Chapter 6: Learning Methods

- Definition: Relatively permanent change in behaviour
  - The acquisition of new knowledge, skills, or responses from experience that results in a relatively permanent change in the state of the learner
  - Because of some experience
  - Three key ideas
    - Based on experience
    - Learning produces changes in organism
    - These changes are relatively permanent
- Habituation: A general process in which repeated or prolonged exposure to a stimulus results a gradual reduction in responding
  - Ex: Living next to a highway and gradually not hearing the sounds of the cars anymore
- Sensitization: A simple form of learning that occurs when presentation of a stimulus leads to an increased response to a later stimulus
  - Ex: Shock an animal and then reacts strongly to every small touch
- ***Pavlovian/Classical conditioning***
  - Advertising: car+women =happy
  - Car=happy (still have the same feeling you got when you saw the car with the women, even without the car)
  - Study of behaviour that are reactive
  - John Watson
  - Classical Conditioning: When a neutral stimulus produces a response after being paired with a stimulus that naturally produces a response
  - Conditioned taste aversion
  - Autonomic Nervous System(glandular)
  - *Elicited* Reactions (don't choose) > called forth
    - Dog will salivate when he sees the guy who brings the food (psychological reflex)
    - Dogs when they hear a novel (something new) stimulus they will have a alarm reaction or an orienting response
    - Make the novel stimulus a thing that creates no reaction > make him used to it (a neutral stimulus)
    - Once the bell is a neutral stimulus then you can start the conditioning
    - Food (stimulus) > salivate (response)
      - Unconditioned stimulus (Something that reliably produces a naturally occurring reaction in an organism) and unconditioned response(A reflexive reaction that us reliably produced by an unconditioned stimulus) since there is no training required
    - Bell(Novel stimulus)+Food (unconditioned stimulus) > salivate (unconditioned response)
    - Reaction to the dog to the bell when he hears it the first time > alarming reaction or orienting response
    - Ring the bell many times to nullify the alarming reaction > make the bell neutral (neutral stimulus) > no reaction to the bell
    - Bell (neutral stimulus)+Food (unconditioned stimulus) > salivate (unconditioned response) > do it many many times
    - Bell (conditioned stimulus) > Salivate (conditioned response) [less secretion]
      - Conditioned stimulus: A previously neutral stimulus that produces a reliable response in an organism after being paired with a US)

- Conditioned response: A reaction that resembled an unconditioned response but is produced by a conditioned stimulus
- Conditioned response is not equal to the unconditioned response (weaker response from the real trigger) > psychic reflex
- Drug overdoses happen often in unfamiliar drug taking places (certain places become a CS which create a CR that helps your body protect against the effect of the heroin before administration, but without the CS your body is not prepared for the drug)
- Basic principles of classical conditioning
  - Acquisition
    - Phase of classical conditioning when CS and the US are presented together
    - Symptoms appear gradually
  - Second-order conditioning
    - Conditioning in which the CS is paired with a stimulus that becomes associated with the US in an earlier procedure
    - Just using the conditioned stimulus, can make another stimulus be associated to the original unconditioned stimulus
  - Extinction and Spontaneous recovery
    - Extinction: Gradual elimination of the learned response that occurs when the CS is repeatedly presented without US
      - Weaken the associated between the CS and the CR
    - Spontaneous recovery: The tendency of a learned behaviour to recover from extinction after a rest period
      - Still has memory of learning
  - Generalization and Discrimination
    - Generalization: The CR is observed even through the CS is slightly different from the CS used during acquisition
      - The bigger the change the smaller the response
    - Discrimination: The capacity to distinguish between similar but distinct stimuli
- Extinction: Reduce the likelihood of the behaviour
  - Weaken the association between bell and food by ringing the bell many times and not giving him food > takes time and effort > however learning never goes away (never fully extinguish it)
  - Spontaneous Recovery
    - The next day you ring te bell and the dog salivate
    - He still has a memory of having learned the association between the bell and the food and he salivates
    - Ring the bell all day and do not give food after the bell, and by the end of the day he will not salivate to the sound of the bell
  - Stimulus Generalization: All bells will trigger the person
    - Little Albert has the same fear response to everything that ressembles it > his fear of the white rat generalized to Santa's bear (Watson and Rayner)
      - Proved that fear can be learnt
      - Emotional responses can be produced by classical conditioning
- Laws of Learning
  - We used to believe that for Classical Conditioning to occur, the following three rues had to be followed
    - Th Neutral Stimulus(NS) must come before the UCS
    - The NS and UCS must be together in time (temporal contiguity)
    - The NS and the UCS must be paired many, many times

