

Quadrant-I E-Text

Details of Module and its Structure

Module Detail	
Subject Name	Education
Course Name	Understanding the Learner
Course Code	EDU502
Module Name/Title	<i>Theories of Learning: Pavlov's Classical Conditioning, Thorndike's connectionism, Skinners operant conditioning and their educational implications</i>
Module Code	UTL 008
Pre-requisites	Knowledge of basic schools of Psychology
Learning Outcome	After going through this lesson, the learners will be able to <ul style="list-style-type: none">• Understand the Concept of Classical conditioning• Describe the Classical conditioning experiment• Explain the Concept of Thorndike's connectionism• Differentiate between various Thorndike's laws of learning• Understand the concept of Skinners operant conditioning• List out the basic components of Skinners Operant conditioning experiment.• Explore the implications of different theories of Learning.
Keywords	Conditioning, Trial and Error, Stimulus and Response

1. Development Team

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1. Introduction

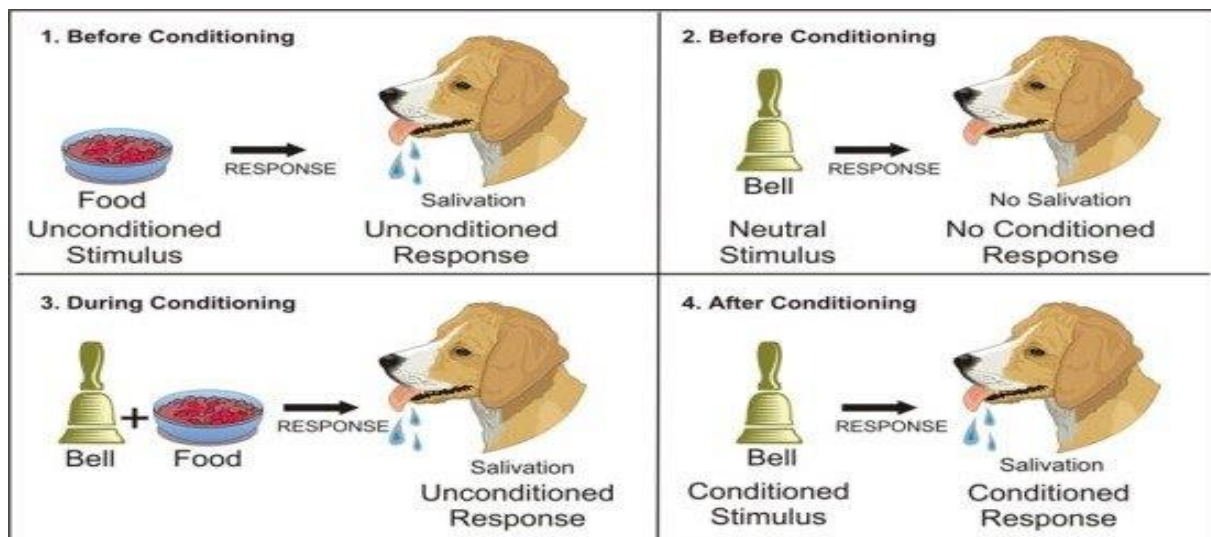
2. Pavlov's Classical Conditioning Theory:

It was the Russian physiologist Ivan Petrovich Pavlov (1849-1936) who first of all explained the process of conditioning as a form of learning in which the capacity to elicit a desired response is transferred from one stimulus to another. This theory is also called classical conditioning as it was the first to be reported in psychological literature. Pavlov in 1972 conducted an experiment on dog which may also be called as the first formal conditioning experiment. He trained one of his laboratory animals- dog to salivate at the sound of ticking metronome or bell. We will now describe the experiment conducted by Pavlov.

3. Classical Conditioning Experiment

When food is put into the mouth of organism, salivation is produced in the mouth of the dog. The salivation response on the part of dog is natural. The food in this case (meat powder) is called the unconditioned stimulus (UCS) and the response of salivation given by the dog when meat powder is presented before it is called Unconditioned Response. (UCR).The stimulus food is called UCS because it conveys the meaning that the response depends upon no special condition. During his experiment on dogs Pavlov introduced a sound of bell or ticking of metronome (Neutral stimulus) which did not evoke any response when it was first presented. Before conditioning the sound of bell did not elicit the response of salivation in the dog and was therefore called the Neutral stimulus. Pavlov discovered in the due course of his experiment that if the neutral stimulus such as ticking of bell was paired a number of times with the meat powder(UCS), the dog would gradually learn to salivate at the sound of the bell alone even in the absence of meat powder.

