1. **Main Learning Theories**

 Psychologists do commonly agree upon the fact that students are not alike and that no two individuals learn the same way. Psychologists concluded through their countless attempts of finding out how students learn that the human brain is characterized by its uniqueness and each individual’s personal experiences do shape the way one learns. This is why teachers and would be teachers should be trained in such a way to be ready to classroom daily teaching, and a very crucial part of teacher education is being knowledgeable about the different learning theories and ways of learning.

 Yet, the various learning theories differ from each other and, according to (Seifert and Sutton, 2009), the most common theories mostly stress upon two domains, either on changes in behavior or thinking. Though it is difficult to limit them to these two criteria, it is helpful to start presenting the learning theories at this level so that students/would-be teachers would have a broad idea about what the main principles of learning are and how the beliefs shaping them could help teachers cope with their everyday teaching/learning situations. To make this clearer, let’s consider behaviorism which focuses on learning which takes place thanks to changes in behavior, and constructivism, as the one which fosters changes in thinking.

 This latter, may even be divided into two sub categories: psychological constructivism which describes learning as a result to personal experiences and social constructivism as changes in thinking which take place thanks to assistance from others. These are two very simplified versions of what comes in the following chapter which will present behaviorism and constructivism.

 **2.1 Behaviourism**

 Behaviourism is a learning theory which initially drew its principles from the experiments done on laboratory animals and then transferred to human subjects. This learning theory stresses upon the observable behaviour of children and the changes in behaviour that take place while learning occurs. Behaviourists define learning as ‘the acquisition of a new behaviour, or the modification of behaviour as a result of teaching, training or tutoring’(Woollard, 2010,p:1).Learning is shown through the behaviour of learners in their actions or reactions to additional stimuli. This learning theory had had a big impact on education in the early twentieth century up to the mid-1970s when the appearance of Constructivism come into inter play in educational circles. As stated before, many psychologists took part in the shaping of this learning theory, its types, principles and characteristics. Within this chapter, we will present the two main trends of behaviourism, classical/respondent conditioning and operant conditioning.

* 1. 1 **Classical/ Respondent Conditioning**

 Generally speaking, respondent conditioning refers to the involuntary responses to particular sensations such as sights and sounds (Lavond,2003).When I come face to face with an unfamiliar dog in an unexpected place, my heart rate shoots up, I tremble and my legs cannot lift my weight anymore. However, whenever a little baby with his parents in a public place looks at me, I automatically smile in response. In both cases I have no control over my behavioral responses. Amazingly, these involuntary responses, not necessarily the above stated examples, are not only human specific but can be observed with animals, too. Just as humans do, a bird in a cage, a cat laying comfortably in its couch, or even a Lion in an animal park, would invariably react in the same way to the sudden loud noise, they all will show a startle response, try to find out the source of the noise and stay on the safer side on their guards for a while.

 These involuntary responses phenomena were first studied systematically by the Russian scientist Ivan Pavlov (1927).Pavlov who initially was a biologist interested in studying how enzymes are involved in facilitating the digestion of food through the digestive system, later on shifted his attention towards studying an unexpected behaviour developed by his laboratory dogs while trying to collect saliva by means of an experimental tube fixed to the side of dogs’ mouths.

 In fact, Pavlov’s aim was to discover what caused saliva to flow. So, he rerouted the saliva to the outside of his dog’s cheek so that he could collect and measure the spittle. He might have thought that the production of saliva is the result of fixed nervous reflexes like a knee jerk. After taking many measurement of spittle, he confirmed that dogs drooled automatically when their tongues touched food. He called the response the salivation reflex. But his work started to run into trouble as his dogs became familiar with this experimental routine, the dogs started to fill the spittle collecting tubes before Pavlov had a chance to stimulate their tongues and thus he noticed that the animals were learning to anticipate food and that was going to make him shift his research interests and discover what was later on going to be labeled ‘respondent conditioning’ which is sometimes also called classical conditioning due to the fact that it was the first form of conditioning which was studied systematically. To confirm his observation and start his new study, Pavlov erected screens so that to keep the dogs apart and prevent them from seeing what was going on on the other side of the screens. Yet, before passing meat through the hatch, Pavlov introduced a stimulus that was totally unrelated to feeding, a ticking metronome. At first the dog dripped saliva into its cheek tube only when the food appeared, but after a number of trials the dog began to connect the ticking with the arrival of meat. Soon the sound alone made the dog drool. Eventually, the dog salivated as much to the ticking itself as it did originally to the presentation of food. Pavlov called this new response *the conditioned reflex*. Whatever the stimulus (bell, light, classical music….) his dogs could soon be conditioned to produce saliva. Pavlov believed that he had discovered how animals learnt even for those living in the wild. He at the same time came out with different concepts related to those different stimuli and their respective responses. These are shown in the representation below:

