal, cognitive operations.
- Requires that teachers change their role from sage to guide.
- Since students learn from thinking about what they are doing, the teacher's role becomes one of stimulating and supporting activities that engage learners in thinking.
 - Teachers must also be comfortable that this thinking may transcend their own insights.
- Requires knowledge to be constructed by the learner, not transmitted from the teacher to the student (Jonassen, et al., 1999).

Figure 5.18: Characteristics of schemata

5.7.4 Attribute of Meaningful Learning

Meaningful learning requires knowledge to be constructed by the learner, not transmitted from the teacher to the student. According to Jonassen, et al. (1999), meaningful learning contains 8 primary attribute. The attributes are active or manipulative, constructive, reflective, intentional, complex, contextual, collaborative, and conversational as shown in figure 5.22.

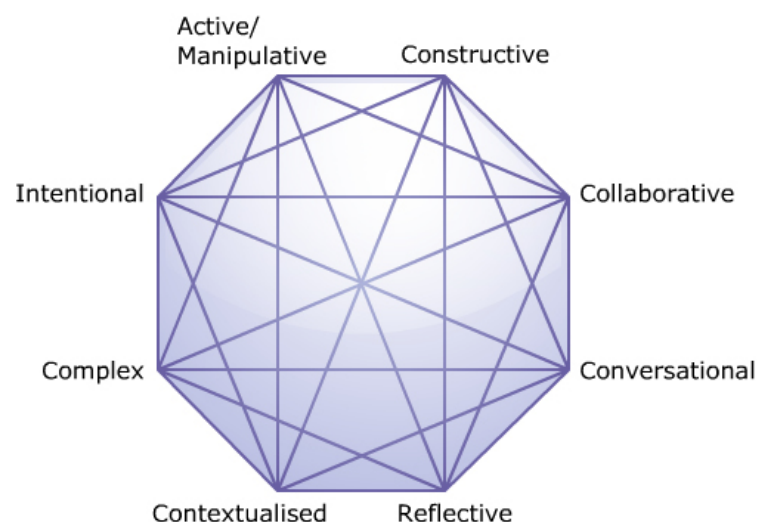
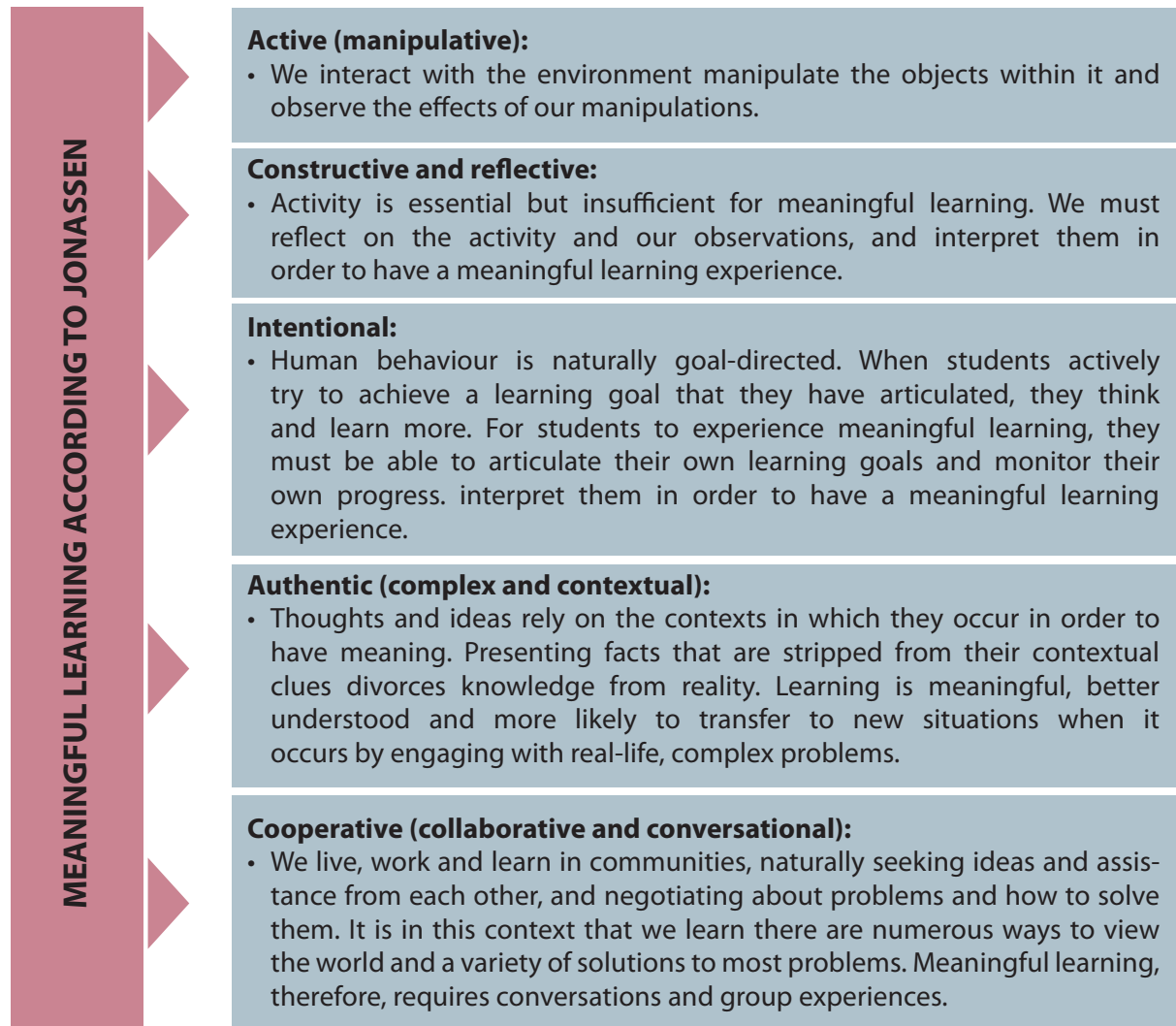