Thus the essential feature of classical conditioning is that the organism gradually learns to respond to a previously neutral stimulus because the neutral stimulus acquires the strength of UCS by being paired with it a number of times. Thus the neutral stimulus such as sound of the bell becomes a conditioned stimulus (CS) after a number of such pairings during the course of experiment and starts eliciting the response associated with unconditioned stimulus (Meat powder). This response that begins to



Classical Conditioning

occur as a result of conditioning is called conditioned response (CR) i.e. salivation response to the sound of bell alone in the absence of meat powder. In due course of time after several pairing of the CS and UCS, the CS begins to elicit the flow of saliva. Thus Classical conditioning is defined as a process in which neutral stimulus (sound of bell) by pairing with unconditioned stimulus (meat powder) acquires all the characteristics of unconditioned stimulus over a period of time and starts eliciting the response associated with unconditioned stimulus (Meat powder).

The basic elements of classical conditioning can be explained with the help of diagrams given above: **DIAGRAM 1.**

3.1. Basic concepts in classical conditioning:

There are several concepts that are associated with classical conditioning, some of these are:

3.1.1. Extinction:

Extinction is the term used for describing the procedure of omitting the UCS and presenting the CS alone. In other words, extinction is a process which results from the discontinuation of the UCS.

3.1.2. Spontaneous recovery:

If the subject whose CR has been extinguished is returned to the experimental environment an hour or two after the extinction has occurred, it is noticed that conditioned response occurs again. This process of appearance of a conditioned response after a reported extinction is called spontaneous recovery.

3.1.3. Stimulus generalization:

When an organism which has been conditioned to respond to one stimulus responds to other stimuli within that class without specific training it is known as Stimulus generalization

3.1.4. Stimulus discrimination:

It is the process where the subject learns to discriminate between the stimuli and as such all stimuli except CS are rendered neutral by extinguishing responses to them.

3.1.5. Educational Implications of Classical Conditioning:

The theory of classical conditioning can be successfully utilised in the following areas.

1. ***Inculcation of good habits:***

Theory of classical conditioning can be utilised in the development of good habits in children such as cleanliness, respect for elders and punctuality etc.

2. ***Elimination of fear***

Learning is acquired from social environment of human being. Acquired learning may be deconditioned by using classical conditioning. It can be used in removing of emotional fear and anxiety among the children.

3. ***Development of positive attitude***

This theory can be utilised for the development of favourable attitude towards learning subjects and teachers in school.

4. ***Vocabulary Building:***

The theory is useful in building of vocabulary, map reading skills, memorisation of historical dates, events, teaching of alphabets and learning of counting in classroom situations.

5. ***Development of Fear and Hatred:***

The development of love, fear and hatred towards specific subjects are created through the process of conditioning. For example an English teacher with his or her defective method of teaching and very strict behaviour in the classroom may be disliked by the students as a consequence of which the student may develop hatred towards the subject of English also due to teacher's behaviour.

4. Thorndike's connectionism

Edward L. Thorndike (1874-1949) was the first American psychologist who put forward the theory of connectionism in his book entitled "Animal Intelligence". His basic assumption was that learning implied an association between a stimulus and response. Such an association was given the name of bond or connection by Thorndike. According to Thorndike, all learning takes place as a result of formation of this bond or connection between stimulus and response.

In the process of learning these S-R bonds are constructed and strengthened over a period of time. Thorndike further added that learning takes place through a process of approximation and correction. The formation of the bond is the key point in describing the learning theory of Thorndike. An individual makes a number of trials and commits many errors in achieving the desired or satisfactory response.

Thorndike conducted a number of experiments on animals such as cats, fishes and dogs to explain the process of learning. Out of these experiments his most famous and influential experiment is with a cat placed in a puzzle box. He put forward his theory of trial and error based on the findings of this famous experiment which was later referred to as Thorndike's connectionism.

