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Akademischer Rat * Dipl.-Berufspäd. Univ.

Psychology of Learning

An Overview

München
2002-09-03

Content

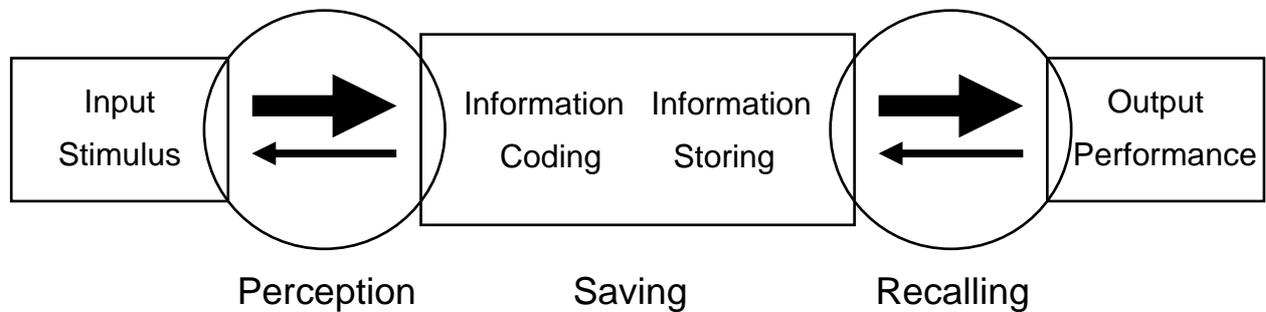
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Human Information Technology

In an analytic model of the human information technology information has to be perceived, saved and recalled.



Human information technology is associated with the terms learning and memory. Learning contains the acquisition and processing of information. In the memory gained experience is stored. Recalled information is displayed as an output of performance.

Teaching and Learning

Learning can happen always and everywhere. If learning is planned and organised, interactive and delegated to institutions, it is defined as teaching.

Learning means that on the one hand an individual acquires new knowledge, abilities, skills or attitudes or on the other hand modifies the existing ones. Learning aims on improving ones competencies.

Learning by Teaching

organised -
planned and systematic
teaching and learning

interactiv -
mutual influence
between teacher and learner

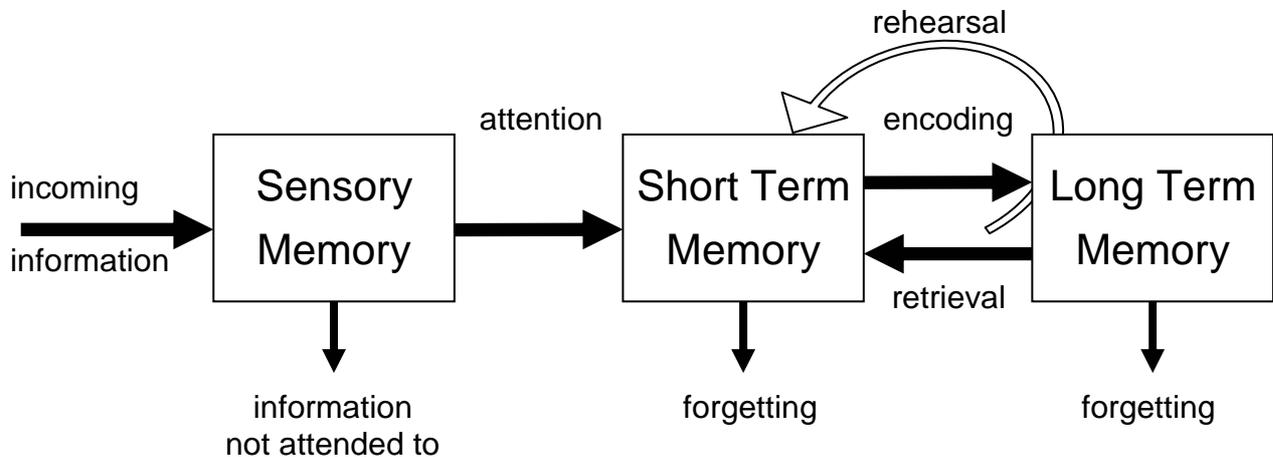
institutional -
delegated to professional
institutions

Learning changes the physical structure of the brain (see below). These structural changes alter the functional organization of the brain. So learning organizes and reorganizes the brain. And as an effect learning changes the behaviour of the learning person.