**Before Conditioning:**

(**U**nconditioned **S**timulus ) Food→ Salivation (**U**nconditioned **R**esponse)

(**N**eutral **S**timulus) Bell→ No response

**During Conditioning**:

(**N**eutral **S**timulus)Bell + Food→ Salivation

**After Conditioning**:

(**C**onditioned **S**timulus) Bell only→ Salivation (**C**onditioned **R**esponse)

 To have a clearer insight of these concepts, suppose you have a dog named Hunter before any conditioning. At the beginning Hunter salivates (**U**n**c**onditioned **R**esponse **UCR**) only after it takes its meal (Unconditioned Stimulus **UCS**). As time goes by, however, a neutral stimulus- such as the sound generated by dog food bags- is usually associated with the eating experience. Through time, this neutral stimulus causes Hunter to salivate even before tasting any food, or even if the bag contains a toy for your little baby. At this time the neutral stimulus(bag’s sound) is called a conditioned stimulus**(CS)** and the original response is labelled a conditioned response (**CR)**.Now after conditioning, Hunter might salivate at the sound of any large bag, regardless of its content, and might develop other conditioned responses beyond salivation, as following you around the rooms, walking by your side and even looking at you with soft eyes.

Thus, Pavlov assumed he had discovered that like animals, children learn by association or what some early behaviourists also called temporal contiguity. A baby may notice that when the doorbell rings, a person will come into the house. Because the bell’s ringing and the appearance of the person in the house take place simultaneously, the child is said to learn by association. But, how could this view of learning be transferred to classroom and what should teachers do to facilitate learning in the classroom.

**2.1.1.1 Features of Classical Conditioning**

**a- Generalisation:** When Pavlov first did his experiment on dogs in the laboratory he noticed that other neutral stimuli were also able to trigger in the dogs salivation when dogs began to pair them with food. The same as your dog Hunter begins to associate the sound made by any bag you bring home to its own food though what in the bag is sometimes just a toy to your little brother or a birthday gift to your mother. Psychologists name this process generalization or the likelihood for similar stimuli to give birth to a given conditioned response. Altogether with kids in school, generalisation does happen very often in situations where the learners pair a neutral stimulus such as the smiles of a teacher to his well-being in class with other teachers. Learners generally display generalizations mainly when they are younger.

 A very cited example of generalization is that of `Little Albert`, which was conducted by John B.Watson and Rosalie Rayner ( Watson and Rayner,1920 ).In this experiment a toddler (Little Albert) is presented with the following classical conditioning paradigm. First, a white lab rat was shown to the toddler. Little Albert had no emotional response to the rat but rather showed some interest to playing and petting the little white animal. Then, after a set of sessions, the presence of the rat was paired with a very loud noise. Upon the presence of noise, Little Albert would show some symptoms of fear and cry. Eventually, the mere presence of the rat in the laboratory elicited Little Albert fear. Interestingly, Little Albert also began fearing other neutral stimuli such as hamsters, rabbits, a white bunny toy, and even a white fur coat. This study is another example and evidence of the generalization phenomenon.

**b- Discrimination**: On the other hand, discrimination happens when individuals respond to certain stimuli but not to others (Mc.Sweeney et.al.2014).A classroom example of discrimination is a learner who has learnt to be anxious during a Math test but is able to remain relaxed during a history or an English test.