Figure 5.23: Attribute of meaningful learning

Jonassen describes those attribute as follows:



5.7.5

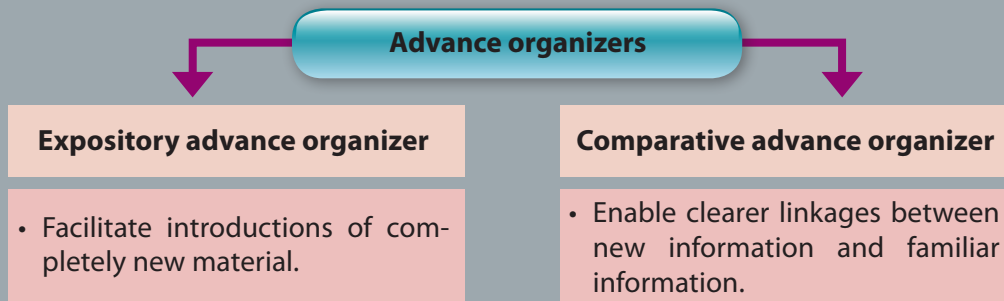
Experiencing the Meaningful Learning

To experience meaningful learning, students need to do much more than access or seek information. They need to know how to examine, perceive, interpret and experience information. There are several proposed structuring strategies for teachers to enhance their teaching method such as advanced organizers and expository teaching by David Ausubel and mediators as explained in figure 5.24.



Advance organizers

David Ausubel (1969) proposes structuring strategy called advance organizers as means to enhance students learning. He found that by providing students with deliberately prepared, slightly abstract passages in advance of the main material to be learned, student learning of subsequent material was facilitated. There are two types of advance organizers:



Expository teaching

David Ausubel (1968) also suggest teacher to apply the meaningful reception learning in instruction and stress “selective linkages”. Ausubel translated his ideas about the significance of the provision of organizing structures into a teaching model called “expository teaching.” This method requires the teacher to provide the students with possible ways of organizing information for more efficient encoding, storage, and retrieval. Teachers must expose students to the underlying and selective interrelationships in cognitive learning, so the students will draw appropriate conclusion.

Mediators

Another structuring strategy advocated by expository teaching is the **mediators**. Mediators are brief written or oral passages linking concepts to be learned with concepts learned already (Gage & Berliner, 1984). At first glance, mediators may resemble advance organizers but it do not have to be written and often are presented orally by teachers.

Example:

The teacher is teaching young children to read, she will pronouns the letter C, while showing cat picture. So the overt mediator used by the teacher will sparked the use of internal mediator.