4.1. Thorndike's Experiment

Thorndike put a hungry cat in a puzzle box and a fish was kept outside the puzzle box. The box had one door, which could be opened by

manipulating a latch of the door. A fish was placed outside the box. The cat being hungry had the motivation of eating fish outside the box. However, the obstacle was the latch on the door. The cat made random movements of jumping and running inside the box indicating trial and error type of behavior biting at the box, scratching the box, walking around, pulling and jumping etc. to come out of the box to get the food. In the due course of her random movements, the latch got pressed accidentally and the cat came out of the puzzle box to get the food. Over a series of successive trials, the cat took shorter and much shorter time and was in a position to open the latch as soon as it was put in the box and the cat gradually learnt the art of opening the door and also of committed lesser number of errors as compared to the earlier trials.

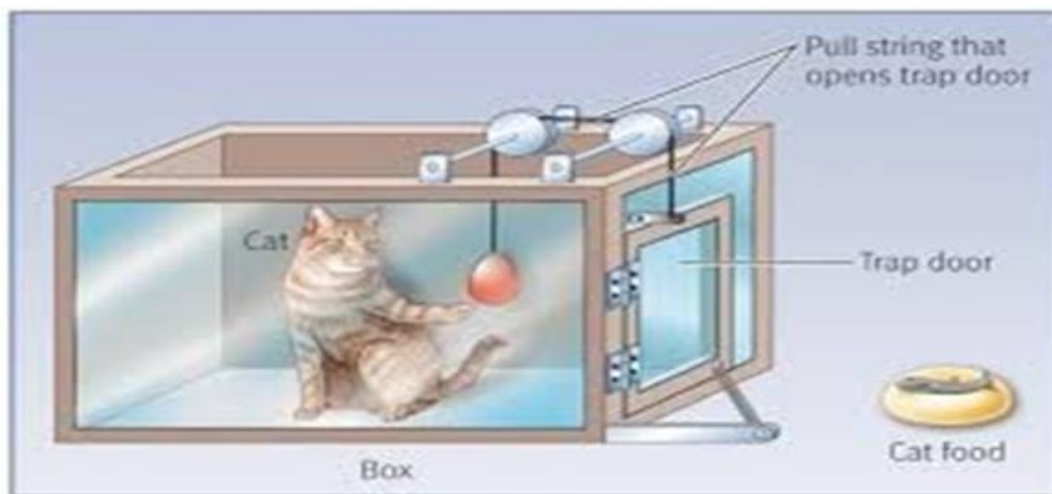


DIAGRAM 2:

Thorndike concluded that it was only after a number of trial and errors that the cat was get out of the puzzle box and therefore he named his theory as Trial and Error Learning. He also emphasized two main points after the analysis of the learning behavior of the cat. The experiment showed that in addition to trial and error the principles of goal, motivation and reinforcement are also involved in the process of learning by Trial and Error.

4.2. Thorndike's Laws of Learning

Thorndike gave certain laws of Learning based on his theory of trial and error of learning. We shall discuss three fundamental Laws of Learning in this section. These laws are:

4.2.1. Law of Readiness

Readiness means preparation for action. According to this law learning takes place only when the learner is prepared or ready to learn. No amount of efforts by the teacher and the parents can make the child learn if he or she is not ready to learn. There is an old saying that 'you can lead a horse to the pond but you can't make it drink water unless it feels thirsty' goes very well with this law. In other words, if the student is ready to learn, he/she learns more quickly, effectively and with greater satisfaction than if he/she is not ready to learn. In the words of Thorndike, the three stages of this Law of Readiness are:

- For a conduction unit ready to conduct, to conduct is satisfying.
- For a conduction unit ready to conduct, not to conduct is annoying.
- For a conduction unit not ready for conduction, to conduct is annoying.

Here the neurons and the synapse involved in the establishment of bond or connection are referred to as "conduction unit"

Thus, the Law of Readiness means mental preparation for action. It means one should not to force the child to learn if he is not mentally prepared to be ready to learn. The failures in learning occur as the result of forcing the learner to learn when he is not ready to learn something.

4.3. Educational Implications of Law of Readiness:

The law of readiness focusses the attention of teacher towards the motivation aspect of the child. To bring about successful learning outcomes the teacher must consider the psycho-biological readiness of the learner. Curriculum of the students should be according to the mental level of the child and should not be beyond the intellectual level of the child.