**c-** **Extinction**: This feature does not refer to the extinction of an animal species but is still related to the disappearance of a conditioned response because of the disappearance of the conditioned stimulus. Let’s take again the example stated above where the novice learner has a harsh and unfriendly teacher who sowed in the learner a feeling of discomfort that generated the conditioned response which is hating to come to school. Imagine that same teacher had to change the school for some reason and is replaced by another teacher who is more friendly and careful with his little pupils. The pupil will keep the same conditioned response with this new teacher as he transfers the behaviour of the first teacher to the second one. Yet, by time that conditioned response starts to extinguish until it disappears as the learner no more associates the harshness of the first teacher to his presence in the classroom. Eventually, the same phenomenon takes place if the conditioned response is a positive one when a gentle teacher is being substituted by one who is less friendly and is harsh with his pupils in classroom.

**2.1.1.2 Classical Conditioning in Schools**

 Who of us does not remember his first day at school and the feelings one had while coming into that place where everything was unfamiliar and that nothing resembled the comfortable safe ‘cocoon ‘ one came out from. Lucky were the kids who had a nice person who came in that room furnished with small sitting chairs and tables and talked gently with a soft voice and asked his pupils about their names, their fathers, mothers, siblings and things that alleviate the contextual chock they found themselves abruptly in. Usually, these little kids are in a hurry to go back to school the next day to meet again that person who welcomed them with a wide smile at the entrance of the class while rowed in pairs with their small bags on their backs. Gradually, the joy of seeing that teacher becomes associated with school and whenever being in school the kids are happy because they know they will meet that person becoming their source of joy. Sadly, the reverse is true, for kids who during their first day at school had a harsh teacher who ill-treated them and sowed in their little souls the feelings of fear and frustration. Both categories of kids will have different attitudes towards school because they were conditioned by the teacher who was in the beginning a neutral stimulus and who later on became a conditioned stimulus who generated a conditioned response which either is enjoying or hating being in school. This is a very simple example of classical conditioning one may encounter in school with kids and even teenagers in middle schools and secondary schools.

 The examples described in these two situations give us insights about how learners’ attitudes are affected in schools, and therefore also their motivation to learn. In the first positive situation, the novice learner becomes more willing to please the teacher and shows his readiness towards sitting for his lectures; while for the second situation, the opposite occurs.

 Teachers’ behaviour in the previously described examples is very important to know and consider since they have a direct impact on learners’ attitude about school and consequently on their motivation to learn. In the first described context, the child is more willing to come to school and may pay more attention to what his teacher is presenting in class. However, in the second context, the opposite is more likely to happen. Thus, as the changes in attitude take place ‘inside’ the individual learner, they are considered to be one way how children acquire intrinsic motivation as compared to extrinsic motivation. Yet, scholars argue that Classical conditioning can affect students’ intrinsic motivation in a positive or a negative way and that is explained by the features shaping it and that are described above.

**2.1.2 Operant Conditioning**

 Instead of focusing on associations between stimuli and behaviours, operant conditioning is rather concerned with on how the effect of consequences impact on behaviours. The operant model of learning (sometimes referred to as instrumental conditioning) is a method of learning that takes place via rewards and punishments for behaviour and a consequence for that behaviour. For example, when a laboratory rat presses a green button, he receives food as a reward, but when he steps on the red button he receives an electric shock. Consequently, the experimental animal is more likely to press the green button and avoids the red one because of their respective consequences.

 Yet, operant conditioning is not only related to studying the behaviour of laboratory animals, but also has an important role in everyday learning. Reinforcement and punishment occur almost every day and everywhere in informal as well as in formal settings such schools and universities.

 In what comes next we are going to have a close view on how operant conditioning came into the psychology scenery and how it is used to change old behaviours, usually undesirable, to teach new desirable ones.

**2.1.2.1 History of Operant Conditioning**

 Operant conditioning was coined by the American behaviourist Burrhus Frederic Skinner (1904-1990), that is why the concept is also sometimes referred to as **Skinnerian conditioning** (Cherry, 2019)**.**B.F Skinner is the 20th century preeminent psychologist who had a great contribution in the field of psychology. He came up with the idea that if psychology is to be a science, it cannot study anything that is not directly observable. Skinner did not deny the existence of the brain, but he argued that if one wanted to be a real scientist, one would never try to study the mind because that is, for him, like a black box that cannot directly be perceived, what can be seen directly was behaviour, and this is the most important sort of concept that he came out with thanks to his experiments which measured animals’ responses while being reinforced. So, the idea is a very simple one, if you want to increase some behaviour in someone, let’s say a positive behaviour like ‘*helping*’, what you need to do is to make sure that you give him reinforcement every time he does that behaviour, a smile or a cookie might be enough in some situations and with certain subjects.