We can not apply the term 'learning' when there are changes in ones behaviour as a result of growth, maturing, instinct, influence of drugs etc.

The Memory

In a more differentiated model of human information technology the memory can be conceptualised in generally three types: sensory memory, short-term memory and long-term memory.



Sensory memory (SM)

In this model of the human memory, sensory information enters the sensory memory (SM) and is either ignored or paid attention to. The sensory memories act as buffers for stimuli received through the senses (from eyes, ears, etc.). A sensory memory exists for each sensory channel: iconic memory for visual stimuli, echoic memory for aural stimuli and haptic memory for touch. Ignored information doesn't last very long. New perceptual information quickly writes over (masks) the old, a process sometimes described as 'interference'. Attended information is not only protected from interference, it is processed by higher-level mechanisms that figure out what it means. For instance, information in the SM might indicate a bright red object somewhere ahead. Attending to this information might expose that there it is a stop-sign. Once information is processed in this way, it can be encoded into the short-term memory (also called working memory). Information is passed from sensory memory into short-term memory as a working memory by attention, thereby filtering the stimuli to only those which are of interest at a given time.

Short-term memory (STM)

Short-term memory acts as a scratch-pad for temporary recall of the information under process. For instance, in order to understand this sentence you need to hold in your mind the beginning of the sentence you read the rest.

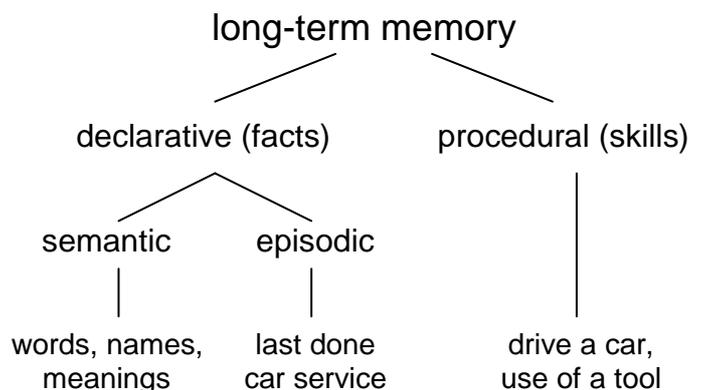
Short term memory decays rapidly (200 ms.) and also has a limited capacity. Chunking of information can lead to an increase in the short term memory capacity. This is the reason why a hyphenated phone number is easier to remember than a single long number. The successful formation of a chunk is known as closure. Interference often causes disturbance in short-term memory retention. This accounts for the desire to complete the tasks held in short-term memory as soon as possible.

Long-term memory (LTM)

Long-term memory is intended for storage of a very large quantity of information over a very long time. Information from the working memory is transferred to it after a few seconds. Unlike in short-term memory (working memory), there is little decay. LTM holds many different kinds of information including: facts, events, motor and perceptual skills, knowledge of physical laws, spatial models, attitudes and beliefs about ourselves and others, etc. (see below). Any different factors seem to affect the difficulty of accessing a memory in the LTM. These factors include: the similarity between current conditions and those that existed when the memory was stored, how recently the memory was last used, its degree of inter-relatedness to other knowledge, its uniqueness relative to other LTM information, and so on.