- Cognitive elements of classical conditioning
  - Classical conditioning appears when people/animal has expectations
  - Classical conditioning most likely will happen when CS is originally unfamiliar then familiar
  - Object or event only associated with CS
- Neural Elements of Classical Conditioning
  - Cerebellum important for eye blink conditioning
  - Amygdala involve in fear conditioning
  - If there is problem with one of these parts that type of conditioning is impossible or very hard to create
- Martin E.P. Seligman
  - World renowned psychologist
  - Former president of the American Psychological Association
  - Professor at the University of Pensylvania
  - Evolutionary elements of classical conditioning
  - Happens with novel food
  - Béarnaise Sauce Phenomenon: Eat food and don't feel good afterwards > person associate the taste with the sickness (conditioned taste aversion)
    - Germs (UCS) > illness (UCR)
    - Sauce (Neutral Stimulus)+ Germs (UCS) > Illness (UCR)
      - Long delay between eating the food and throwing up (Long-Delay learning)
    - Sauce (CS)> illness (CR)
      - One-Trial Learning (happen once and never again)
  - Learnt fast because his life was at risk > evolution
  - Seligman proposed the concept "prepareness"
  - Unprepared
    - Unprepared: We can learn these things , but we need training and time
    - Pavlov's dogs can learn to salivate to the sound of the bell-but they need many pairing
    - Particular procedures must be followed
  - Prepared
    - Prepared: We are hard wired (it makes evolutionary sense) to learn these associations very easily and with little training/exposure
    - One-trial learning
    - This association is highly resistant to extinction
    - Things that are life threatening
    - Seligman only needed one experience with steak sauce and the flu germs/illness
  - Contraprepared (against)
    - There are some things we cannot learn even with a lot of conditioning, time, practice
    - Birds are contraprepared to associate taste cues and illness> not physiology able to form that association > contrary to rats they react to visual cues which works best with unfamiliar ones
    - Biological preparedness: A propensity for learning a particular kinds of association ove others
    - When you can't learn a certain behaviour even if you try
    - There are some things we cannot learn even with a lot of conditioning, time, practice,etc.
  - John Garcia Conditioned taste aversion (evolution)
- Phobia
  - Under the category of Anxiety Disorders- Phobic Disorders are included
  - In order to have a disorder you have a distress or impairment that stops you from working or living (seriously impair their day to day life)

- Disruption in ability to function
- Strong fear response to an object or a situation
  - **Specific Phobia**
    - The feared object/situation should be avoided at all cost or endured with great anxiety
    - Change their life or behaviour to avoid the object at all cost
    - There should be marked distress or impairment
    - Fear of spiders, fear of drowning, fear of flying, claustrophobia, fear of ghost, fear of heights, fear of snakes> makes evolutionary sense > keeps us alive > those things are life threatening
    - Seligman highly prepared for some and under prepared for others
    - Fears come from a traumatic event
    - Most people can't remember the traumatic event, but the fear is still inside them
    - Some people have a phobia, because they saw someone going through a dangerous situation or having heard of it
    - How to get over a disorder (Behaviour therapy treatments)
      - Exposure therapy (Exposure to the fear stimulus and showing that nothing bad will happen)
        - Systematic desensitization
          - Set up a hierarchy of the less feared object (saying elevator) to the most feared (ridding an elevator) object
          - Make them comfortable with things on the lower level of the hierarchy and slowly going up
          - Teach them relaxation treatment (meditation, thinking of stuff that relaxes them)
          - Learn to relax at each step of the hierarchy
          - Breaking the connection between elevator and anxiety reaction
          - Fear may come back
          - Don't totally destroy the connection between object and fear but weakening it
      - Flooding or implosion therapy
        - Faster method
        - Massive exposure to the fear stimulus
        - Quickly do as much exposure possible
        - Faster result, but much more likely to have spontaneous recovery
        - Quick fix that may not last long
        - Some people can't go through flooding > doesn't work for everyone
  - **Social Phobia**
    - Fear of being embarrassed > fear of being evaluated
    - Fear tied to other people judging or evaluating you
    - The more you do it, the less scared you'll be
    - More comfortable with your skills
  - **Agoraphobia**
    - Fear of the market place > fear of not being able to escape/finding an escape
    - Can't stand in line in the supermarket
    - Can't be in a bus or train
    - Scared of being scared
    - This disorder is more complicate than specific phobia in its ethology (or aetiology)- the root causes of the problem (roots of the problem are more complicated to figure out)> usually a variety of situations that come together
    - Extreme cases can't leave their home

