

MODULE I
LEARNING

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Definition – classical conditioning: Basic principles and applications – operant conditioning: Basic principles and applications – observational learning: nature and principles – cognitive learning.

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Learning occupies a very important role in our life. It helps us to acquire important skills and adapt to changing conditions in the world around us. Psychologists define learning as any relatively permanent change in behavior, or behavior potential, produced by experience.

Learning occurs in several basic forms. Some of the important forms of learning are classical conditioning, operant conditioning, cognitive learning, and observational learning.

CLASSICAL CONDITIONING

Classical conditioning (respondent conditioning) is one of the basic forms of learning in which one stimulus or event predicts the occurrence of another stimulus or event. Classical conditioning became a subject of study when Ivan Pavlov (1849-1936), a Russian physiologist identified it as an important behavioral process. He conducted a number of experiments to understand the nature of the process of conditioning.

In his major experiment, Pavlov kept a dog hungry for a few days and then tied him to the experimental table. Arrangements were made to give food to the dog through an automatic mechanism. He also arranged a bell to ring every time food was presented to the dog. Pavlov remained hidden from the dog but was able to view the experiment by means of a set of mirrors.

To begin the experiment, Pavlov rang a bell. At first, the bell was a neutral stimulus (it did not evoke a response). Immediately after Pavlov rang the bell, he placed meat powder on the dog's tongue, which caused reflex

salivation. This sequence was repeated many times: bell meat powder, salivation. Eventually (as conditioning took place) the dog began to salivate when the dog heard the bell. By *association*, the bell which before had no effect, began to evoke the same response as food. This was shown by sometimes ringing the bell alone. Pavlov then observed that the dog salivated, even when no food was present. Pavlov's conditioning procedure is shown below:

Before Conditioning

NS (Bell) → No Response
UCS (Food) → UCR (Salivation)

During Conditioning

NS + UCS → UCR

After Conditioning

CS (Bell) → CR (Salivation)

Principles of Classical Conditioning

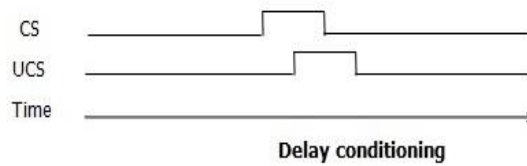
1.Acquisition: It is the process by which the CS (bell) gradually acquires the capacity to elicit a CR (salivation) as a result of repeated pairing with an UCS (meat powder).

There are some factors that affect the conditioning process. One of the most important factors is temporal arrangement of the CS-UCS pairings.

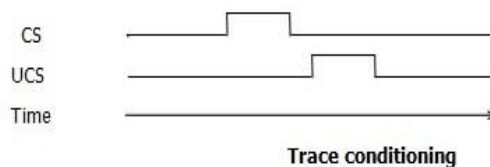
There are four types of temporal arrangements: delay conditioning, trace conditioning, simultaneous conditioning, and backward conditioning.

i. Delay conditioning: In delay conditioning, the CS is presented before the UCS and remains in place until the response occurs. This

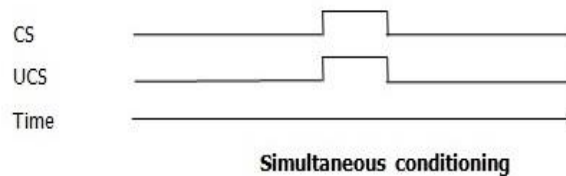
procedure is found most effective for establishing a conditioned response.



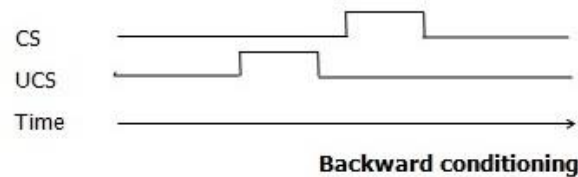
ii. Trace conditioning: In trace conditioning, the CS is presented and then removed before the UCS is presented.



iii. Simultaneous conditioning: In simultaneous conditioning, the CS and the UCS are presented at the same time.



iv. Backward conditioning: In backward conditioning, the UCS is presented prior to the CS. Conditioning is very poor in backward conditioning.