Long-term memory structure

In a model long-term memory can be split in a declarative and procedural memory. The declarative part is a memory for facts and events (dates, historical facts, telephone numbers, etc – knowing that). The procedural memory is responsible for procedures and abilities (to drive a car, to play football, to tie your shoe strings or your tie – knowing how) There are two types of the declarative long-term memory: episodic memory and semantic memory. Episodic memory represents our memory of events and experiences in a serial form. It is from this memory that we can reconstruct the actual events that took place at a given point in our lives. Semantic memory, on the other end, is a structured record of facts, concepts and skills that we have acquired. The information in semantic memory is derived from that in our own episodic memory, such that we can learn new facts or concepts from our experiences.



Long-term memory processes

There are three main activities related to long term memory: **storage** (putting encoded information into a store), **deletion** (when information is not maintained) and **retrieval** (recall and decode needed information). Information from short-term memory is stored in long-term memory by rehearsal. The repeated reaction to a stimulus or the rehearsal of a piece of information transfers it into long-term memory. Experiments also suggest that learning time is most effective if it is distributed over time. Deletion is mainly caused by decay and interference. Emotional factors also affect long-term memory. However, it is debatable whether we actually ever forget anything or whether it becomes increasingly difficult to access certain items from memory. Having forgotten something may just be caused by not being able to retrieve it! Information may not be recalled sometimes but may be recognized, or may be recalled only with prompting. This leads us to the third process of memory: information retrieval. There are two types of information retrieval: recall and recognition. In recall, the information is reproduced from memory. In recognition the presentation of the information provides the knowledge that the information has been seen before. Recognition is of lesser complexity, as the information is provided as a cue. However, the recall can be assisted by the provision of retrieval cues which enable the subject to quickly access the information in memory.

How to Improve One's Memory

There are many things that can be done to improve one's memory.

To stimulate memory. Use your memory to the utmost. Challenge a novelty. Learn new skills. If you work in an office, learn to dance. If you are a dancer, learn to deal with a computer; if you work with sales, learn to play chess; if you are a programmer, learn to paint. This could stimulate your brain's neural circuits to grow.

Pay attention. Don't try to memorize all the facts that happen, but focus your attention and concentrate in what you consider more important, avoiding all other thoughts. Exercise: take any object, as a pen, and concentrate on it. Think on its various characteristics: its material, its function, its colour, its anatomy, etc. Don't allow any other thought to occupy your mind while you are concentrating on that pen.

Relax. It is impossible to pay attention if you are tense or nervous. Exercise: hold your breath for ten seconds, then release it slowly.

Associate facts to images. This can be a very efficient way to memorize large quantities of information.

Visualize images. See figures with the "eyes of your mind". Exercise: Close your eyes and imagine a big and juicy steak. Smell its aroma and feel the softness of its meat. Imagine yourself cutting it with a knife and fork, then tasting it. If your mouth filled with saliva while you visualized this scene, then you have done a good work! Do these exercises with other objects, like a bowl of soup, an ice-cream cup, a chocolate pie, anywhere, as a dental office, an examination room, etc.

Food. Some vitamins are essential for the proper working of memory: tiamin, folic acid, and B12 vitamin. They are found in bread and cereal, vegetable and fruits.

Water. Water help maintain the memory systems working, specially in older persons. A lack of water in the body has an immediate and deep effect on memory; dehydration can generate confusion and other thought difficulties.

Sleep. To be able to have a good memory, it is essential that we allow the brain to have enough sleep and rest. While sleeping, the brain disconnects from the senses, and proceeds to revising and storing memory. Lack of sleep would produce a chronic fatigue and would impair the ability of concentration and the storing of information.

Medication. Some medicines can cause loss of memory: tranquilizers, muscular relaxants, sleep pills, and anti-anxiety drugs, etc.

Alcohol. The affects memory. Alcohol interferes specially with short-term memory, which impairs the ability of retaining new information.

Smoking. It is already well known that smoking lower the amount of oxygen arriving in the brain, and this fact many times affect memory.