 Skinner’s work was based on Thorndike’s (1898**) Law of Effect.** According to this type of learning, behaviour that is followed by pleasant consequences is likely to be done again, and the one which is followed by an unpleasant one is less likely to take place again. Thus, Skinner introduced a new term into the Law of Effect - Reinforcement. Behaviour which is reinforced tends to be repeated (i.e., strengthened); behaviour which is not reinforced tends to extinguish.

 Skinner did his experiments mostly on Laboratory rats. He first fed them for many days until they gained weight and then starved them for long hours and put them in a cage, called a skinner box, that contained nothing except a lever and a small container just big enough to hold a small quantity of food (see exhibit 1). At first the rat would wonder around the cage at random, but soon after would come close to the lever and eventually happen to touch or press on it. The lever would release food, which the rat would eat. Eventually, the rat would stay closer to the lever and presses it again and again, getting more and more pellets of food. Skinner, assumed that the animal had “discovered” that receiving food goes through pressing the lever. Skinner named the changes in the rat’s behaviour an example of operant conditioning, and attributed special names to the different parts of the process. He called the **food pellets** *the reinforcement* and **the lever-pressing** *the operant* (because it “operated” on the rat’s environment)



**Exhibit 2.1**: A Skinner box model (Retrieved from Google Image

Similar to what we have seen with classical conditioning, operant conditioning also tells us how human beings learn and mainly with learners in schools. There are many classroom examples which show the effect of consequences on learners’ behaviours.

Indeed, how to apply operant conditioning in classrooms is very simple. According to (Honig, 1966), when a certain kind of behaviour (labelled an operant) is followed by a stimulus ( usually called a reward or technically a reinforcer), that behaviour is likely to happen again and again as far as the stimulus is there. In this situation the operant is said to have been reinforced. The only concern of the teacher will be then to select the behaviour to be monitored and the appropriate stimulus to be applied. Theoretically, the reinforcer can boost the behaviour over time, or more exactly its occurrence rate.

**2.1.2.2.1 Positive reinforcement**

Operant conditioning takes place when a response to a stimulus is reinforced in a positive way.

Let’s remind the reader about the main principles governing this type of conditioning as put forward by John Woollard:

■ the reinforcer must follow the response;

■ the reinforcer must follow immediately; and

■ the reinforcer must be contingent on the response. (2010, p.65)

John Woollard (2010) believes that the rate at which new behaviours are learned can all be impacted by the timing, magnitude, and consistency of reinforcement. Three areas are said to be the sources of this classroom reinforcement and which are as follow: intrinsically from the learner’s self-motivations, extrinsically as part of the mechanisms of teaching and extrinsically as a result of the direct and personalised actions of the teacher. All three are important aspects of the behaviourist pedagogy and they are illustrated in Figure 2.1.The conditioning is usually sustained whenever the association between the stimulus and response is rewarded (reinforced), and therefore there are more chances that the response will occur even when the reward is removed.

 Wooollard (2010) believes that the intrinsic reinforcers are harder to control; nevertheless they have a great impact on the reinforcement process. Woollard (2010) argues that if association between the stimulus and the positively reinforced response is paired up by the two kinds of motivation, the intrinsic one like satisfaction, and the extrinsic teacher’s reward of praise or approval, then in this case the satisfaction reinforce is more likely to continue to motivate the learner even if the extrinsic reward has ceased to exist.

Intrinsic reinforcement

 **arousal:** anger; fear; excitement; misery ...

hedonic: relief; jo **hedonic:** relief, joy, satisfaction; pleasure; sexual ...

impulse or auto **impulse or automatic response:** smile with pleasure; jump with

 joy; sigh with relief; attack in anger; vomit in disgust ...