Intensity is another factor that affects the conditioning process. In general, conditioning is faster when the intensity of either the conditioned or unconditioned stimulus increases.

2. Expectancies: During conditioning, the brain learns to expect that the UCS will follow the CS. As a result, the brain prepares the body to respond to the UCS.

3. Extinction and spontaneous Recovery: Extinction is the process through which a conditioned stimulus gradually loses the ability to evoke conditioned responses when it is no longer followed by the unconditioned stimulus. For example, after many presentations of a bell (CS) in the absence of meat powder (UCS) the dog no longer salivates in response to the bell. That is extinction has occurred.

If the bell is rung, until the dog quits responding, it might seem that extinction is complete. However, the dog will probably respond to the bell again on the following day. The reappearance of a response following apparent extinction is called spontaneous recovery.

4. Stimulus Generalization: It is the tendency of stimuli, similar to a conditioned stimulus to evoke conditioned responses. That is once a person has been conditioned, other stimuli similar to the CS may also trigger a response. For example, the conditioned dog (with bell) may salivate to the sound of a ringing telephone or door bell, even though they were never used as conditioned stimulus.

5. Stimulus Discrimination: It is the process by which an organism learns to respond differently to stimuli that are distinct from the CS on some dimension.

Applications of Classical Conditioning

1. Eliminating the conditioned fear often called phobias through certain procedures such as flooding, and systematic desensitization.
2. In developing good habits, healthy attitudes, behavior, cleanliness, etc.
3. Eliminating undesirable habits, unhealthy attitudes, etc.
4. Training of animals.

OPERANT CONDITIONING

Operant conditioning or instrumental conditioning is a form of learning in which behavior is learned, maintained or changed through its consequences, often called reinforcers.

B.F. SKINNER

Skinner hypothesized that behaviors are acquired primarily through operant conditioning. His basic idea is that any behavior is entirely a functioning of its consequences. In other words, behaviors associated with desirable consequences will likely to be repeated while those associated with neutral or no consequences will not.

Skinner's Experiment

Skinner conducted his experiments on rats and pigeons in specially made boxes called the operant chamber. A hungry rat is placed in the chamber which was so built that the rat could move inside but could not come out. In the chamber, there was a lever, which was connected with a food container kept on the top of the chamber. When the lever is pressed, food pellet drops on the plate placed close to the lever. While moving around and paving the walls, (exploratory behavior) the hungry rat accidentally presses the lever and food pellet drops on the plate. The hungry rat eats it. In the next trial, after a while the exploratory behavior again starts. As the number of trials increases, the rat takes lesser and lesser time to press the lever for food. Conditioning is complete when the rat presses the lever immediately after it is placed in the chamber. It is obvious that lever pressing is an operant response (An operant is any behavior that is emitted by an organism and can be characterized in terms of the observable effects it has on the environment) and getting food is its consequence.

In his experiments with pigeons, Skinner made use of another specific apparatus called pigeon box. A pigeon in this experiment had to peck at a lighted plastic key mounted on the wall at head height and was consequently rewarded with grain.

Principles of operant conditioning

The probability of behavioral change is determined through four basic procedures, two of which strengthen or increase the rate of behavior and two of which weaken or decrease the rate of behavior. Procedures that strengthen behavior are termed reinforcement, whereas those that suppress behavior are termed punishment.

Reinforcement

A reinforcement is an object or event that increases the probability of a response. There are two types of reinforcers: primary and secondary reinforcers. Primary reinforcers are those that have a direct relationship to some biological drive such as food and water. Secondary reinforcers are those that become reinforcers as a result of being associated with primary reinforcers. Examples of common secondary reinforcers in humans include money, good grades, attention, flattery, praise and applause.

