

# Learning Approaches



# Learning Approaches:

## *Critically Examining the Major Learning Theories*

By

Nazmi Xhomara

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The book is dedicated to my late uncle **Idriz XHOMARA**, agronomist, teacher, director and advisor at the Ministry of Agriculture, Member of Parliament, publicist, scholar of several foreign languages, intellectual of broad dimensions, who dedicated his entire life to the development and promotion of knowledge, science and culture.



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# CHAPTER 1

## NATURE OF LEARNING

### 1.1 Learning Understanding

Learning is the concept or theory and at the same time the process and practice of acquiring new understanding, knowledge, behaviors, skills, values, attitudes, and preferences. “Learning is one of the most important topics in contemporary psychology, yet it is an extremely difficult concept to define. Common, popular definitions of learning suggest that it is *comprehension, knowledge, or understanding* gained through practice or experience. Most psychologists, however, would find this definition unacceptable because of nebulous terms, such as knowledge, comprehension, and mastery, that it contains” (Hergenhahn & Olson, 2013). One of the most popular definitions is the one suggested by Kimble (1961), and Boneau & Wertheimer (2006), that defines learning as “a relatively permanent change in behavioral potentiality that occurs because of reinforced practice” (Kimble, 1961; Boneau & Wertheimer, 2006).

Despite that fact that well known, this concept characterization is far from totally accepted. “First, learning is indexed by a change in behavior; in other words, the results of learning must always be translated into measurable behavior. After learning, learners do something that they did not do before learning took place. Second, this behavioral change is relatively permanent; that is, it is neither transitory nor fixed. Third, the change in behavior need not occur immediately following the learning experience. Fourth, the change in behavior or behavior potentiality results from experience or practice. Fifth, experience, or practice, must be reinforced; that is, only those responses that lead to reinforcement will be learned” (Hergenhahn & Olson, 2013). Even though the concepts reward and reinforcement are frequently used interchangeably, there are at least two arguments why they must not be. “In Pavlov’s work, for example, a reinforcer is defined as any unconditioned stimulus, that is, any stimulus that elicits a natural and automatic reaction from an organism” (Hergenhahn & Olson, 2013). For supporters of Skinner’s theory, a reinforcer gives strength to any behavior that straight away go in advance of its happening. In contrast, “a reward is

usually thought of as something that is given or received for a worthy accomplishment or for an act deemed desirable by society” (Skinner, 1986). Anyway, Kimble’s (1961) elucidation of learning concept and practice offers an appropriate reference frame for analyzing some of the significant issues that should be challenges when endeavors to define learning.

## 1.2 Early Notions About Learning

Learning is a very old concept and practice. “Plato believed that knowledge was inherited and was, therefore, a natural component of the human mind. According to Plato, one gained knowledge by reflecting on the contents of one’s mind. Aristotle, in contrast, believed that knowledge derived from sensory experience and was not inherited. Although Plato believed that knowledge is inherited and Aristotle believed that it is derived from sensory experience, both believed that the mind is actively involved in the attainment of knowledge. For Plato, the mind must engage in active introspection to discover inherited knowledge. For Aristotle, the mind must actively ponder the information provided by the senses to discover the knowledge contained within that information. The philosophies of Plato and Aristotle show the difficulty in using such general philosophical terms as rationalist, nativist, and empiricist. A rationalist maintains that the mind must be actively involved in the quest for knowledge, by thinking, reasoning, or deducing. Certainly, both Plato and Aristotle were rationalists. The nativist maintains that some important trait or attitude is inherited. For Plato, one such attribute is knowledge. Aristotle, however, did not totally reject nativism. For him the reasoning powers used to abstract knowledge from sensory experience are innate. The empiricist maintains that sensory information is the basis of all knowledge, and because Aristotle believed this, he can be labeled an empiricist” (Hergenhahn & Olson, 2013).