4.4. Law of Exercise

The law of exercise implies the strengthening of S-R bonds or connections with practice and the forgetting or weakening of these bonds when practice is not done. According to this law, learning becomes strengthened through practice or exercise. Here the dictum 'Practice makes a man perfect' goes very well with this law. This law is further divided into two parts — Law of use and Law of disuse. The law of use means that a connection between a

stimulus and response is strengthened by its occurrence, its exercise or its use. The word strengthening means increase in the probability of response to occur.

The law of disuse states that when a connection is not made between a stimulus and a response over a period of time, there is gradual decrease in the strength of the connection. This means that probability of the response to appear decreases when the S-R bond is weakened. Anything that is not exercised or practiced for a certain period tends to be forgotten or becomes weak in strength and efficiency over a period of time.

4.5. Educational Implications

1. According to this law practice occupies an important place in learning. Teacher should provide opportunity for sufficient practice in some subjects like mathematics, science, English grammar and drawing to the students. The drill practice used by the teacher strengthens the bondage between S-R.
2. This law of exercise plays very important role in the elementary classrooms especially in the learning of multiplication tables, alphabets and meanings of words.

4.6. Law of Effect

This is most important of Thorndike's laws, which state that when a connection between stimulus and response is accompanied by the state of satisfaction its strength is increased. On the other hand the connection strength is reduced or weakened when it is accompanied by state of annoyance. The old dictum 'Nothing succeeds like success' goes very well with this law. In other words, the responses that bring satisfaction to the learner are strengthened and responses that produce annoyance for the learner are weakened.

4.7. Educational Implications

1. This law signifies the importance of reinforcement or feedback in learning. This implies that learning must be associated with state of satisfaction. The teacher should use certain rewards such as praise and encouragement in the classroom to strengthen certain responses and punishment to weaken

others. However, the use of reward is more desirable than the use of punishment in school classrooms.

2. School activities and experiences should be organised in such a manner that the students may progress without any failure.

5. Skinners operant conditioning theory

It is referred to as a method of learning involving rewards and punishments for showing the desired behavior. It is a process in which control over the organism's behaviour is exercised in free environment by judicious application of reinforcement. Therefore, an operant conditioning is a process of learning in which behaviour of organism is emitted rather than elicited one and is strengthened in due course of time through reinforcement.

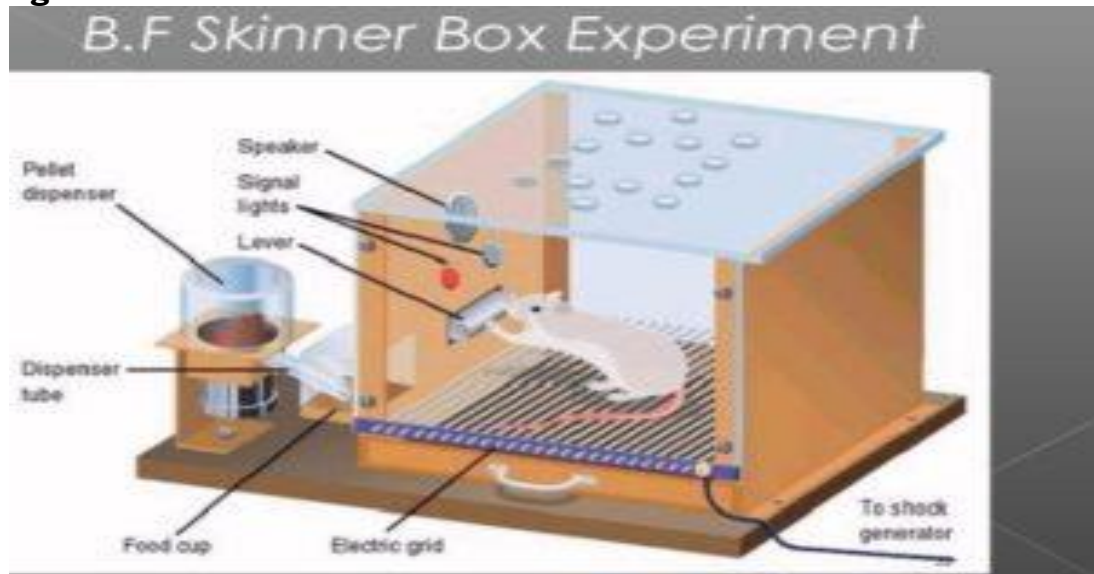
B.F. Skinner coined the term operant conditioning, which is why it is also referred as Skinnerian conditioning. Skinner used the term *operant* to refer to any "active behavior that operates upon the environment to generate consequences" (1953).