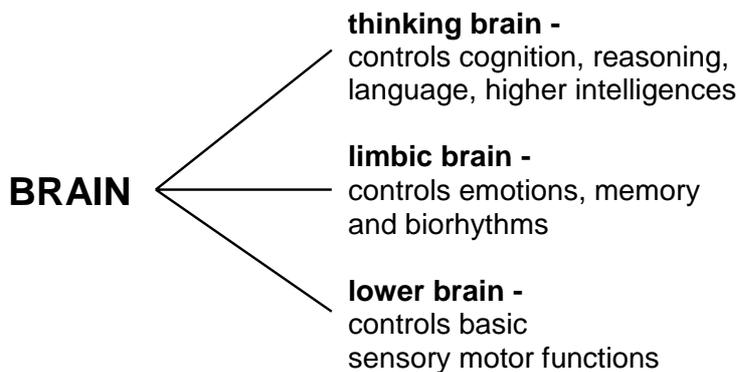
Caffeine. Coffee and tea have a very positive effect to maintain attention and to end sleepiness, but the excitation promoted by these drinks may interfere with the memory function.

Other tips. Take notes, get organized, use a diary, engage in sports to keep fit, regular health checks, memory aids, etc.

The Brain

The nervous system and the brain are the physical foundation of our process of learning. Neuroscience is the study of the human nervous system, the brain, and the biological basis of consciousness, perception, memory, and learning. Some of the key findings of this science can be summarized as follows:

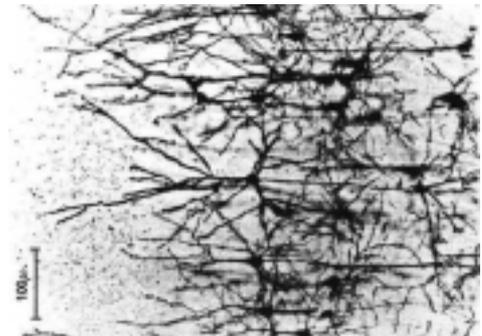
The triune structure of the brain



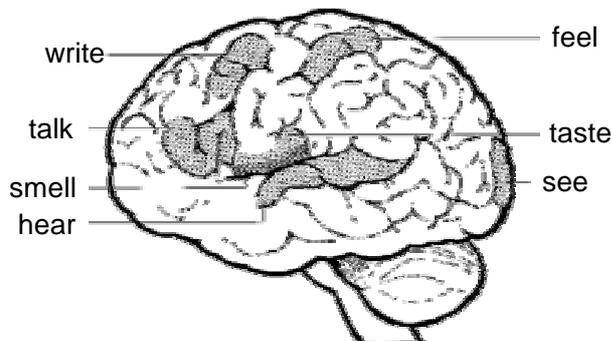
The brain has a 'triune' structure. Our brain is really three brains – the lower or 'reptilian' brain that controls basic sensory motor functions; the 'mammalian' or 'limbic' brain that controls emotions, memory and biorhythms; and the 'neo-cortex' or 'thinking' brain that controls cognition, reasoning, language and higher intelligences.

Neural network of the brain

The brain does not work like a computer. It is impossible for such a system to function like a linear, or even parallel-processing computer. The brain is better described as a 'self-organizing system' than a computer. Our nerve cells (neurons) are connected by branches called dendrites (see picture). Mental concentration and effort changes the physical structure of the brain. As we use the brain, we strengthen certain patterns of connection. This results in a physical change in the connection itself that makes that connection easier to make next time. This is the development of memory.