There are two types of reinforcement: positive reinforcement and negative reinforcement. A positive reinforcement involves a reinforcer that produces pleasure or satisfaction. For example, rat receives food when it presses a lever and eventually begins to press the lever more often. A negative reinforcement involves aversive stimulus events (head ache) that strengthen a response (taking medicine) that lead to their termination or avoidance. In other words, in negative reinforcement, a response is strengthened by the subsequent removal of an aversive stimulus. For example, taking aspirin to get relief from headache (aversive stimuli). Both positive and negative reinforcement strengthen or increase the likelihood of a response.

Premack principle can also be used to change behavior. According to this principle, more preferred activity can be used to reinforce a less preferred activity. For example, you must eat your vegetables before you get a dessert.

Schedules of reinforcement: a schedule of reinforcement means reinforcing the correct response on particular instance. When rewards are given after each response, the procedure is called *continuous reinforcement* and it leads to rapid acquisition of operantly conditioned responses. When rewards are withheld sometimes, the procedure is called partial reinforcement. Partial reinforcement schedule can be further classified into ratio schedules and interval schedules. Generally, ratio schedules produce higher rate of responses than the interval schedules.

In **ratio schedules**, the delivery of reinforcement depends on the number of correct responses. Reinforcement may be delivered every second, fifth, tenth or some other ratio chosen by the experimenter. Ratio schedules are further divided into fixed ratio schedules and variable ratio schedules.

In a **fixed ratio schedule**, the reinforcer is given after a fixed number of nonreinforced responses. For example, a sales person receives a bonus for every fourth set of books sold.

In a **variable ratio schedule**, the reinforcer is given after a variable number of nonreinforced responses. The number of nonreinforced responses varies around a predetermined average. For example, a rat is reinforced for every 5th lever press on the average. The exact number of responses required for reinforcement varies from one time to the next. The variable ratio schedules produce the *highest rate of response* and greatest resistance to extinction.

Interval schedules require a time period to pass between the presentations of reinforcers. Interval schedules can be further classified into fixed interval schedules and variable interval schedules.

In a **fixed interval schedule**, the reinforcer is given for the first response that occurs after a fixed time interval has passed. For example, after a big exam, little if any studying takes place. As the time for the next test approaches, the rate of such behavior increases dramatically.

In a **variable interval schedule**, the reinforcer is given for the first response after a variable time interval has passed. The interval length varies around a predetermined average. For example, employees whose supervisor checks their work at irregular intervals. Since the employees never know when such checks will occur, they must perform in a consistent manner in order to achieve praise or avoid negative outcomes.

Punishment and omission training

Punishment and omission training are procedures that weaken or decrease the rate of behavior. In punishment, behaviors are followed by aversive stimulus events termed as punishers. For example, your cell phone rings in the middle of a class lecture, and you are scolded by your teacher for not turning your phone off before class.

Omission training (negative punishment) is a term used to describe weakening of a response through the removal of something pleasurable. For example, a parent can discipline a child by taking away TV privileges.

Thus both punishment and omission training are procedures that weaken or decrease behavior.

In addition to reinforcement principle, operant conditioning operates on the basis of set of processes similar to those seen in classical conditioning. They are acquisition and the associated phenomenon of shaping, chaining, and autoshaping as well as extinction, spontaneous recovery, discrimination, and generalization.

1. Acquisition: The process by which new behaviors are acquired. This is achieved through repeated reinforcement.

Operant responses are usually established through a gradual process called **shaping**. Shaping is a technique in which closer and closer approximations of a desired behavior are reinforced. For example, when a rat is first placed in a Skinner box, it may not press the lever at all. In this case, an experimenter begins shaping by releasing food pellets whenever the rat moves toward the lever. As this response becomes more frequent, the

experimenter starts requiring a closer approximation of the desired response. He may release food when the rat actually touches the lever. As the reinforcement increases, the rat will spontaneously press the lever on occasion, and finally the rat will learn to press the lever for the desired response.