Skinner is regarded as the father of Operant Conditioning, but his work was actually based on Thorndike's law of effect. Skinner added a new terminology into the Law of Effect which is known as Reinforcement. The behavior that is appropriately reinforced tends to be repeated (i.e. strengthened) over a due course of time and the behavior which is not provided with reinforcement will become extinct over the passage of time.

5.1. Skinners Operant Conditioning Experiment

Skinner evolved his theory of operant conditioning by conducting experiments using animals, which he placed in a "*Skinner Box*" that was very much similar to Thorndike's puzzle box

Diagram: 3



His experiment with the Skinner box involved placing an animal (such as a rat or pigeon) into a sealed box with a lever that would release food when pressed. If food was released every time the rat pressed the lever, it would press it more and more because it learnt that by pressing of lever food is given. The pressing of lever in the experiment is described as an operant behavior, because it is an action that results in a consequence. In other words, it operates on the environment and changes it in some way.

The release of food as a result of pressing the lever by the rat or pigeon is known as a reinforcer because it increases the frequency of the operant behavior (lever pressing).

5.2. Concept of Reinforcement:

It occupies the central place in the theory of operant conditioning. A reinforcer is any event which changes subsequent behaviour when it follows the behaviour in time.

Skinner identified three types of reinforcers that can follow behavior.

5.2.1. Neutral Operants: Responses from the environment that neither increase nor decrease the probability of a behavior being repeated.

5.2.2. Reinforces are any event that strengthens or increases the behavior it follows. There are two kinds of reinforcers.

5.3. Positive Reinforces

These are events or outcomes that are likely to increase the frequency of desired behaviour. Praise, reward, salary, certificates of merit are examples of positive reinforcement.

5.4. Negative Reinforces

These involve the removal of an unfavorable events or outcomes after the display of a behavior. In these situations, a response is strengthened by the removal of something considered unpleasant. In both of these cases of reinforcement, the behavior increases. Physical punishment, discouraging or critical remarks are examples of negative reinforcers. A negative reinforcer precedes the response and forces its occurrence to terminate the unpleasant condition.

5.5. Punishment: - It is the presentation of an aversive stimulus which follows a response and frequently serves to suppress it. The punishment follows the response and decreases the likelihood of the recurrence of response.

Schedules of reinforcement

This term refers to the particular patterns according to which reinforcers follow responses or are delivered.

1. Intermittent schedule of reinforcement - reinforcement is given only part of the times the animal gives the desired response.

2. Continuous reinforcement - reinforcement is given every time the animal gives the desired response.

3. Ratio reinforcement - a pre-determined proportion of responses will be reinforced.

4. Fixed ratio reinforcement - Reinforcement is given on a regular ratio, such as every fifth time the desired behavior is produced.

5. Variable (random) fixed reinforcement- reinforcement is given for a predetermined proportion of responses, but randomly instead of on a fixed schedule.

6. Interval reinforcement- reinforcement is given after a predetermined period of time.

7. Fixed interval reinforcement - reinforcement is given on a regular schedule, such as every five minutes.

8. Variable interval reinforcement - reinforcement is given after random amounts of time have passed.

In animal studies, Skinner found that continuous reinforcement in the early stages of training seems to increase the rate of learning. Later, intermittent reinforcement keeps the response going longer and slows extinction.

Skinner specifically addressed the applications of behaviorism and operant conditioning to educational practice. He believed that the goal of education was to train learners in survival skills for self and society. The role of the teacher was to reinforce behaviors that contributed to survival skills, and extinguish behaviors that did not.

5.6. Basic components of Operant Conditioning

5.6.1. Shaping

In many situations of our life the desired response is uncommon or difficult to find therefore the designer of experiment using operant training procedure is advised to use technique called shaping. According to skinner operant conditioning shapes the behaviour of the animal as a sculptor shapes a lump of clay. Therefore, if we wish to condition an entirely new response we have to use a procedure called shaping. Human beings learn to speak languages, play basketball, driving a car through this procedure. Shaping consists of learning in small steps where each successive step requires a response that is more similar to the desired behaviour or performance. This process of developing complex Form of behaviour in small steps is called shaping.