Plato indicated that “every object in the physical world has a corresponding abstract *idea* or *form* that causes it. According to Plato, if humans accept what they experience through the senses as truth, they are doomed to live a life of opinion or ignorance. Only by turning away from the physical impure world to the world of ideas, pondered by the mind’s eye, can we hope to gain true knowledge. Plato advises the astronomer to let the heavens alone and use the natural gift of reason” (Cornford, 1968). As it is already seen, “Plato was a nativist because he felt knowledge was inborn. He was also a rationalist because he felt this knowledge could be made available only through reasoning. It was Plato’s philosophy that dominated Europe for the first twelve centuries of the Christian Era. To Plato, it was a hindrance and

something to be distrusted, but to Aristotle, sensory information was the basis of all knowledge. With his favorable attitude toward empirical observation, Aristotle compiled an extraordinarily large number of facts about physical and biological phenomena. Aristotle, however, in no way abandoned reason. He felt that sense impressions were only the beginning of knowledge—the mind must then ponder these impressions to discover the lawfulness that runs through them. The laws that govern the empirical world are not knowable through sensory information alone but must be discovered for active reasons. Thus, Aristotle believed that knowledge was gained from sense, experience and reasoning” (Hergenhahn & Olson, 2013).

Aristotle laws are well known. “It is because Aristotle contended that the source of all knowledge is sensory experience that he is labeled an empiricist. In elaborating his empiricist view of knowledge, Aristotle formulated laws of association.

- *Law of similarity*- the experience or recall of one object will tend to elicit the recall of things like that object.
- *Law of contrast*- recall of opposite things.
- *Law of contiguity*- recall of things that were originally experienced along with that object.
- *Law of frequency*- the more frequently two things are experienced together, the more likely it will be that the experience or recall of one will stimulate the recall of the second.

Hence, according to Aristotle, sensory experience gives rise to ideas. The ideas stimulated by sensory experience will stimulate other ideas in accordance with the laws of similarity, contrast, contiguity, and frequency. His associative principles of similarity, contrast, contiguity, and frequency later became the basis for the doctrine of associationism, which is still very much part of modern learning theory” (Hergenhahn & Olson, 2013).

Weimer (1973) shows that “Aristotle’s doctrines are at the heart of contemporary thought in epistemology and the psychology of learning. The centrality of associationism as the mechanism of the mind is so well known as to require only the observation that not one single learning theory propounded in this century has failed to base its account on associative principles”.

### 1.3 Prior Paradigms of Learning

There were different prior approaches to learning. “Psychology’s first school of learning was *voluntarism*, and it was founded by Wundt. Wundt’s goals were to study consciousness as it was immediately experienced and to study the products of consciousness such as various cultural achievements. Wundt believed that immediate consciousness could be studied scientifically as a systematic function of environmental stimulation. For Wundt, the most important aspects of the mind could be studied only indirectly by studying its products, such as religion, morals, myths, art, social customs, language, and law. These products of the mind could not be studied experimentally but only through naturalistic observation” (Fahrenberg, 2019).

Titchener made the *structuralism* paradigm. “Structuralism, like Wundt’s voluntarism, was concerned with the systematic study of human consciousness, and it, too, sought the elements of thought. In explaining how the elements combine to form complex thoughts, voluntarism stressed the will, perception, and creative synthesis-following in the rationalistic tradition. Voluntarists postulated an active mind. In their explanation of the formation of complex thoughts, structuralists stressed the laws of association-following in the empiricist tradition” (Boring, 1927).

*Functionalism* was the third main learning approach. “*Functionalism* initially coexisted with structuralism. Although functionalist beliefs diverged, their emphasis was always the same—the utility of consciousness and behavior in adjusting to the environment. Clearly the functionalists were strongly influenced by Darwin’s doctrine of evolution. The founder of the functionalist movement is usually thought to be James (1890). Consciousness cannot be reduced into elements as James indicated, and functions are a unity whose purpose is to allow the organism to adjust to its environment” (Hergenhahn & Olson, 2013).

The fourth prior paradigm of learning was the well-known behaviorism. “The founder of *behaviorism* was Watson (1959), who noted that consciousness could be studied only through the process of introspection, a notoriously unreliable research tool. Because consciousness could not be reliably studied, he said, it should not be studied at all. To be scientific, psychology needed a subject matter that was stable enough to be reliably measured, and that subject matter was behavior. Watson (1959) felt that the main concern for the psychologist should be behavior and how it varies with experience. Watson and McDougall (1929) emphasized that the behaviorist cannot find consciousness in the test tube of his science. He finds no

evidence anywhere for a stream of consciousness, not even for one so convincing as that described by James (1890). He does, however, find convincing proof of an ever-widening stream of behavior. Watson had two lasting effects on psychology. First, he changed psychology's goal from attempting to understand consciousness to the prediction and control of behavior. Second, he made behavior psychology's subject matter. Ever since Watson (1959), all psychologists have studied behavior. Even cognitive psychologists use behavior to index postulated cognitive events. For this reason, it can be said that all contemporary psychologists are behaviorists" (Hergenhahn & Olson, 2013).