Since we are reinforcing successive approximations of the desired behavior, shaping is also described as ***method of successive approximations***.

Chaining is another procedure that is used to shape behavior and learning of a task. In chaining, the behavior is broken down into small steps for its effective learning and subsequent reinforcement. Chaining is used to develop a sequence (a chain) of responses by reinforcing each response with the opportunity to perform the next response. For example, independent living skills (brushing teeth, carrying out daily routines, etc.)

In certain situations, shaping occurs without reinforcement. This is known as ***autoshaping***.

2. Extinction and Spontaneous recovery: In operant conditioning, extinction refers to the general gradual weakening and disappearance of a response (tendency) due to the absence of reinforcement. For example, if we withhold the food reinforcer, the key pecking will gradually decrease because it is no longer being rewarded.

If we return the pigeon on the box a few days after its key-pecking response is extinguished, we may find that it will once again display the response. Skinner called this return of responding spontaneous recovery.

3. Stimulus Control: Stimulus Discrimination and Generalization: Stimulus discrimination occurs when there is an increase in the probability of a response to one stimulus and a decrease in the probability of response to another. We achieve discrimination by selecting reinforcing responses in the presence of one stimulus and not another.

Stimulus generalization occurs when organism responds to a stimulus that *differs to some degree* from that originally involved in the acquisition of the response.

Application of operant conditioning

1. useful in the field of education to improve the teaching learning process
2. behavior modification
3. Treatment of behavioral and psychological problems such as impulsive spending, drug addiction, anorexia nervosa (less eating).
4. Applicable in interventions for solving socially significant issues such as crime, energy conservation, health care issues, consumer affairs, etc.
5. Wide applications in the organizational field.

OBSERVATIONAL LEARNING

Observational learning is the acquisition of new information, concepts, or forms of behavior through exposure to others (models) and the consequences they experience. If the observer sees the modeled response lead to a favorable outcome, the observer's tendency to emit the modeled response will be strengthened.

Basic principles of observational learning

Bandura identified four key processes that are crucial in observational learning.

1. **Attention:** the first step is to pay attention to another person's behavior and its consequences.
2. **Retention:** the second step is to store a mental representation of what you have witnessed in your memory.
3. **Reproduction:** the third step is to present the modeled response depends on your ability by converting your stored mental images into overt behavior.
4. **Motivation:** finally, without proper motivation, you will not reproduce an observed response.

Thus observational learning occurs through the four interrelated processes.

COGNITIVE LEARNING

Cognition refers to the processing of information about the environment that is received through our senses. Cognitive process plays an important role in learning. Cognitive learning may take various forms. Some of them are:

1. Cognitive maps
2. Latent learning
3. Insight learning
4. Imitation

I. Cognitive maps

Edward C. Tolman (1886-1959) coined the term **cognitive map**, which is an internal representation (or image) of external environmental feature or landmark. He thought that individuals acquire large numbers of cues (i.e. signals) from the environment and could use these to build a mental image of an environment (i.e. a cognitive map).

By using this internal representation of a physical space they could get to the goal by knowing where it is in a complex of environmental features.