5.6.2. Extinction

The process of extinction is almost reverse of the process of acquisition of response. Learning of a response is dependent upon the reinforcement. Now in this process when the desired response is emitted there is no presentation of the reinforcement. This is repeated again and again and in due course of time the strength of the desired response starts decreasing and over a period of time it is almost completely diminished. This procedure of eliminating the desired response is called Extinction.

5.6.3. Stimulus generalization and Discrimination

When an organism learns to make the same response to different stimuli within the same class it is known as stimulus generalization. Thus a pigeon conditioned to peck at key for food will peck the key no matter whether the key is black or white. After conditioning of the response if the pigeon is reinforced only when it pecks the black key, it is found that response of pigeon to white key is extinguished. Since the colour of the key serves as discriminative stimulus, it becomes visible that discrimination can also be taught to the organism in operant conditioning. This process is called as Stimulus Discrimination.

5.6.4. Chaining

Skinner described chaining as a process in which a series of responses or operants are linked or combined together. For example, in his Skinner box experiment if the rat has to obtain the food he must jump upon a platform, turn a wheel and then press the lever. Thus the three responses must be linked or chained together if the rat in the experiment has to obtain the food. At the level of human beings chaining involves linking long sequence of responses in order to produce the desired behaviour.

6. Educational Implications of the theory of operant conditioning:

6.1. Classroom behaviour

The classroom environment of our schools is dominated by unpleasant experiences and fear. Students do homework in order to avoid punishment from teachers. This unpleasantness becomes conditioned to the teacher, subject and as a result learner starts disliking the subject and the teacher teaching that subject. Good classroom environment in schools can be generated by using positive reinforcement such as rewards, praise and encouragement to eliminate the element of fear in schools.

6.2. Gap between behavior and reinforcement

It is widely seen in our schools that learner's behaviour is not properly reinforced by the teacher. This delay in reinforcement eliminates the effect of reinforcing stimulus. The teacher should make use of programmed instructional material in which there is provision for immediate reinforcement.

6.3. Objectives of school courses are vague

The objectives of our various school courses have not been properly defined in operational terms. This is major defect in our existing system of education. Teachers should start making use of new and innovative techniques in schools for teaching such as Programmed Instruction where the initial and the terminal behaviour which the teacher wants to instill in his learners are defined in operational terms. In this method whole subject matter is broken into small steps or frames arranged in a logical sequence and the learners progress from simple to complex frames and are provided with immediate reinforcement.

6.4. Shaping of Complex Behavior:

The theory of operant conditioning can be successfully utilized in shaping of complex behaviour in human beings. Shaping consists of learning in small steps where each successive step requires a response that is more similar to the desired behaviour or performance. Human beings learn to speak languages, vocabulary building and driving a car etc., through this procedure.

7. Summary

In this module we learnt about the concept of classical conditioning, Thorndike's connectionism, Skinner's operant behaviour and its conditioning. Now we have understood the Pavlov's classical conditioning and the essential feature of classical conditioning is that the organism gradually learns to respond to a previously neutral stimulus because the neutral stimulus acquires the strength of UCS by being paired with it a number of times. We have also learnt about Thorndike's theory of connectionism and the various laws propounded by Thorndike based on his theory. We have also come to know about the Skinnerian principles of reinforcement and shaping of behaviour in the organisms through successive stages of approximation i.e. learning of desired behaviour in organism through small steps.

Quadrant – III**Learn more/Web resources/Supplementary Materials**

Books, Articles, research papers, journals, case studies etc.:

Chauhan, S.S. (2000). Advanced Educational Psychology.6th revised edition, Vikas Publishing house, New Delhi.

Mangal, S.K. (2010). Advanced Educational Psychology.2nd edition, Phi Learning, New Delhi.

Links to websites giving additional readings, Wikipedia's, blogs, open source content etc.:

Diagram: 1

https://www.google.co.in/search?q=classical+conditioning&tbm=isch&tbs=ring:CTCHELxW9twUIjiHSVScYF-XGseSf_1-oKos7G0NbHU_1t7aMtyJfUnS8R48OzfEWNcYUDprrHp10191NujSdaGuJfjyoSCYdJVJxgX5caEaHS1B9sUrzmKhIJx5J_1_16gqizsRi3L8BwkDCfUqEgkbQ1sdT-3toxF08HSAUX9tdioSCS3II9SdLxHjEQJj6aDbzO9OKhIJw7N8RY1xhQMR5chmIdt4uUkqEgmmusenXTX2UxHwLHnHSwFfqCoSCW6NJ1oa4l-PEbdO782I7_1wb&tbo=u&sa=X&ved=2ahUKEwjsuuJh_HdAhUTSI8KHXREXBPtEQ9C96BAGBEs&biw=1517&bih=695&dpr=0.9#imgrc=JAjt86SbjP PgkM:

Diagram: 2

<https://www.google.co.in/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=2ahUKEwjR8K3P7oLeAhVF6aQKHrujBVgQjRx6BAGBEAU&url=https%3A%2F%2Ftwitter.com%2Feddiethorndike&psig=A OvVaw07qR7JuhszM1fxPrEWhwXW&ust=1539501075598024>

Diagram: 3

<http://specanthology.qwriting.qc.cuny.edu/how-operant-conditioning-in-the-house-of-stairs-relate-to-the-lab-rats-in-b-f-skinner-behavior-studies/>
www.verywellmind.com/operant-conditioning-a2-2794863
[simplypsychology.org/operant-conditioning.html](http://www.simplypsychology.org/operant-conditioning.html)
<http://www.preservearticles.com/201105206859/thorndikes-laws-of-learning.html>
<https://courses.lumenlearning.com/boundless-psychology/chapter/classical-conditioning/>

Glossary

1. UCS (Unconditioned stimulus): The meat powder that produced salivation naturally without any training.
2. UCR (Unconditioned response): The salivation response that occurs naturally at the presentation of meat powder.
3. CS (Conditioned stimulus): The sound of bell that starts eliciting saliva after conditioning procedure in the absence of meat powder.
4. CR (conditioned response): The salivation response that is produced by the sound of bell in the absence of meat powder.
5. Operant: Operant to refer to any "active behavior that operates upon the environment to generate consequences" (1953).
6. Shaping: Shaping consists of learning in small steps where each successive step requires a response that is more similar to the desired behaviour or performance.
7. Chaining: Chaining is a process in which a series of responses or operants are linked or combined together
8. Stimulus Generalization: When an organism learns to make the same response to different stimuli within the same class it is known as stimulus generalization.
9. Extinction: The procedure of eliminating the desired response is called Extinction. In this process when the desired response is emitted there is no presentation of the reinforcement.
10. Spontaneous recovery: The process of appearance of a conditioned response after its reported extinction is called spontaneous recovery.

Quadrant IV

Self-Assessment

Description: In self-assessment Question No. 1 to 11 consist of multiple choice questions in which learners are required to select the correct one out of the four alternatives.

1. The unconditioned stimulus in classical conditioning is
 - A. Food
 - B. Saliva
 - C. bell
 - D. none
2. The conditioned stimulus in classical conditioning is
 - A. Bell
 - B. saliva
 - C. Food
 - D. None
3. After the process of conditioning the neutral stimulus becomes
 - A. UCS
 - B. UCR
 - C. CS
 - D. CR
4. In Pavlovian conditioning function of reinforce is played by
 - A. UCS
 - B. UCR
 - C. CS
 - D. CR
5. For the extinction of built response
 - A. CS is to be presented with UCS
 - B. CS is to be presented without UCS
 - C. Only UCS needs to be presented
 - D. None
6. The child is fearful of black dog, black coat and now anything black in color is an example of
 - A. Response generalization
 - B. Stimulus Discrimination
 - C. Spontaneous recovery
 - D. Stimulus generalization
7. Developing new behavior and increasing the probability of a response by introducing reward or punishment is known as
 - A. Extinction
 - B. Shaping
 - C. Reward
 - D. Punishment
8. The concept of reinforcement in theory of learning was given by
 - A. Thurston
 - B. Thorndike

C. Pavlov

D. Skinner

9. In continuous reinforcement schedule (CRF), every appropriate response:

A. Is reinforced

B. Is not reinforced

C. Is sometimes reinforced

D. Is an instinctive drift

10. Aversion is one of the conditioning procedures used in

A. Chemotherapy
therapy

B. Non directive

C. Psychoanalytic therapy

D. Behaviour therapy

11. A skinner box is used for

A. Verbal learning

B. Motor learning

C. Problem solving

D. Sensory learning

Answers:

1. A 2. A 3. C 4. A 5. B 6. D 7. B 8. D 9. A 10. D 11. C