## **1.4 The Impact of Learning Approaches**

Learning approaches play an important role in both understanding and applying learning in practice. "Learning begins a very long time before school, continues for even longer after school, and happens rapidly, and in parallel with school, in a great number of different ways and settings. Learning proceeds in several different ways and has been described and explained by many different interested researchers over many years. There is a range of definitions of the process of learning; (1) a change in behavior because of experience or practice; (2) the acquisition of knowledge; (3) knowledge gained through study; (4) to gain knowledge of, or skill in, something through study, teaching, instruction or experience; (5) the process of gaining knowledge; (6) a process by which behavior is changed, shaped or controlled; (7) the individual process of constructing understanding based on experience from a wide range of sources" (Hergenhahn & Olson, 2013).

Learning is considered as a process and a product at the same time. "In everyday terms, it is supposed that learning is the process of gaining more knowledge, or of learning how to do something. Learning is viewed differently by those who have spent time investigating and experimenting in the field, according to the context of their work and other factors exerting influence at the time. It is looked at by both behaviorist and cognitivist and considers the very different approaches that each takes and the very different definitions that each might offer of a process which, for most people, comes very naturally. A basic understanding of processes of learning is essential for teachers who intend to develop activities that will have the potential to lead to effective learning taking place in classrooms" (Hergenhahn & Olson, 2013).

Research on the process and product of learning has continued in parallel with the development of education and schooling from antiquity to the present day. “Although the history of a philosophical interest in learning can be traced back to ancient times, the modern history of the psychology of learning dates to the late nineteenth and early twentieth centuries. James (1890) pointed out that psychology was the “science of mental life”. It is from this approximate starting point that two branches of the psychology of learning developed and have made important inroads into the practice of teaching over the last decades. First there is *behaviorism*, and second *constructivism*, which is an aspect of a very much larger field of understanding and study, that of *cognitive psychology*. Both branches have a series of sub-branches, but it is reasonably fair to divide learning theory in this way. Behaviorism is concerned with what can be seen happening-*behavior*. Constructivism rests on the idea that knowledge and, more importantly, understanding are *constructed* by individual learning and an understanding of the mental processes involved; the underlying structures relating to knowledge and understanding are deemed to be of prime importance” (Hergenhahn & Olson, 2013).

Learning styles have also played a very important role in students' acquisition of knowledge in various academic disciplines. “An aspect of the learning process that in relative terms has only recently come to the fore is that of individual learning preferences. The ideas that lie behind the notion that we as individual learners have preferred approaches to our learning are based upon research which identifies humans as more or less receptive to different stimuli. This leads to a classification of learning types which describes learners in such terms as (a) visual, (b) auditory or (c) kinesthetic learners. An important development in our understanding of how learning proceeds was Gardner's work on *multiple intelligences*. He describes a picture of a set of different intelligence strengths, including areas such as linguistic, mathematical, physical and more, which all people have in different proportions, giving each of them a different profile of intelligences which will affect the way in which the people approach problems and the ease with which they might understand new ideas according to how they are presented” (Hergenhahn & Olson, 2013).

Learning to learn constitutes a very advanced level of understanding and practical application of learning. “*Metacognition* is another example of the development of our realization that learning is a vast and complex subject. Metacognition refers to knowledge and thought about learning itself. It is proposed that if an individual learner can gain insight into their own thought processes and come to understand better the ways in which they learn then

they are better equipped as learners and likely to make good progress at times when they might otherwise find learning less straightforward. The last developing area of knowledge about learning is that of what is widely known as *brain-based learning*. This refers to a body of knowledge taken from a range of disciplines, including neuroscience and educational research, which gives insight into approaches that appear to favor learning and that rely on what is known about brain structure and function” (Hergenhahn & Olson, 2013).