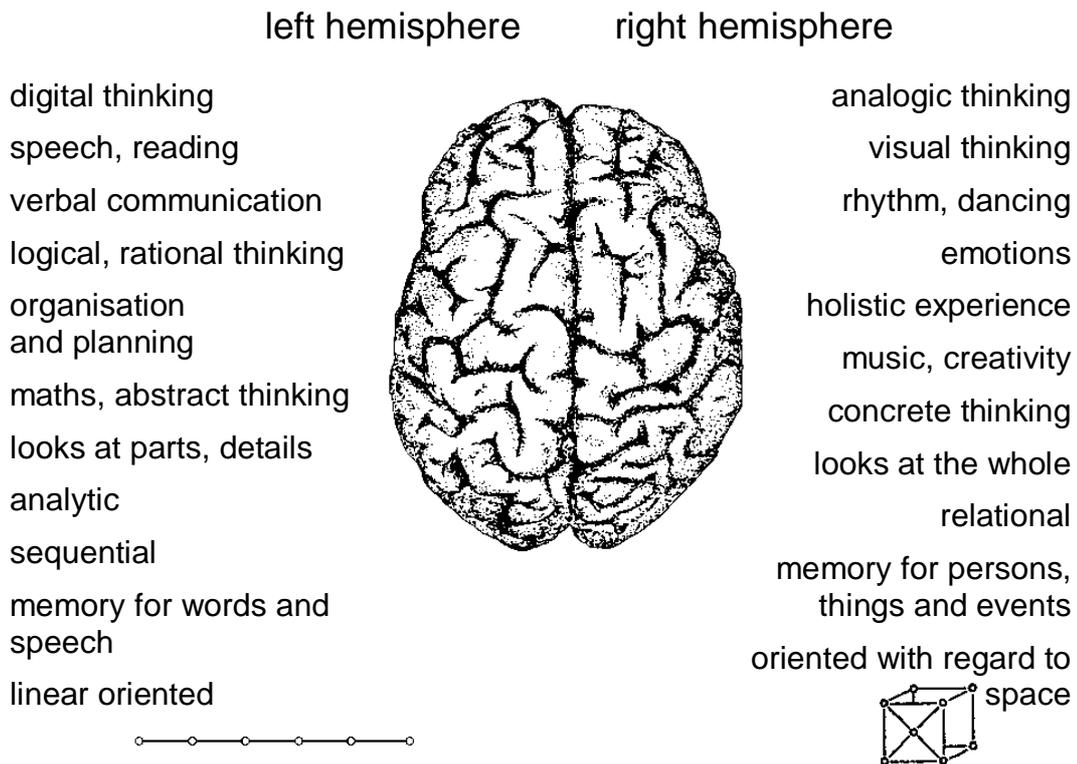
Different areas for different activities



The brain is the source of all our behaviour, thoughts, feelings, and experiences. We know that different areas of the brain are used for different activities like memory, language, problem-solving, and so on. The information coming from sense organs are also processed in different regions of the brain. In difference to the processing of information, which can be localised in specific regions of the brain, memory contents are stored as network of combined information. The information contents are scattered all over the brain.

Left and right hemispheres of the brain

Saving and recalling processes of knowledge in memory take place in the brain. Experiments done by researchers show, that the human brain (cortex) can be differed in two parts called hemispheres. In general the left and right hemispheres of the brain process information in different ways. Listed below are information processing styles that are characteristically used by the right or left brain hemisphere.



Brain Requirements for Learning

Most individuals have a distinct preference for either the left or the right hemisphere styles of thinking. Some, however, are more whole-brained and equally adept at both modes. In general, schools tend to favour left-brain modes of thinking, while downplaying the right-brain ones. Left-brain scholastic subjects focus on logical thinking, analysis, and accuracy. Right-brained subjects, on the other hand, focus on aesthetics, feeling, and creativity.

We tend to process information using our dominant side. However, the learning and thinking process is enhanced when both side of the brain participate in a balanced manner. But different parts of the brain may also be ready to learn at different times. This means strengthening your less dominate hemisphere of the brain. Teachers should pay attention to the less dominant style so that students can learn how to improve it.

Teachers should – if the learning content allows it – try to activate both hemispheres for learning processes. Information can be better recalled, when it was coded and stored in use of both hemispheres. In this case the probability of forgetting is much lower.

For whole-brain teaching and learning, a combination of the different styles of thinking (as described above) are seen as the basis for comprehension. For this reason, learners e.g. are encouraged to visualize as they develop new contents, in order to retain them. A simultaneously storage in brain can happen, when text contents were visualised by pictures, drawings etc. Here the left hemisphere checks out, if corresponding to a digital concept already a visualised mental representation exists.