Environmental

reinforcement

 **automatic:** computer-based learning including quizzes and interactivity.

 **systematic:** pupil recording activities/milestones either privately or

 publicly unplanned events that reinforce behaviour.

Social reinforcement

 **verbal praise:** personalised/general; subjective/objective**;**

 **physical:** touch; stroke; pat; caress; hold; restrain; smack

 **Figure 2.1:** Classroom conditioning through reinforcement: adopted

 from ( John Woollard, 2010,p.65)

 The impulse responses made by learners can bear insightful signs for instructors to guess whether or not a type of stimulus is likely to generate a response enough adequate for establishing and sustaining learning. A response generated by fear or anger is not a positive reinforce, and the stimulus might not reinforce learning.

 The environmental reinforcements are the systems made available in class which systematically play the role of reinforcers. Systematic reinforcement can be fostered through available classroom teaching resources. Clearly defined outcomes should always be identified and communicated to learners in all kinds of teachings. The outcomes of the planned learning or the behavioural objectives should be sequenced and should reflect the results of a task analysis of the curriculum.

**2.1.2.2.2 Behaviour reinforcement through Shaping**

 Among the various ways of reinforcing a desired behaviour is shaping. This technique consists of reaching a complex behaviour through different stages of approximate behaviours. Shaping takes place by first reinforcing a behaviour that looks like the behaviour we want the learner to perform. More reinforcements are applied for each close behaviour performed by the subject under focus. It goes without saying that only the similar behaviours are reinforced.

Let’s take as an example learning to ride a bicycle to clarify the shaping process. Usually we learn to ride a bicycle thanks to some extrinsic reinforcement of success provided by a father, a mother or an older brother, but the most extrinsic reinforcement that impacts our learning and keeps us trying to cycle again and again is the bicycle itself when it keeps upright while we are sitting safely on its saddle. Yet, any clumsy behaviour such as pressing on the brakes too quickly is usually followed by an unwanted punishment. When we first try to ride a bicycle, we start doing it as novice riders, and it is through the process of successive approximations (shaping) that we reach the level of competent and self-confident cyclists.

 Some behaviourists consider shaping as a process which evolves just in the same way Darwin looks at the evolution of species (Baum, 2005).For Darwin, evolution does not have a predetermined end point but is a process of an on-going change in response to the environment. Likewise, learners are in a constant development of their skills (and some skills vanish during development) due to the reinforcement impacts taking place.

During the process of conditioning, the consequences of behaviour affect future probability of that behaviour demonstrations. Thorndike (1874/1949) and Skinner (1904/1990) have shown that reinforcement (also known as reward) strengthens a behaviour, i.e., increases its frequency, whereas punishment weakens a behaviour, i.e., decreases its frequency. Reinforcement can also be distinguished as primary/secondary and intrinsic/ extrinsic.

**2.1.2.2.3 Positive and Negative Reinforcement**

 Reinforcement is generally a stimulus whose application leads to the empowerment of an exhibited behaviour.An organism, after a series of connected presentations of behaviour-reward, pairs up a given behavioural action with a desired outcome and is motivated to repeat it in the future. When desired consequences occur, the reinforcement is said to be positive. However, when negative reinforcement is applied, it usually lead to the removal of unwanted behaviour. A positive reinforcement involves the introduction of a stimulus that raises the frequency of occurrence of a behaviour (e.g. a rat pressing a lever in a Skinner box to receive food). Negative Reinforcement, however, leads to a decrease of the frequency of an unwanted behaviour because it aims at the removal of an unpleasant stimulus (e.g. deactivating a car sound buzzer by putting on the seat belt.).

**2.1.2.2.4 Primary and Secondary Reinforcement**

 Primary reinforcers have the capacity to innately reinforce behaviour (Powell et al. 2017), they are also labelled by unconditioned reinforcers. They satisfy an existing, biology related need or desire (e.g., food, water, oxygen…etc), require no previous learning, and are primordial for our physiological and psychological well-being.

 Secondary reinforcers, also known as conditioned reinforcers, are generally neutral stimuli at first and then turn into conditioned ones because of repeated association with other reinforcers like: praise, good grades, gifts, money…etc) (Powell et al. 2016).