## 1.5 Learning and Behavioral Change

The science of studying behavior or psychology has known its stages of development and has filled a gap in the body of scientific and academic knowledge. “Psychology has become a behavioral science for good reasons. Science requires an observable, measurable subject matter, and in the science of psychology, that subject matter is behavior. Thus, whatever we study in psychology must be expressed through overt or covert behavior, but this does not mean that the behavior it is studying is learning. Authors study behavior so that they can make inferences concerning the process believed to be the cause of the behavioral changes they observe. In this case, that process is learning. Most learning theorists agree that the learning process cannot be studied directly; instead, its nature can only be inferred from changes in behavior. Skinner took exception to this contention. For Skinner, behavioral changes are learning, and no further process needs to be inferred. Other theorists say that behavioral changes result from learning. Except for the Skinner theory authors, most learning theorists look on learning as a process that mediates behavior. For them, learning is something that occurs as the result of certain experiences and precedes changes in behavior. In such a definition, learning is given the status of an intervening variable. An intervening variable is a theoretical process that is assumed to take place between the observed stimuli and responses. Independent variables cause a change in the intervening variable- learning, which in turn causes a change in the dependent variable- behavior, the situation that can be diagrammed as follows” (Hergenhahn & Olson, 2013).

Table 1: Relationship among experience, learning and behavioral changes  
*Source: Hergenhahn & Olson (2013)*

<b>Independent variables</b>	<b>Intervening variable</b>	<b>Dependent variables</b>
Experience	Learning	Behavioral Changes

### ***1.5.1 Learning and Performance***

Learning must be translated into the performance of behaviors, activities, achievement of objectives or acquisition of knowledge, skills and competencies, although there are different concepts. “As previously mentioned, what is learned may not be utilized immediately. Athletes, for example, may learn a new strategy by watching films and listening to lectures, but they may not translate that learning into behavior until game time. In fact, some players may be prevented from performing for a prolonged period because of an injury or an illness. It is said, therefore, that the potential to act differently resulted from learning, even though behavior was not immediately affected. This type of observation has led to the very important distinction between learning and performance. Learning refers to a change in behavior potentiality, and performance refers to the translation of this potentiality into behavior” (Hergenhahn & Olson, 2013).

### ***1.5.2 Practice vs Experience***

Practice, reflexes, and experience, although considered related to each other, constitute different concepts. “Obviously not all behavior is learned. Much simple behavior is reflexive. A reflex can be defined as an unlearned or innate response in reaction to a specific class of stimuli. Sneezing in response to a tickle in the nose, exhibiting a knee jerk when doctor taps the patient with little hammer, and instantly withdrawing the hand when it touches a hot stove are examples of reflexive behavior. Clearly, reflexive behavior is unlearned; it is a genetically determined characteristic of the organism rather than a result of experience. Some complex behaviors can also be innate. When complex behavior patterns are genetically determined, they are generally referred to as examples of instinct. Instinctive behavior includes such activities as nest building, migration, hibernation, and mating behavior. Psychologists once explained complex behavior patterns by referring to them as instincts. It is said that birds and fish migrate because they possess a migration instinct, and birds build nests because of a nest-building instinct” (Hergenhahn & Olson, 2013).

However, some cases “seem to demonstrate complex behavior that is clearly not influenced by learning” (Brown, 1965). Different research studies supports “the contention that some species-specific behavior is both learned and innate. The formation of an attachment between an organism and an environmental object is called imprinting. Imprinting was found to occur only during a critical period, after which it was difficult, if not impossible. With imprinting, there is a combination of learned and instinctive behavior.

The main point to emphasize, however, is that to attribute a behavioral change to learning, the change must be relatively permanent and must result from experience” (Hess, 1958; Lorenz, 1970; Cambridge University Press, 2018).

According to Kimble’s (1961) definition, “learning results from reinforced practice. In other words, only reinforced behavior will be learned. On this point, there is widespread disagreement among learning theorists. Theorists disagree not only over what constitutes reinforcement but also over whether it is even necessary for learning to take place”. Hergenhahn and Olson (2013) revised Kimble’s (1961) “definition of learning to make it neutral on the matter of reinforcement, thereby making it more widely accepted. *Learning is a relatively permanent change in behavior or in behavioral potentiality that results from experience and cannot be attributed to temporary body states such as those induced by illness, fatigue, or drugs.* Such a definition still stresses the importance of experience but leaves it to the theorist to specify the kind of experience the theorist feels is necessary for learning to take place. These might include reinforced practice, contiguity between a stimulus and a response, or the acquisition of information”.