        - Enforced by people who enable them from staying at home > enabler (person that helps the phobic person > feel like they lose their power when the person gets over their fear) > might sabotage their recovery> feel like their role is threaten
        - Can't leave their house to go to therapy
    - Treatments
        - Pharmacological
        - Individual (insight oriented, cognitive-behavioural, behavioural)
        - Family and/or couple therapy
        - For the enabler
    - High relapse rate
- ***<u>Operant conditioning(B.F Skinner)</u>***
    - Behaviourist: Behaviour shaped by our environment
    - Skinner: Behaviour shaped by environment
    - Operant conditioning: Study of behaviour that are active
        - A type of learning in which the consequences of an organism's behaviour determine whether it will be repeated in the future
        - Behaviour that an organism produces produces that has some impact on the environment
    - The law of effect
        - Edward Thorndike studied instrumental behaviours(Behaviour that required an organism to do something, solve a problem, or otherwise manipulate elements of its environment)
        - Law of effect: Behaviours that are followed by a "satisfying state of affair" tend to be repeated and those that produce an "unpleasant state of affairs" are less likely be repeated.
        - Thorndike's puzzle box: Puzzle box where the cat had to trigger the appropriate lever to open the door and access the food outside
        - Only get the reward if they do the correct behaviour while in classical conditioning they get the US no matter what
    - The Skinner Box
        - Box with a metal bar and when it is pressed a food pebble falls down
        - Motivate the rat to find food (starve him)
        - Want him to learn how to press the bar to get food
        - Have to shape the rat to press the bar
        - Shaping by successive approximation
        - Extinction of behaviour: No more food when he presses bar
        - Might have spontaneous recovery
    - B.F Skinner
        - Behaviour impacted environment and then environment would respond with a punishment or a reward
        - Reinforcement more effective then punishment because learn what you should do, but punishment just tells you what not to do, not what you should do.
    - Primary Punishment/Reinforcer: Associated with things that satisfy biological needs
    - Secondary punishment/reinforcement: Derive their effectiveness from their association with primary reinforcement through classical conditioning
    - Shaping by successive approximations: As he gets closer and closer to the bar put a food pellet in the container> continuous reinforcement (CRF): Every single bar press gets him food (acquisition of the behaviour)
        - Needs motivation for the reinforcer (hunger for food)> hungry so motivated to find food
    - Continuous reinforcement to acquire the behaviour

- Reinforcement (increase in behaviour> consequence that follows make you want to repeat the behaviour)
- Punishment (decrease in behaviour > consequence that follows make you less likely to repeat the behaviour)
- Positive and negative reinforcement
  - Positive:Add something
  - Negative: Take away (subtract) something
  - Positive: A behaviour is emitted and a consequence is added that leads to an increase in the behaviour
  - Negative: Escape or avoidance behaviour, the behaviour serves to remove something undesirable (behaviour will increase)> take a detour so you don't have to come in contact with a dog > remove something undesirable
    - Change your behaviour to avoid a bad consequence
    - Maladaptive in the long run
    - Perpetuate problem if you never address it
    - Never face the problem
    - Not good in the long term> short term solution
    - Escape: Eat fast to skip an awkward supper
    - Avoid: Skip supper all together
    - Related to phobia
- Positive and negative punishment
  - Positive: Add something
  - Negative: Take away (subtract)something
  - Positive punishment: A behaviour is emitted and an undesirable consequence is added (spank, cat spray (cats don't like water), yelling[might encourage the kid to get a rile out of the parents])
    - If the punishment is too severe, the bad behaviour will increase, because the kid will do it over and over again to piss off the parents
  - Negative punishment: A behaviour is emitted and a desirable consequence is removed (Something you like is being removed [grounded, take away a privilege]
- Punishment should be appropriate (fit the crime, if excessive kid will rebel), timely and meaningful
- Immediate vs Delayed Reinforcement/Punishment
  - The more time that passes the less effective is the reinforcer/punishment
  - Explains difficulty eliminating behaviours that only have long term rewards like smoking
    - Smoking= Immediate reinforcer (relax feeling)
    - Quitting smoking= Long term reinforcer (better health)
- Different cultures=Different reinforcers
- *Basic Principles of Operant Conditioning*
  - Discrimination and Generalization
    - Discriminate: Recognize only the same painter after being thought to recognize his works (pigeons)
    - Generalize: Recognize any painting from a movement that they learnt to recognize with only one artist (pigeons)
  - Extinction
    - Extinction depends how often reinforcer is received
    - No longer deliver the reinforcer no matter how many time they do the behaviour
    - Spontaneous recovery
  - Partial Reinforcement- schedules of reinforcement

- Pattern on reinforcement more important then number like in classical conditioning
- We automatically notice when we don't get the reward after doing the behaviour
- So we are less likely to do the action if we don't get the reward
- Partial Reinforcement helps us maintain the behaviour
- Schedule of reinforcement
  - Maintenance
    - Encouraging the behaviour to continue after it has been learned
    - Will notice as soon as reinforcer is removed and behaviour will decrease
    - Requires intermittent reinforcement
  - Fixed ratio
    - Reinforcer is delivered after a specific number of responses have been made
    - 1:1 (continuous reinforcement) 5:1 (every 5 bar presses he gets a pellet > every single time it is 5 bar presses to get an enforcer)> more number of responses high rates of responding
      - As soon as the reinforcer is not there, you automatically notice it so you stop the behaviour
  - Variable ratio
    - The delivery of reinforcement is based on a particular average number of responses
    - The higher the ratio, the higher the responses
    - Amount of times he presses the bar changes (never know how many times he has to press the bar to know when the enforcer will come > doesn't know how many times he has to do it)> more number of responses
    - Intermittent reinforcement: When only some of the responses made are followed by reinforcement
      - Behaviour much more resistant to extinction then a continuous reinforcement schedule
      - Can't notice a change in the environment
      - Intermittent reinforcement effect: The fact that operant behaviours that are maintained under intermittent reinforcement schedules resist extinction better then those maintained under continuous reinforcement
    - HIGHEST RATES OF RESPONDING > more difficult to determine pattern
  - Fixed Interval
    - Reinforcers are presented at fixed-time periods, provided that the appropriate response is made
    - Barely any responses after reinforcer is administered but when the interval is coming to an end> burst of response
      - Ex: studying for an exam
    - You know what the time is (knows it is every 5m)> knows he has to wait until a certain amount of time > not high rates of responding> still has to press the bar every 5 minutes> less number of responses
    - Jobs> better health and quality results
  - Variable Interval
    - A behaviour is reinforced based on an average tine that has expired since the last reinforcement
    - Passage of time will change > has to respond more often then the fix interval> has to test the waters here and there > less number of responses
    - Phone line > wait different amount of times
    - Radio station promotions: never know when exactly one while be announced
    - Higher rates of response then fixed interval since hard to determine pattern

        - Ratio vs Interval
            - Ratio: Enforcer based on the number (ratio between number of bar presses and food pellet) > Quantity is not quality> people would make a lot, but not well
                - Higher rates of responding> number of time you do the behaviour
            - Interval: A time period must pass+desire response must be emitted> an amount of time has to pass before he gets a reward after he presses a bar > Better quality
                - Lower rates of responding> test the waters over time
            - Moved from fixed ratio (no equity among workers) to fixed interval when we are talking about getting payed from a job > better quality over quantity
            - Gambling addiction: Maybe the next one
            - Cumulative responses
                - ++ Fixed ratio
                - + Variable ratio
                - - Fixed Interval
                - - - Variable interval
    - Shaping through successive approximations
        - Shaping: Learning that results from reinforcement of successive steps to final desired behaviour
        - The outcome of one set of behaviours shape the next set
        - Each small behaviour leading to the wanted final result is reinforced
    - Superstitious behaviour
        - Correlation is not causation
        - If reinforcer is to arrive every time interval, the animal will credit the action he was doing at the moment when the reinforcer arrived and will continuously do it and blame the next reinforcer on the fact he was doing that behaviour
        - Accidental correlation will turn into causation in people's heads
        - Superstition behaviours
- Cognitive elements of Operant conditioning
    - Edward Chance Tolman: More to learning then just knowing the circumstances of the environment and the particular outcome
        - Belief that in a certain situation, a particular reward will be received after a specific action
        - Stimulus doesn't directly provoke a response
    - Latent Learning and cognitive maps
        - Latent learning: Something is learned, but it is not manifested as a behavioural change until sometime in the future
        - Rats were not given any food when reached goal box, but on the 11 day they were and there was a humongous improvement > rats had learned a lot even with no reinforcement in the beginning
        - Cognitive maps: A mental representation of the physical features in the environment
            - When they changed the maze except for start and finish, rats were able to adapt to changes
    - Learning to trust: For better or worse
        - Experiment when the participant could give 3$ to a person and then maybe the person gives them back half or they could keep 1$. After reading descriptions of these people, biases made them give more money more often to the people they thought sounded more trustworthy while in reality there was no difference
- Neural Elements of Operant Conditioning
    - Pleasure centres in brains> rats had electrodes on their brain and when they pressed a bar this zone would be shocked which would give them a intensely positive experience