5.24: Several proposed structuring strategies for teachers to enhance their teaching method

5.8 Bruner and Learning Via Insight

Jerome Bruner(1978) proposed **learning via insight**. Learning via insight theory highlights the influence of our motivations on our selected perceptions and learning. Bruner presented teachers with a developmental model suggesting that our motivation changes developmentally. There are 3 stages of motivation. They are enactive, iconic, and symbolic. The descriptions for these stages are explained in Figure 5.25.

Enactive	When we are very young, our motivation to perceive and learn is “ enactive ”, meaning that when we are motivated to perceive things that we can manipulate physically via our overt hands-on experiences.
Iconic	When we reach school age, our motivation to perceive is “ iconic ”, meaning that we are motivated to perceive things that are tied less to the physical manipulation. We are motivated to perceive and learn from pictures and visual aids or memories from familiar experiences.
Symbolic	In adolescent as in adulthood, our motivation to perceive is “ symbolic ”, meaning that we learn what is presented neither enactively or iconically. We can understand and utilize abstract concepts without having to handle them or having them represented concretely.

Bruner concluded that:
“At any age we learn best when we are motivated to perceive by insightful experiences.”

Figure 5.25: 3 stages of motivation

Insightful experiences evoke our powers of induction. We seek answers to questions, we solve problems and we make connections between clues because we want to answer, solve, and make those connections. He translated his ideas of learning via insight through **discovery learning**.

Example:

Puan Normah asked her class a problem:

a) *Musa is two years older than Raja and one year younger than Ah Wan. Who are the youngest of them all?*

b) *Zara is shorter than Fizi and is taller than James. Who is the tallest?*

She directed her class’s attention to the problem and let them try to solve it, piece by piece, she was encouraging their learning through insight.

5.9

APPLICATION OF COGNITIVE THEORIES IN THE CLASSROOM

Teachers can apply concepts from cognitivists in the classroom to enhance their students understanding. The steps taken are discussed below.

Meaningful learning

- Teachers need to promote more effective learning, the teacher need to link new information to familiar information.
- Example: If teacher want to teach about rice plantation, it is advisable for him to organize trip to Sabak Bernam where rice are planted or show them video showing rice plantation in Sabak Bernam.

Dual coding theory

- Guide students to process information using **dual coding theory**.
- Dual coding theory suggests that we remember better when two processes are engage: visual learning and verbal learning.

Schema theory

- Engage student in schema theory while teaching.
- This theory suggested that our prior knowledge can facilitate or enhance transfer of learning.
- Example: In teaching account, teacher may use prior knowledge or formula they have learned earlier in mathematics.

Phases of learning

- **Gagne** (1985) translated the information-processing model into an instructional model called "phases of learning."
- As detailed in Table 5.1 Gagne (1985) parallels information processing with instructional events.

Internal Process	Instructional Event	Action Example
Reception Expectancy	1. Gaining attention 2. Informing learners of the objective.	Use abrupt stimulus change. Tell learners what they will be able to do after learning.
Retrieval to Working memory	3. Stimulating recall of prior learning.	Ask for recall of previously learned knowledge or skills.

Selective perception	4. Presenting the stimulus.	Display the content with distinctive features.
Semantic encoding	5. Providing “learning guidance”.	Suggest meaningful learning.
Responding Reinforcement Retrieval & reinforcement	6. Eliciting performance. 7. Providing feedback. 8. Assessing performance.	Require additional learner performance, with feedback.
Retrieval and Generalization.	9. Enhancing retention and transfer.	Provide varied practice and space reviews.

Table 5.1 Gagne’s Phases of Learning

Source: Table from *The Conditions of Learning and Theory of Instruction* by Robert M. Gagne, 1985 from Tan et al., 2003, page 249.

Mnemonic

Teacher can guide students in using organizing techniques memorizing facts such as mnemonic. Mnemonics are memory gadgets. They provide a familiar structure for processing information so that it can be recalled easily. Many mnemonics take the form of acronyms. Each letter of a term is associated with new concepts, or new concept information is associated with phrases design to link the terms.

Example:

“HOMES”
for
“Huron. Ontario, Michigan, Erie, and Superior”
(Names of the Great Lakes in United States of America.)