### ***1.5.3 Classical and Instrumental Conditioning***

Learning related to demonstrated behavior derives from experience. “Learning is a general term that is used to describe changes in behavior potentiality resulting from experience. Conditioning, however, is a more specific term used to describe actual procedures that modify behavior. Because there are two kinds of conditioning, instrumental and classical, many theorists conclude that there are at least two kinds of learning or that learning ultimately can be understood in terms of classical and instrumental conditioning” (Hergenhahn & Olson, 2013).

*Classical conditioning* may be shown in a summative way as follows:

- “A stimulus, such as food, is presented to an organism and will cause a natural and automatic reaction, such as salivating. The stimulus causing this natural reaction is called the unconditioned stimulus. The natural, automatic reaction to the unconditioned stimulus is called the unconditioned response.
- A neutral stimulus one that does not cause a unconditioned response, such as a tone or light, is presented to the organism just prior to the

presentation of the unconditioned stimulus. This neutral stimulus is called the conditioned stimulus.

- After the conditioned stimulus and unconditioned response are paired several times, with the conditioned stimulus always preceding the unconditioned stimulus, the conditioned stimulus alone can be presented, and the organism will salivate. This salivating response, similar to the organism's response to the unconditioned stimulus, now occurs in response to the conditioned stimulus, the tone or the light. It is now said that a conditioned response has been demonstrated" (Hergenhahn & Olson, 2013).

Classical conditioning, the unconditioned stimulus and reinforcement are considered to be linearly and logically related to each other. "In classical conditioning, the unconditioned stimulus is called reinforcement because the entire conditioning procedure depends on it. Meanwhile, with *instrumental conditioning*, the organism must act in a certain way before it is reinforced; that is, reinforcement is contingent on the organism's behavior. If the animal does not emit the desired behavior, it is not reinforced. Thus, in instrumental conditioning, the animal's behavior is "instrumental" in getting it something it wants, that is, a reinforcer. A small experimental test chamber called the *Skinner box* is often used to demonstrate instrumental conditioning or a closely allied form of conditioning called operant conditioning. Such a box is a Plexiglas cage with a metal-grid floor and a lever that, when pressed, activates a feeder mechanism that delivers food pellets to the animal inside. The experimenter introduces a hungry rat into the Skinner box. As the rat explores the enclosure, it will eventually activate the lever and receive a pellet of food. Soon the rat will associate lever pressing with the appearance of food, and its rate of lever pressing will increase. In this case, the rat must engage in lever pressing to get food. The lever pressing is the conditioned behavior; the food is the reinforcement" (Hergenhahn & Olson, 2013).

Escape conditioning, avoidance conditioning are related specifically to instrumental conditioning. "Escape and avoidance conditioning are special kinds of instrumental conditioning. In escape conditioning, a rat is placed in the Skinner box and the grid floor is electrified. The animal must perform some response, such as jumping a small hurdle or climbing onto a small platform, to terminate the shock. The rat will associate the response with the termination of the shock. In this case, the escape response is the conditioned behavior, and the termination of shock is the reinforcement. To demonstrate avoidance conditioning, let the Skinner box floor be electrified at intervals, with a signal, such as a light, that precedes the onset of shock by, say, five

seconds. The rat will soon learn to associate the light with the onset of shock, and it will perform its response to avoid the shock whenever it sees the light go on” (Hergenhahn & Olson, 2013).

Authors are concerned about the influence that research about classical and instrumental conditioning will not consider individual experience. “Learning theorists have become increasingly aware that confining themselves to research involved with just classical and instrumental conditioning leaves out vast areas of human experience. Gagné (1970) feels it is more realistic to assume that there are eight kinds of learning. Gagné believes that the eight kinds of learning are arranged in a hierarchy, with one sort being a prerequisite for the next. Thus, for Gagné, simple conditioning simply provides the basis for the more advanced kinds of learning” (Hergenhahn & Olson, 2013).