**2.1.2.2.5 Intrinsic and Extrinsic Reinforcement**

 Intrinsic reinforcement can be behind maintaining a wanted behaviour as reading for leisure, practising sport, writing or researching. While learning, this intrinsic reinforcement can be the exciting feeling of success, pride or discovery learning (Ormrod 2016).Whereas extrinsic reinforcement is the kind of reinforcement that is caused by consequences that are external to the organism. They may be material as money and gifts; social such as a smile, consideration, attention or praise; or positive feedback like teacher’s comments on learners’ progress, or good grades.

 Seifert (2009) claims that the extrinsic reinforcement is usually more easily noticeable than the intrinsic one. This may lead us to think, he argues, that the operant conditioning is a sort of “bribery in disguise”, and that practically that only the external reinforcements operate on learners’ behaviours.

**2.1.2.2.6 Positive and Negative Punishment**

 Punishment generates a given behaviour frequency decrease as it is paired up with an unpleasant outcome. In positive punishment, a particular behaviour is followed by a presentation of an unpleasant stimulus (e.g., a spank for a child after he has misbehaved). In negative punishment, a pleasant stimulus is removed (a child is not allowed to practise his hobby because he has not completed his homework). Yet, many problems have been raised with the use of punishment, and it should be avoided or at least used very attentively as it may generate strong emotional responses, aggression, or even resistance to the teacher’s or parents’ expected behaviour.(Powell et al. 2016).

 Hewett, 1968 stated that ‘Punishment is a dead-end since its effects run straight into the teeth of major educational goals. If one gets a child to sit quietly or read because they are afraid not to do so, one is a long way from achieving the oft-stated goals of self-discipline and self-directed learning’.

 Vargas goes further into the question by saying that it is even ‘Worse than not being fair to the learner who is, after all, doing what circumstances produced, punishment disrupts further progress. The harmful effects of punishment can be hard to eliminate’ (2009: 178).Thorndike’s law of effect states that the likely recurrence of a response is generally determined by its consequence or impact upon the individual whether that is positive (rewarding) or negative (punishing). A negative response weakens reinforcement and makes the recurrence less likely.

 **2.1.2.2.7 The Behaviourist Teacher**

 This part of the text will present some strategies that the behaviourist teachers usually adopt to meet the needs of their learners. In the behaviourist classroom some, or all, of the following approaches to encouraging learning will be evident. The teacher will:

■have clearly structured the learning intention and outcomes (task analysis);

■ make use of activities that stimulate, motivate and reward the pupils (positive reinforcement);

■ observe and record positive and appropriate responses in the beginning (baselining);

■ make explicit the expected outcomes and behaviours (SMART targets);

■ reward achievement in a systematic and fair way (token economy);

■ enter into agreements to support pupils’ learning (contracts);

■ provide the appropriate opportunities for pupils to be in alternative places (sanctuary); and

■ set a good example in terms of physical appearance and behaviour and in terms of cognitive rehearsals (modelling). (Adopted from John Woollard 2010, p.93)

**2.1.3 Summary**

 The behaviourist movement has a long history and has influenced many areas of education. The major aspects of behaviourism are classical conditioning and operant conditioning. In behavioural learning theory under the paradigm of operant conditioning, the consequences of behaviour serve as guidance for future behaviour. When behaviour is followed by pleasurable consequences, reinforcement occurs and the behaviour is strengthened in the future. When behaviour is followed by aversive consequences, punishment occurs and the behaviour is weakened. Reinforcement and punishment are further distinguished by whether a stimulus is added (resulting in positive reinforcement and positive punishment) or removed (resulting in negative reinforcement and negative punishment).

The stimulus, response and consequence model underpins the concepts of conditioning and behaviour modification that drives the pedagogic processes. These have resulted in a number of educational strategies among which are the following ones:

■ behaviour that is positively reinforced will more readily reoccur (enabled by direct and indirect rewards);

■ intermittent reinforcement is particularly effective (enabled by scheduling);

■ learning experiences should be presented in small amounts (identified through task analysis),

■ so that the responses can be reinforced and complex objectives achieved (enabled by shaping);

■ reinforcements generalise across similar stimuli producing secondary conditioning;