There are other kinds of mnemonic devices, including pegword mnemonics, keyword mnemonics, loci mnemonics, and face-name mnemonics.

Concept Mapping

Concept mapping is a concept popularised by Tony Buzan. Concept maps provide a little more information than the typical hierarchical retrieval system. They offer teacher and student added insight into the student’s understanding of the interconnectedness of concepts and sub concepts. There are other kinds of concept mapping such as ven figure, fish bone, graphic organizer, etc.

Advance organizers

David Ausubel (1969) suggested teacher to use structuring strategy called advance organizers as means to enhance students learning. He found that by providing students with deliberately prepared, slightly abstract passages in advance of the main material to be learned, student learning of subsequent material was facilitated.

Expository teaching

Expository teaching is the application of meaningful reception learning whereby students receive selectively organizes information from the teacher.

Hierarchical retrieval system

Cognitivists also offer teacher to apply hierarchical retrieval system in teaching. In hierarchical retrieval system (or HRS) teacher stress selective organization over other elements of cognitive structuralism. HRSs present material hierarchical, from the most general representations of concepts to specific and detailed representations (Hinson, 1988; Byrnes, 1996; Ritchie & Karge, 1996 in Tan et al. 2003).

Learning via insight

Jerome Bruner (1978) proposes learning via insight. Bruner suggested teacher to teach using discovery approach or inquiry approach whereby students making meaning of information through experimentation or learning by doing.

SUMMARY

- Cognitive revolution is a school of thought evolves from the three disciplines, namely psychology, anthropology and linguistic. Cognitivists focus their theory on the human conscious mind, while behaviourism focuses on behaviour and psychoanalysis focuses on the unconscious mind.
- The contemporary cognitive perspective was originated from the Gestalt psychology, which was first founded by Max Weithmer in Germany. The gestaltists focus their research on human perceptions and come about with the theory of perceptual organization called the Law of Perceptual Organization.
- The Information Processing Model consists of perception, encoding, storage, and retrieval, while the 'Multi-store model' proposed by Atkinson and Schriffin (1968) consists of three stages, namely sensory register, short-term memory and long-term memory.

- According to the schema theory, our prior knowledge can facilitate or enhance transfer of learning.
- Cognitive structuralism was founded by Piaget (1896-1980) and other constructivists such as Bruner and Ausubel.
- Ausubel proposed the rote meaningful learning. He contended that in order to learn meaningfully, students must relate new knowledge (concepts and propositions) to what they already know.
- Bruner came up with insightful learning which argued that people's understanding of objects or facts were developed through stages.
- Teacher can apply many principles suggested by constructivists such as insightful learning, meaningful learning, scaffolding, expository approach, and techniques of memorizing devices such as mind-mapping and mnemonics.

KEY TERMS AND CONCEPTS

Terms	Definitions
Cognitive revolution	The “ cognitive revolution “ is the name for an intellectual movement in the 1950s that began with what are known collectively as the cognitive sciences . It began in the modern context of greater interdisciplinary communication and research.
Cognitivists	Psychologist that emphasizes the importance of cognitive processes such as perception, memory and thinking.
Conscious mind	The part of the mind of which we are aware at the present time.
Discovery learning	Bruner (1978) suggested teacher to teach using discovery approach or inquiry approach whereby students making meaning of information through experimentation or learning by doing.
Encoding	To represent information in some form (sound, visual image, meaning) to be stored in long term memory.

Expository teaching	This method requires the teacher to provide the students with possible ways of organizing information for more efficient encoding, storage, and retrieval. Teachers must expose students to the underlying and selective interrelationships in cognitive learning, so the students will draw appropriate conclusion.
Gestalt psychology	Gestalt is a perspective focuses on the belief that human consciousness cannot be broken down into its elements. This approach to psychology was founded on the concept of the <i>gestalt</i> , or whole . Gestalt psychologists led by Max Wertheimer (1880 - 1943), Wolfgang Kohler (1887 – 1967) and Kurt Koffka (1886 – 1941) have made substantial contributions to our understanding of perception.
Information processing model	This model proposes that human memory is like the computer which in volves a sequence of three stages: sensory memory, short term memory and long term memory.
Insightful learning	Learning through a sudden cognitive change that solved the problem using past experiences and utilising objects available at that time.
Law of closure	Perceptually, we have the tendency to fill in the gaps, making meaning of what we see according to our past experience.
Law of continuity	Perceptually, where figures are defined by a single unbroken line, they tend to be seen as an entity. This principle is of course of particular importance in teaching.
Law of figure and ground	In our perception, we will discriminate figure and ground. If the source of this message wants us to perceive a vase, then the vase is the intended <i>figure</i> and the black background is the <i>ground</i> .