1. *Signal learning*- the simplest form of learning known as classical conditioning. The learner is conditioned to produce a desired involuntary response because of a stimulus that would not normally produce that response.
2. *Stimulus-response learning*- this is a voluntary response to learning that may be used in acquiring verbal skills as well as physical movements. This type of learning can occur when the instructor praises the learner for deeper thinking or provides constructive criticism during reflection or debriefing.
3. *Chain learning*- occurs when the learner can connect two or more previously learned stimulus-response bond into a linked order; more complexed psychomotor skills are learned, but they tend to occur naturally i.e. learning how to tie shoestrings or buttoning a shirt.
4. *Verbal association*- occurs when the learner makes associations using verbal connections; it is the key process in language skill development.
5. *Learning discrimination* is seen when the learner can perform different responses to a series of similar stimuli that may differ in a systematic way. Discrimination learning is made more difficult when the learner comes across roadblocks or interference that inhibits continual learning.
6. *Concept learning*- involves the ability to make consistent responses to different stimuli; it is the process in which the learner learns how to organize learning in a systematic structure and foster deeper learning. The student’s behavior is controlled by the abstract properties of each stimulus.

7. *Rule learning*- this involves being able to learn relationships between two or more concepts and apply them in different situations, new or old; it is the basis of learning general rules or procedures. This can be seen when the student can apply advocacy and confidentiality to a patient situation.
8. *Problem solving*- involves developing the ability to invent a complex rule or procedure for the purpose of solving one problem and other problems of a similar nature; this can be accomplished through case studies and reflection” (Gagné, 1970).

Learning paradigms and teaching practices seemed to be related in a linear way. “There is a close relationship between the principles of learning and educational practices. In many cases, principles that have been uncovered while studying the learning process in the laboratory have been utilized in the classroom. The widespread utilization of programmed learning and computer-assisted instruction offers examples of how research on learning influences teaching practices. It is reasonable to conclude that as the knowledge of the learning process increases, educational practices should become more efficient and effective” (Hergenhahn & Olson, 2013).

## CHAPTER 2

### EVOLUTION OF LEARNING CONCEPT

#### **2.1 Development of Learning Concept**

Obtaining knowledge, behaviors, skills, values, and attitudes or learning process is one of the most significant issues in human life. “The interest in learning and how to influence it have been around throughout history. Already in ancient Greece, Socrates- fifth century B. C. and in Rome Seneca- first century A. D. wrote about the nature of learning. At the dawn of the modern era, Vives (1492-1540) and Comenius (1592-1671) formulated influential ideas about learning and teaching (Berliner, 2006). In the less distant past, Herbart (1776-1841) and his followers can be considered as the precursors of the scientific study of learning and teaching. They stressed, for instance, the important role in learning prior knowledge consisting of mental states or ideas. New ideas are learned by relating them to already existing mental states by a process of apperception” (Bigge, 1971).

Learning has undergone very important developments especially in the 20th century. “During the 20th century the concept of learning has thus undergone important developments. For behaviorists, it was conceived of as response strengthening through reinforcements. The advent of cognitive psychology brought fundamental change by putting the focus on the central role of information processing which led to the view of learning as the acquisition of knowledge in rather passive ways. With the focus on the active role of the learner as a sense-maker came a new metaphor for learning as knowledge construction. Near the end of the century this constructivist view was amended by highlighting the important role of the situation in which cognition and learning occur and the socio-constructivist understanding of learning is seen as participation or social negotiation. The latter constitutes the current dominant view of learning. In this approach the psychological processes evolving in the learner, on the one hand, and the social and situational aspects impacting learning, on the other hand, are reflexively related, with neither having priority over the other. This

distinguishes the socio-constructivist standpoint from the socio-cultural approach that accords precedence to the social and cultural processes” (Cobb & Yackel, 1998).

## 2.2 Behaviorism

The theory of learning indicated that human behaviors are get through conditioning or interaction with the environment- behaviorism contributed significantly in psychology of learning. “The behaviorist understanding of learning originated in the United States in the early 1900s, where it came to dominate during the first part of the 20th century. The basic idea of the behaviorist perspective is that learning consists of a change in behavior based on the acquisition, strengthening and application of associations between stimuli from the environment and observable responses of the individual, so-called *S-R (Stimuli-Response) bonds* or connections. This view underlies a family of behaviorist learning theories that vary especially in the mechanisms seen to be influential in determining the S-R bonds. for education, the two most important behaviorists were Thorndike and Skinner. Thorndike’s variant of behaviorism dominated the early decades of the 20th century and is usually called *connectionism*. For Thorndike, the connections between stimuli and responses are controlled by different laws of learning, the most important being the *law of effect*: a response to a stimulus is strengthened or reinforced when it is followed by a positive rewarding effect, and this occurs automatically without the intervention of any conscious activity. The second major law- S-R connections become stronger by exercise and repetition- is the *law of exercise*. It is not hard to see the direct connection between this view of learning and the so-called drill-and-practice programs. In this era, Thorndike had a substantial impact on education” (de Corte, 2010).