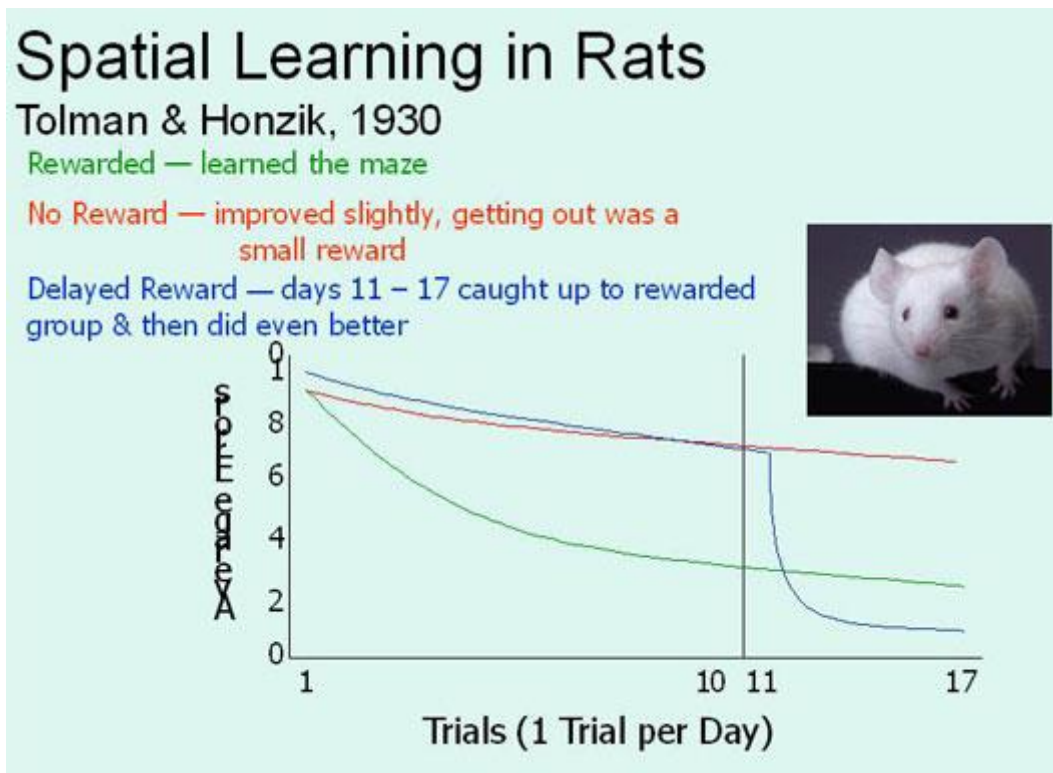
II. Latent learning

Latent (hidden) learning is a type of learning which is not apparent in the learner's behavior at the time of learning, but which manifests later when a suitable motivation and circumstances appear.

Experiment

In their famous experiments, Tolman and Honzik (1930) built a maze to investigate latent learning in rats. The study also shows that rats actively process information rather than operating on a stimulus response (S-R) relationship.

This shows that between stimulus (the maze) and response (reaching the end of the maze) a mediational process was occurring the rats were actively processing information in their brains by mentally using their cognitive map.



III. Insight learning

Insight learning is a type of learning or problem solving that happens all-of-a-sudden through understanding the relationships of various parts of a problem rather than through trial and error. In other words, insight learning means sudden perception of a useful relationship that helps to solve a problem. In insight learning situation, a problem is posed, a period follows during which no apparent progress is made, and then the solution comes suddenly. It was Wolfgang Kohler, a German psychologist who conducted many experiments on insight learning.

Experiment

In this experiment, Kohler hung a piece of fruit just out of reach of each chimp. He then provided the chimps with either two sticks or three boxes, then waited and watched. Kohler noticed that after the chimps realized they could not simply reach or jump up to retrieve the fruit, they stopped, had a seat, and thought about how they might solve the problem. Then after a few moments, the chimps stood up and proceeded to solve the problem.

In the first scenario, the problem was solved by placing the smaller sticks into the longer stick to create one very long stick that could be used to knock down the hanging fruit. In the second scenario, the chimps would solve the problem by stacking the boxes on top of each other, which allowed them to climb up to the top of the stack of boxes and reach the fruit.

Based on these observations, Kohler's theory of insight learning became an early argument for the involvement of cognition, or thinking, in the process of learning.

IV. Imitation

Imitation occurs when we imitate other individual or model our behavior or that of someone else. Albert Bandura and Walter Mischell have done considerable work on imitation which is also called as social learning or vicarious learning.

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