<p>Law of good form</p>	<p>The word ‘Gestalt’ means ‘form’ or ‘shape’. Gestalt psychologists were of the view that psychological organization will always be as ‘good’ as prevailing conditions allow. For Gestalt psychologists <i>form</i> is the primitive unit of perception. When we perceive, we will always pick out form. Our perceptions are influenced by our past experiences.</p>
<p>Law of similarity</p>	<p>Things which are similar tend to be perceived as grouped together.</p>
<p>Loci</p>	<p>Techniques of associating items with specific place. EG. garage – car, lake –fish, kitchen – food.</p>
<p>Long-term memory</p>	<p>This memory provides the lasting retention of information, from minutes to lifetime and almost limitless capacity to retain information. It consists three types of memory : episodic, semantic and procedural memory.</p>
<p>Meaningful learning</p>	<p>Meaningful learning refers to the concept that the learned knowledge (lets say a fact) is fully understood by the individual and that the individual knows how that specific fact relates to other stored facts (stored in your brain that is). For understanding this.</p>
<p>Mediators</p>	<p>Are brief written or oral passages linking concepts to be learned with concepts learned already (Gage & Berliner, 1984). At first glance, mediators may resemble advance organizers but it do not have to be written and often are presented orally by teachers.</p>
<p>Mind mapping</p>	<p>Is a concept popularized by Tony Buzan. Mind maps provide a little more information than the typical hierarchical retrieval system. They offer teacher and student added insight into the student’s understanding of the interconnectedness of concepts and subconcepts.</p>

Mnemonics	<p>Many mnemonics take the form of <i>acronyms</i>. Each letter of a term is associated with new concepts, or new concept information is associated with phrases design to link the terms. Example “HOMES” for names of the Great Lakes (Huron, Ontario, Michigan, Erie, and Superior) in United States of America.</p>
Multi-store model	<p>The multi-store model of memory is an explanation of how memory processes work. The model was first described by Atkinson and Shiffrin in 1968. It consists of the three stages of the memory: sensory register, short term memory and long term memory.</p>
Peg word	<p>Systems of associating items with cue words usually place serially. eg. to remember the first prime minister: Tengku Abdul rahman baling batu (satu); tun razak suka burung tempua (DUA).</p>
Perceptual organisation	<p>The tendency to organize facts or objects which we percept visually.</p>
Psychoanalysis	<p>A method of psychoteraphy developed by Freud based on his belief that the root of all psychological problem is unconscious conflict between the id, the ego, and the superego.</p>
Retrieval	<p>The process of “finding” information previously stored in memory.</p>
Psychoanalysis	<p>A method of psychoteraphy developed by Freud based on his belief that the root of all psychological problem is unconscious conflict between the id, the ego, and the superego.</p>
Rote learning	<p>Is where you memorize something without full understanding and you don’t know how the new information relates to your other stored knowledge. For our example, lets say we learn 5 facts in a math course during a full semester by rote learning. Expository learning.</p>

Sensory Memory	This memory which contain receptors that briefly hold on to only that information that enters through our senses. This memory is very short (less than ½ second for vision; about 3 seconds for hearing).
Schema theory	The theory that information stored in LTM sometimes changes over time to become more consistent with our beliefs, knowledge, and expectation.
Short-term memory	Is a temporary storage fascility. Short term memory is also called working memory. It will initially last somewhere around 15 to 20 seconds unless it is repeated (rehearsal)
Storage	Is the process whereby information is encoded to be kept in long term memory
Unconscious mind	The part of the mind of which we can never be directly aware whereby instinctual motives, memory and emotion are stored.

ENDNOTES

1. Atkinson, R.C. and Shiffrin, R.M. (1968). *Human memory: A proposed system and itscontrol processes*. In K. W. Spence and J. T. Spence (Eds) *The psychology of kearning and motivation* (Vol 2). London: Academic Press.
2. Bloom, B. (1984). *The Search for methods of group instructions as effective as one-to-one tutoring*. Educational Leadership.
3. James, W. (1890). *Principles of Psychology*, New York: Holt.
4. Gagne, R (1970). *The Conditions of Learning (Second Edition)*. New York: Holt, Rinehart, & Winston Holt.
5. Tan Oon Seng, Richard D. Parson, Stephanie lewis Hinson, Deborah Sardo-Brown (2003). *Educational Psychology*.Singapore : Thomson Learning.
6. Gagne, E.D., Yekovich, C. W., & Yekovich, F.R (1993). *The Cognitive Psychology of School Learning*.
7. Lahey, B. B. 2004. *Psychology: an introduction*. 8th ed. Boston: McGraw Hill.

8. Ormrod, J. E. 2006. *Educational psychology developing learners*. 5th ed. New Jersey: Prentice Hall.
9. Santrock, J. W. 2008. *Educational psychology*. 3rd ed. Boston: McGraw-Hill.
10. Tan O. S., Parsons, R. D., Hinson, S. L. & Sardo-Brown, D. 2003. *Educational psychology a practitioner-researcher approach*. Australia: Thomson.
11. Woolfolk, A. 2007. *Educational psychology*. 10th ed. Boston: Pearson.

REVIEW AND DISCUSSION QUESTIONS

1. The word 'Gestalt' to means _____.
 A. Good
 B. Shape
 C. Ground
 D. Good form
2. Theory of Cognitive development was founded by _____
 A. Piaget
 B. Gardner
 C. Marcia
 D. Erikson
3. Look at the figure below and answer question that follow.

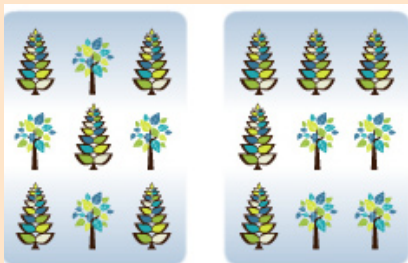


Figure 5.3: Trees

- The figures above are presented pertaining to law of _____.
- A. Good From
 - B. Continuity
 - C. Closure
 - D. Similarity

4. The cognitive revolution was founded based on few disciplines, which are _____
 - A. philosophy, psychology, and arts
 - B. psydology, history and geography
 - C. archaeology, antropolog and history
 - D. psychology, linguistic and anthropology

5. There are 3 stages in the multi-store memory. Which stages can store memory up to one year and more?
 - A. Sensory Memory
 - B. Short-term memory
 - C. Long-term memory
 - D. Sensory short memory

6. Characteristics of schemata according to Anderson are _____.
 - i. not always organized meaningfully, can be added to.
 - ii. schemata change moment by moment as information is received.
 - iii. be reorganized when incoming data reveals a need to restructure.
 - iv. schemata are an effective tool for understanding the world.
 - v. each schema is embedded in other schemata and itself contains subschema.
 - A. I, II dan III
 - B. I, II dan IV
 - C. II, III, dan IV
 - D. II, III dan V

7. Meaningful learning refers to
 - A. The concept that the learned knowledge
 - B. Meaningful learning from rote learning.
 - C. Students must relate old and new knowledge
 - D. Rote learning which is structure hierchichally.

8. Multi-Store Model Of Memory consists of three stages which are _____.
 - i. Sensory memory (SM)
 - ii. Sensory term memory (STM)
 - iii. Long-term memory (LTM)
 - iv. Short-long memory (SLM)
 - v. Short-term memory (STM)
 - A. I, II, dan III
 - B. II, III dan V

- C. I, III dan V
D. II, III, V dan IV
9. Schemata are an effective tool for understanding the world. Through the use of schemata, most everyday situations do not require effortful thought - automatic thought is all that is required. People can quickly organize new perceptions into schemata and act effectively without effort. Whose idea was that?
- A. Aderson
B. Leinhardt
C. Jonassen
D. Jean Piaget
10. According to Jonassen, (1999), meaningful learning are _____ .
- A. Constructive and reflective, Authentic and Cooperative.
B. Active, Constructive and reflective, Intentional and Authentic.
C. Active, Constructive and reflective, Intentional, Authentic and Cooperative.
D. Manipulative, complex and contextual and collaborative and conversational.