Other authors bring about new approaches to behaviorism. Skinner (1953), “developed his variant of behaviorism known as *operant conditioning* towards the middle of the century. In contrast to Thorndike, Skinner distinguished between behavior elicited by external stimuli and operant behavior initiated by the individual. Rewarding the correct parts of the more complex behavior taken reinforces it and makes it more likely to recur. Reinforcers thus control the occurrence of the desired partial behaviors, and this is called operant conditioning. Skinner argued that his operant conditioning was immediately applicable to classroom learning even though it was based on experiments with animals. Learning is considered as the stepwise or successive approximation of the intended complex behavior. It

is guided by reinforcement of appropriate contributing, but partial behavior produced by the individual or elicited by different situational arrangements organized by the teacher to facilitate their appearance. The best-known application of Skinner's theory to education is in programmed instruction, in which the correct sequence of the partial behaviors to be learned is determined by detailed task analysis" (de Corte, 2010).

### **2.3 Gestalt Psychology and Würzburg School of "Denkpsychologie"**

Gestalt approach of learning and the Würzburg model of thinking induced different point of views regarding psychology as the science of behavior. "The European counterparts of the behaviorist theories in the first part of the 20th century were gestalt psychology and the Würzburg school of the psychology of thinking. Both schools strongly disagreed with psychology as the science of behavior, a view which they considered too mechanistic. Although behaviorism was quite well known in Europe, it never became as dominant as in the United States. The key idea of gestalt psychology is expressed in the German word Gestalt which means a *configuration*- an organized whole as opposed to a collection of parts. Exponents such as Wertheimer and Köhler argued that human behavior cannot be fully understood by the behaviorist approach of breaking it down into its constituent parts. On the contrary, it must be studied (Bigge, 1971). The mind interprets sensory data according to organizing principles whereby humans perceive whole forms- *gestalts*, rather than atomistic perceptions (De corte, Greer & Verschaffel, 1996): the spontaneously observed whole comes first and is afterwards gradually given structure" (de Corte, 2010).

The report between the whole and the parts was in the core of Gestalt and Würzburg approach of learning. "The whole is more than the composite parts. for learning and thinking, the major contribution of gestalt psychology is their study of insight: learning consists of gaining insight, discovering a structure, and, hence acquiring understanding. Insightful learning occurs as the sudden solution to a problem. But because the gestalt approach to learning remained rather global, it had little to say about instruction" (Knoers, 1996). The "Würzburg school led by Külpe, focused on the study of thinking, especially problem solving. A basic idea of the Würzburgers was that a problem-solving process is guided by a determining tendency, i.e. the thinking process is goal-oriented and controlled by the task. Building on this idea, Selz (1913) studied thinking processes and discovered that

good thinking depends on using appropriate solution methods, and that there are specific methods for solving problems” (Frijda & De Groot, 1981).

## 2.4 Cognitivism

The main focus of theory of cognitivism is on processing the information inside the human mind, going beyond observable behavior. “An important development in American psychology was initiated in the late 1950s and has become known as the *cognitive revolution*; this resulted in the shift from behaviorism to cognitive psychology. People are no longer conceived as collections of responses towards external stimuli but essentially as information processors. One reason for this shift was growing dissatisfaction in psychology with the ability of behavioristic theories to explain complex mental phenomena” (Gardner, 1985). But also, according to Simon (1979) who was a pioneer of cognitive psychology, this development was strongly influenced by the ideas of Würzburg and gestalt psychology, and by the emergence of the computer as an information-processing device that became a metaphor for the human mind. The so-called *information-processing* approach became increasingly dominant in instructional psychology in the 1970s and, in contrast to behaviorism, strongly influenced European research. Instead of being satisfied with studying externally observable behavior, the aim was to analyze and understand the internal mental processes and the knowledge structures that underlie human behavior. So, the interest in education is, for instance, in grasping the strategies involved in competent mathematical problem-solving or unravelling the conceptual structure of a students’ knowledge of the French revolution”.