- Neurons in the medial forebrain bundle: pathway that meanders its way from the midbrain through the hypothalamus into the nucleus accumbens > most susceptible to stimulate pleasure> this zone is linked with pleasurable activities (eating, drinking, sex)> secrete dopamine (associated with positive emotions)
  - Dopamine associated with craving and expectations of the reward not the reward itself> plays role in reward related learning
    - Dopamine important in prediction error (difference between actual reward and expected reward)
      - Positive: better then expected
      - Negative: worst then expected
    - Increase in dopamine activity when receive unexpected reward and decrease when doesn't receive expected
  - Parkinson's disease: movement disorder associated with loss of dopamine
    - Reward base learning impaired in a person suffering from Parkinson's
    - Compulsive behaviour are more present when they they take dopamine medication >thought of reward
- Evolutionary elements of operant conditioning
  - In a T shape maze, if rats find food in one side of the T, they will go on the other side at the next round
    - Evolutionarily food is never at the same and the rat wants to explore to see if there is some on the other side (rarely returns to same place since it knows it ate the food)
  - Animals are predispose to learn some things better then others and they respond to the stimuli in a way that is according to evolution
- Behaviour therapy
  - Can be based on Operant Conditioning or Classical conditioning
  - Make it painful for people to smoke so they quit smocking (Operant conditioning)
- Extinction
- Desired or Undesired behaviour
- It does not matter whether it's good or bad behaviour
- Good behaviour may be punished (or totally ignored)

- ***<u>Social learning theory/cognitive behaviourism</u>***
  - Learning from people in our environment
  - Observational learning: A condition in which learning takes place by watching the actions of others
    - Learning through extensive observation and initiation of models
  - Model your behaviour off the coach
  - ADVERTISING: want to be like others (celebrity endorsements)
  - Believe in reinforcement in punishment, less severe then Skinner
  - Albert Bandura
    - You can learn from other people's example
    - Do they get rewarded or punished for their behaviour
    - Don't have to do the action to learn from it
    - Did their action pay off or not
    - Care about your thoughts and feelings and see how it encourages or discourage you to doit again
    - Self-Efficacy: You feel competent and capable in a certain situation> do a certain behaviour if you feel good about your capabilities
    - Reinforcement and punishment and develop thoughts about those things

- Sometimes observational results in just as much learning as doing the task itself
- Studying violence on kids
  - Kids who saw the frustrated man punch the bobo doll and not get punished for it will do it when they get frustrated, however kids who saw him get punished wouldn't (less likely to be aggressive
  - Vicarious reinforcement/ punishment
    - Learning through others
    - If man gets punished for punching a Bobo doll this is vicarious punishment for the boy watching who won't imitate the man's behaviour
- Boys more likely to follow behaviour of boys and girls of girls
- Therapists show how patterns are maladaptive
  - Mediator should understand how maladaptive behaviour can occur
  - Mediator must model good behaviour by being professional and not losing their tempe
- Julian Rother: Uses a formula to define our behaviour/motivation
- Observational learning in animals
  - Chimpanzees learn by observation that they can use the tool to get food efficiently while 2 year old kids learned how to use it by observation
    - However if chimpanzees are raised in a more humanlike environment performed like the kids
    - Raised in human culture, chimpanzees have a better cognitive ability
    - Cultural influence on cognitive processes that support observational learning
- Neural elements of observational learning
  - Mirror neurons > found frontal and parietal lobe of primate
    - Activate when doing an action and when watching someone do an action
- Implicit Learning under the wires
  - Implicit learning: Learning that takes place largely independent of awareness of both the process and the products of information acquisition
    - Habituation: repeated exposure to stimulus result in reduced response
- Cognitive approach implicit learning
  - Implicit learning: Know something is not right or notice something, but can say explicitly what it is
    - Know something without knowing how you know it
- Implicit and explicit learning use distinct neural pathway
  - People with amnesia show legions the hippocampus and medial temporal lobe
    - Don't have problem with implicit learning
    - Responding to implicit instruction decrease activity in occipital region
- Learning in the classroom
  - Techniques for learning
    - Distributed practice (rehearsal)
      - High utility
      - Spreading study activity> time between studying sessions
      - Retain 47% if information compared to 37% when mass studying (cramming)
    - Practice testing
      - Active retrieving of a memory on a test improves retention of it
      - Helps draw conclusions
      - Testing aids attention
        - Reduce tendency to mind wander
    - Control of learning

    - People devote more time on things they don't think they learnt well (judgements of learning) > JOLs
        - JOLs are inaccurate
- To be a sophisticated learner requires understanding of
    - key features of learning and memory
    - effective learning techniques
    - how to monitor and control one's own learning
    - biais that be undermine by JOLs

Subcortex
Split brain
Drugs
learning