Cognitivism is based on the rationalism putting in the first place the obtaining of knowledge and internal mental structures functioning. “The new perspective was accompanied by a fundamentally different understanding of the nature of human cognition, namely a shift from an atomistic toward a gestalt view. This considered the organization of knowledge as the central characteristic of cognition” (Greeno, Collins & Resnick, 1996). The behavioristic, response-strengthening metaphor of learning was replaced by the knowledge-acquisition metaphor” (Mayer, 1996; Sfard, 1998). Learning is seen as” the acquisition of knowledge: the learner is an information-processor who absorbs information, performs cognitive operations on it and stores it in memory. Accordingly, lecturing and reading textbooks are the preferred methods of instruction; at its most extreme, the learner is the

passive recipient of knowledge seen as a commodity dispensed by the teacher” (Mayer, 1996; Sfard, 1998).

## 2.5 Constructivism

According to constructivism learners build their understanding through experiences and interaction, integrating new ideas or notions with prior knowledge and skills. “To unravel internal mental processes and knowledge structures in their studies of human learning and thinking, cognitive psychologists had to administer more complex assignments than the simple laboratory tasks used by the behaviorists. Out of this research work emerged the idea during the 1970s and 1980s that learners are not passive recipients of information; rather, they actively construct their knowledge and skills through interaction with the environment and through reorganization of their own mental structures. As argued by Resnick (1989), “learning occurs not by recording information but by interpreting it”. Learners are thus seen as sense-makers. Stated differently, the knowledge-acquisition metaphor had to be replaced by the knowledge-construction metaphor” (Mayer, 1996).

Constructivism is based in epistemology, a theory of knowledge focused on logical categories of knowledge and its rationalization. De corte and Verschaffel (1987), “found evidence supporting this constructive view of children’s learning even in the simple domain of solving one-step addition and subtraction word problems. Indeed, they observed in first graders a large variety of solution strategies, many of them not taught in school, in other words, they were constructed by the children themselves. The accumulating evidence in favor of the constructive nature of learning was also in line with and supported by the earlier work of influential scholars like Piaget (1955) and Bruner (1961)”.

There are a lot of different options of constructivism. “One of the distinctions relevant for education is between radical and moderate constructivism. Radical constructivists claim that all knowledge is purely an idiosyncratic cognitive construction and not at all the reflection of a reality out there. For moderate or realist constructivists, learners arrive at cognitive structures that eventually correspond to external realities in the environment, and this construction process can be mediated by instruction. But common to all constructivist perspectives is the learner-centered approach whereby the teacher becomes a cognitive guide of student learning instead of a knowledge transmitter” (Phillips, 1995; Steffe & Gale, 1995).

## 2.6 Socio-constructivism

Social constructivism or sociological theory of knowledge indicates that knowledge is constructed through socially interaction with others. Like social constructionism, social constructivism states that people work together to actively construct artifacts. “In the late 20th century, the constructivist understanding of learning was further amended by the emergence of the *situated cognition and learning* perspective that stresses the important role of context, especially social interaction” (Brown, Collins & Duguid, 1989; Greeno, 1989). “Strongly influenced by the landmark work of Vygotsky (1978), but also by anthropological and ethnographic research (Rogoff & Lave, 1984; Nunes, Schliemann & Carraher, 1993), the information-processing constructivist approach to cognition and learning came in for increasing criticism. The major objection was that it considers cognition and learning as processes taking place encapsulated within the mind, with knowledge as something self-sufficient and independent of the situations in which it unfolds. In the new paradigm, cognition and learning are conceived of as interactive activities between the individual and a situation, and knowledge is understood as situated, “being in part a product of the activity, context, and culture in which it is developed and used” (Brown et al., 1989).

Social constructivism shows that the natural world has a small or non-existent function in the construction of knowledge and skills. Cognition is thus “considered as a relation involving an interactive agent in a context, rather than as an activity in an individual’s mind (Greeno, 1989). This led to new metaphors for learning as participation (Sfard, 1998) and social negotiation” (Mayer, 1996).

## 2.7 The Influence of Learning Theories in Educational Practice

Learning theories describe how humans receive, process, and retain knowledge in the process of learning. The major aim of education is to promote student learning. Therefore, with the emergence of the scientific study of learning, expectations grew that this would yield principles and guidelines to improve classroom practice and learning materials. De Corte, Verschaffel and Masui (2004) have argued that “what has been called an educational learning theory (Bereiter, 1990) should involve the following four components: