Cognition and Learning

Slide # 1

Albert Einstein did not begin to speak until he was three years old. His parents feared he would never talk. As a child, Thomas Edison had trouble with grammar and spelling. His head was so large his parents thought he might be retarded. How can you tell if someone is learning? When we observe an improvement in some aspect of a child's performance, we usually assume that learning has taken place. In this presentation, we will explore human cognition and the ways in which we learn. We will also explore memory and language.

Phobias and Conditioning

- Phobias are irrational fears of specific objects, animals, or situations
- People acquire phobias through conditioning

Slide # 2

Are you afraid of heights? What about small, enclosed spaces like closets and elevators? People are afraid of all different kinds of things: dogs, cats, heights, snakes, tunnels, bridges, and even the number 13 (this fear is called triskaidekophobia, from the Greek word for 13). Why do people develop phobias? It usually happens through a process known as "conditioning." Jane (pictured in this slide) may not really understand why she's so terrified of elevators. Perhaps when she was very young she got stuck in an elevator or a closet. Such an experience could have conditioned her to have a fear of elevators.

Classical Conditioning

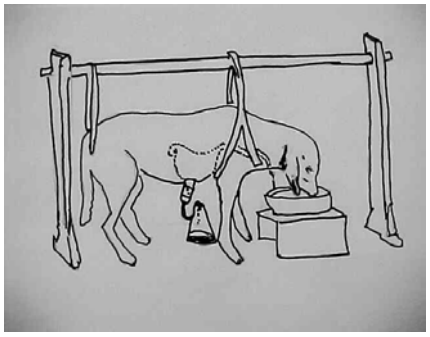
- A learning procedure in which subjects make associations between a natural stimulus and a neutral stimulus
- Ivan Pavlov
- Tuning fork/salivation

Slide # 3

Bullet # 1 Learning occurs when experience causes a permanent change in behavior. Classical conditioning is a relatively simple form of learning.
Bullets # 2–3 Ivan Pavlov (pictured in this slide) was a Russian psychologist who discovered classical conditioning while experimenting with dogs to study the process of digestion. Pavlov wanted to know how a dog's stomach prepared to digest food. In the course of his testing, he noticed that the sight or smell of food made the dogs salivate. He decided to find out if he could use something other than food to get the dogs to salivate.
Quote from Pavlov (1849–1936) "While you are experimenting, do not remain content with the surface of things. Don't become a mere recorder of facts but try to penetrate the mysteries of their origin."

The Experiment

- A neutral stimulus can replace a natural stimulus if it's presented just before that stimulus
- Food = unconditioned stimulus (US)
- Salivation = unconditioned response (UR)

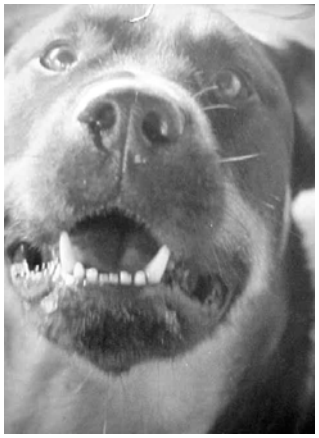


Slide # 4

Bullets # 1–3 In a famous experiment, Pavlov rang a tuning fork then immediately put meat powder on a dog's tongue. The dog eventually came to associate the sound of the tuning fork with food, and consequently, the dog would begin to salivate every time it heard the fork ring. Pavlov used the term "unconditioned" to refer to natural stimuli and the automatic involuntary responses they cause. For example, a dog does not have to be taught to salivate when it smells food. The mere presence of the unconditioned stimulus causes an unconditioned response. Unconditioned responses are very much like reflex actions.

Under normal conditions, the sound of a tuning fork or a bell would not cause a dog to salivate. The animal has to be conditioned to associate the sound of the bell with the imminent arrival of food.

Other Terms

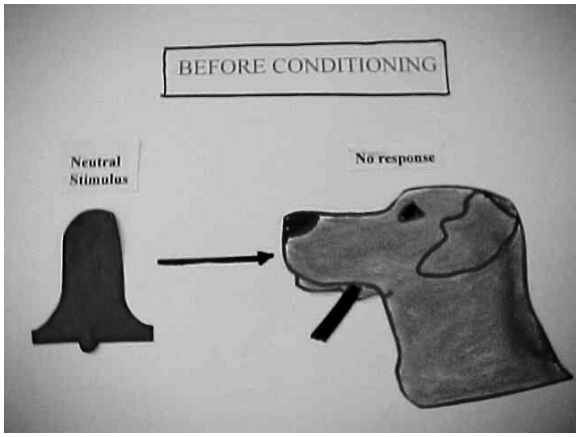


- Conditioned stimulus (CS) = tuning fork
- Salivation = conditioned response (CR)
- Conditioned responses are learned, not natural or reflexive

Slide # 5

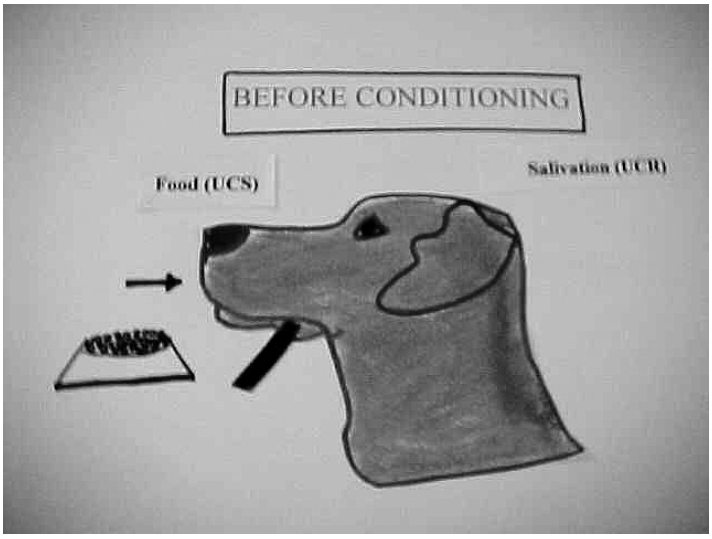
Bullets # 1–3 Pavlov found that a number of different events could trigger salivation. He learned that he could condition the dogs to salivate at the mere sight of food or even at the sight of the experimenter entering the room. In other words, Pavlov used different conditioned stimuli (CS) to produce a conditioned response (CR) that would not naturally have occurred.

Classical Conditioning



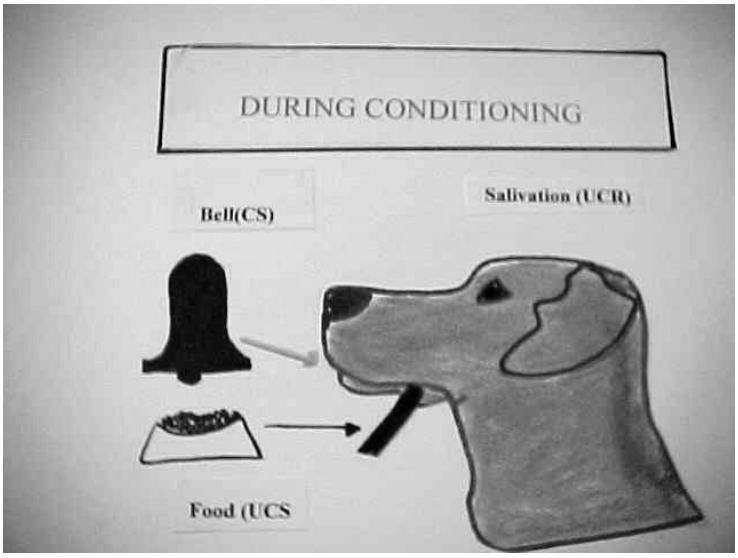
Slide # 6

The dog initially shows no response to the neutral stimulus: the ringing of the bell.



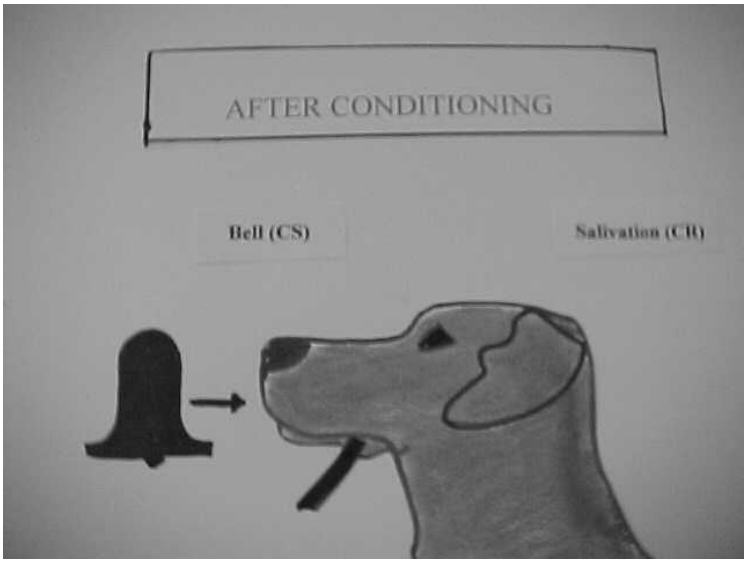
Slide # 7

The dog already finds some stimuli meaningful, such as the smell or taste of food. These unconditioned stimuli cause the dog to salivate.



Slide # 8

The bell (CS) and the meat (US) are presented or paired together.



Slide # 9

The bell is no longer a neutral stimulus, but a conditioned one that can trigger salivation.

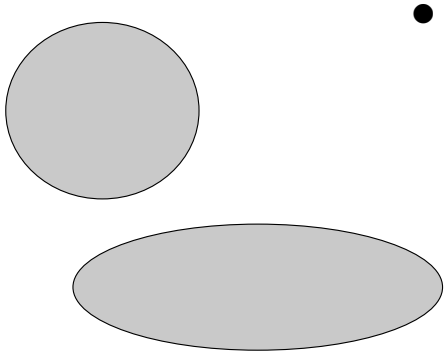
Principles of Classical Conditioning

- Acquisition of a conditioned response occurs gradually
- Timing is very important
- The intensity of the US

Slide # 10

Bullet # 1 Pavlov found that the more often he paired a bell or tuning fork with food, the more often the tone would cause the dog to salivate— a conditioned response.
Bullet # 2 Pavlov also found that presenting the conditioned stimulus (CS) about a half a second before the unconditioned stimulus (US) would yield the strongest associations between the sound of the bell and the food.
Bullet # 3 The greater the intensity of the US, the more quickly conditioning will occur. Pavlov's experiment involved a particularly intense US—hunger.

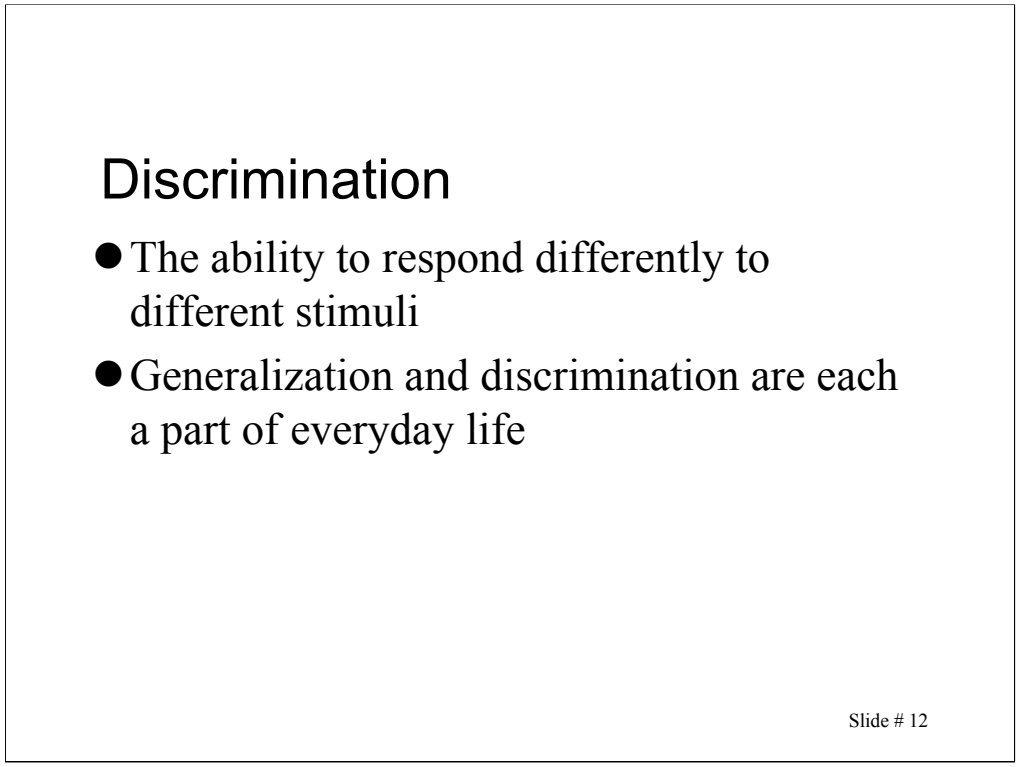
Generalization



- Occurs when a subject responds to a second stimulus similar to the original (CS) without any conditioning

Slide # 11

Pavlov also conditioned the dogs to salivate at the sight of a circle (CS). He then found when he included an oval alongside the circle, the dogs would eventually salivate at the sight of the oval alone. This process is known as “generalization.”



Bullet # 1 Pavlov also identified a process he called "discrimination," which works exactly the opposite of generalization. He again paired food with a circle, but this time he didn't pair food with the oval. This conditioned the dogs to respond only to the circle.

Bullet # 2 Generalization and discrimination occur in many everyday contexts. For example, when some people hear the sound of a dentist's drill (CS), they become afraid (CR). After several uncomfortable sessions at the dentist, those people may generalize this feeling and become afraid when they hear any kind of drill. Later, those people may learn to discriminate between the sound of the dentist's drill and that of a regular electric drill.

Extinction

- The gradual weakening and eventual disappearance of a conditioned response
- The response disappears but is not forgotten (spontaneous recovery)
- Reconditioning

Slide # 13

Bullet # 1 Pavlov noticed that the conditioned response of salivation to the sound of a tone would gradually weaken and eventually disappear if he presented the tone, but not the food. He called this "extinction."
Bullet # 2 He also found that although a conditioned response may disappear, it is not completely lost to memory—it may return later. He called this "spontaneous recovery."
Bullet # 3 Pairing the CS and the US again will cause the CR to appear more quickly than it did during the original conditioning. He called this process "reconditioning."

Extinction and Spontaneous Recovery

Slide # 14

To understand how extinction and spontaneous recovery work, imagine that you were in a serious car accident. After you recover from the accident, you may find it difficult to drive or even to get into a car. As time passes, the fear of the accident may be blunted, muted, or even extinguished; you no longer feel uncomfortable being in a car. Then one day, many months after the accident, you have a close call and narrowly avoid another accident. Your heart begins to race all over again whenever you get into a car. You would have just experienced spontaneous recovery.

John B. Watson

- The case of "Little Albert"
- Fear response
- Ethics

Slide # 15

Bullet # 1 In 1920, John B. Watson and Rosalie Rayner used classical conditioning on an 11-month-old infant they dubbed "Little Albert." Watson wanted to know how classical conditioning could affect emotional development. He and Rayner devised an experiment to teach Little Albert to fear laboratory rats. At first, they let Albert simply play with the rats. They then began to strike a steel bar with a hammer whenever he was playing with the rats.

Bullet # 2 The loud sound of steel hitting steel frightened Albert, and he consequently became fearful every time he saw a rat—even if the loud noise was not repeated. In this experiment, the noise produced by hitting the steel bar with the hammer was the US, the CS was the rat, and the CR was Albert's fear.

Bullet # 3 Psychologists today would criticize this type of research as unethical because it taught a child to fear things that he previously did not fear. It did prove, however, that emotional responses can be classically conditioned not just in animals, but in people as well.

An Application

Slide # 16

Classical conditioning has many applications, especially in the field of advertising.

Classical Conditioning and Pleasant Response

- Advertising campaigns use classical conditioning
- Pairing a healthy, young, pretty model with a product
- John Watson

Slide # 17

Bullets # 1–2 Advertisers often pair their products with unconditioned stimuli that elicit positive emotions (Gorn, 1982; Smith & Engel, 1968). The most common technique presents a product in association with an attractive person. The reasoning behind this is that by showing attractive people using a product, consumers will then associate the product with being attractive. They feel that the product can help them become as attractive as the people in the ad. An example: the ad in this slide shows a healthy young woman paired with a healthy product—bottled water.
Bullet # 3 John Watson (discussed earlier) later took a job as a psychological consultant for a large advertising firm and helped develop some extremely successful advertising campaigns. These campaigns employed many techniques used in classical conditioning. Watson helped produce print ads which paired a manufacturer's product with emotionally arousing cues and sexual stimuli. Watson's techniques are still widely used today as television bombards us with commercials that pair products with ridiculously attractive models.

Classical Conditioning and Products that Pose Health Risks

Slide # 18

Alcohol and tobacco manufacturers very often market their products using classical conditioning. Since these products are unhealthy, advertisers often pair them with appealing images. The “Marlboro Man” (depicted in the drawing in this slide) represents an attempt to get men to associate cigarettes with the ruggedness and masculinity often associated with cowboys. Ironically, many of the actors who portrayed the Marlboro Man later died from smoking-related diseases. Ads for alcohol frequently use scantily clad models or scenes of attractive young people partying. These ads imply that if you drink the product, your social life will improve and you’ll become more attractive.

Positive Emotions

- A song on the radio
- Scent, fragrance, or perfume
- Passing a bakery

Slide # 19

Bullets # 1–3 All types of emotions can be classically conditioned. A married couple hears a song on the radio that was playing when they went on their first date. Catching a whiff of the aftershave your grandfather wore reminds you of him. The smells coming from a bakery may bring back childhood memories of your mother pulling freshly baked bread out of the oven. These are all examples of classical conditioning.

Applications: Drug Addiction

- Withdrawal/"cold turkey"
- Cues or triggers in the environment
- Avoidance of cues

Slide # 20

Bullet # 1 People who undergo drug rehabilitation frequently experience withdrawal symptoms (also known as "abstinence syndrome") which include intense cravings for the drug. Quitting the drug all at once instead of tapering off is known as going "cold turkey"; this can make the withdrawal symptoms even stronger.
Bullet # 2 Former addicts often find that triggers or cues they once associated with drug use (such as the smell of a match burning or the clink of bottles in a bar) can reawaken their craving. One study showed that former alcoholics actually salivate at the sight and odor of alcohol (Montiet, 1987).
Bullet # 3 Psychologists try to help recovering alcoholics and drug addicts to avoid cues that they associate with drugs and/or alcohol.

Taste Aversions

- John Garcia explained the role of classical conditioning in creating taste aversions
- Timing/single instance

Slide # 21

Bullet # 1 Classical conditioning can also create aversions to certain tastes. John Garcia (depicted in the drawing in this slide), along with colleague Bob Koelling, noticed something unusual in the behavior of rats that had been exposed to nausea-inducing radiation. The rats would refuse to drink from the water bottles in the radiation cages. Garcia theorized that the rats had come to associate the taste of the water with the nausea caused by the radiation.
Bullet # 2 Garcia also found that taste aversions could arise even when several hours elapsed between the nausea-inducing stimulus and tasting the food. In addition, aversions could often be created by only a single conditioning session.

Taste Aversion: An Application

- Aversions can have survival benefits
- How to protect sheep from coyotes without killing the coyotes

Slide # 22

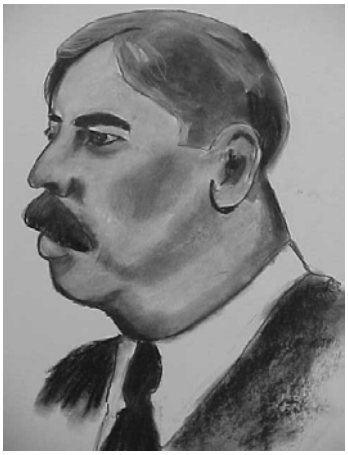
Bullets # 1–2 Garcia believed that taste aversions have survival benefits. One experiment (Garcia, Gustavson, Hankins & Rusiniak, 1974) illustrating this took place in an area where coyotes had been killing thousands of sheep. Ranchers retaliated, killing off so many coyotes that their number dropped to perilously low levels. In the experiment, Garcia and his colleagues injected sheep carcasses with a poison that would sicken the coyotes, but not kill them. The coyotes came to learn that eating the sheep carcasses would make them sick. They eventually developed a severe aversion to the taste of sheep and would even run away at the mere sight of a sheep.

Operant Conditioning

Slide # 23

Classical conditioning centers around involuntary responses and reflexes. Operant conditioning focuses on voluntary actions we take to either gain pleasure or avoid pain. For example, a child learns that if he says “please,” he can get a piece of candy. Someone suffering from a headache learns to take a couple of aspirin. A dog may roll over or shake hands in order to receive a treat. We learn not to put our hand on a hot stove. All of these are examples of operant conditioning.

Groundwork for Operant Conditioning

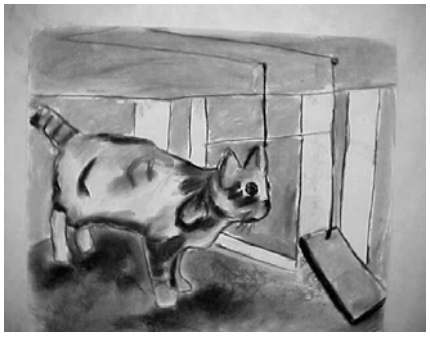


- Edward Thorndike
- Thinking and reasoning

Slide # 24

Bullet # 1 At the turn of the 20th century, psychologist Edward Thorndike (depicted in the drawing in this slide) laid the groundwork for operant conditioning.
Bullet # 2 Whereas Pavlov focused on classical conditioning in animals, Thorndike studied animals' thinking and reasoning abilities.

The Puzzle Box



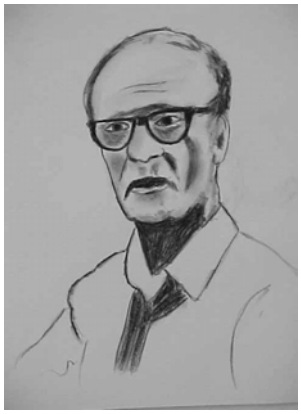
- Thorndike used a hungry cat who needed to learn a particular response (stepping on a pedal) which would unlock a door with food behind it
- The law of effect/instrumental learning

Slide # 25

Bullet # 1 Thorndike conducted an experiment in which he placed a hungry cat in a box like the one pictured in this slide. He wanted the animal to learn a particular response—stepping on a pedal which would open a door with food behind it. Thorndike found that at first, it would take the cat a long time to solve the problem. Each time he put the cat back in the box however, the animal took less time to open the door.

Bullet # 2 Thorndike believed that the cat's experiences in the puzzle box illustrated what he called the "law of effect," which states that if a response made in "the presence of a particular stimulus is followed by satisfaction, like a reward, that response is more likely to be made the next time the stimulus is encountered." Any response that produced discomfort would be less likely to be repeated. He called this "instrumental learning."

Reinforcement



- B.F. Skinner believed that behavior is influenced by rewards and punishments
- The Skinner box
- Food = reinforcement

Slide # 26

Bullet # 1 B.F. Skinner (pictured in the drawing in this slide) is the psychologist most associated with operant conditioning. He believed that most of our behavior is influenced by rewards and punishments.
Bullet # 2 Skinner trained rats to respond to different stimuli, often lights and sounds built into a special enclosure called the Skinner box. In order for rats to get food, they had to learn to press a bar or lever. When the rat first went into the box, the experimenter would reward it with food if it merely approached the lever. After the rat began to consistently approach the bar, the experimenter would only give the rat food if it pressed the lever. Eventually, the rat would learn to press the bar whenever it got hungry.
Bullet # 3 "Reinforcement" is defined as a stimulus or event that follows a response and increases the likelihood that the subject will repeat the response. In Skinner's experiment, food represented the reinforcement.

Superstitious Behavior

- Can be acquired through association of a response or reinforcement
- Baseball players
- Commonly held superstitions

Slide # 27

Bullets # 1–2 Superstitious behavior also involves operant conditioning. For example, baseball players can be extremely superstitious. Before a hitter goes up to bat or a pitcher goes to the mound, they may perform rituals: crossing themselves; digging a toehole in the batter's box; rubbing their hands with dirt from the mound; kicking the rubber in a specific way; and so on. The players do this most likely because the first time they performed the ritual, they got a hit or struck someone out. They then attributed that success to the ritual and from that point on felt the need to always perform it.

Bullet # 3 Common superstitions such as avoiding stepping on a crack on the sidewalk, throwing salt over your shoulder to ward off evil spirits, or knocking on wood are ingrained in our culture even though most people don't have any idea how these superstitions originated. They may have started through operant conditioning; some incident in the past may have accidentally reinforced these behaviors.

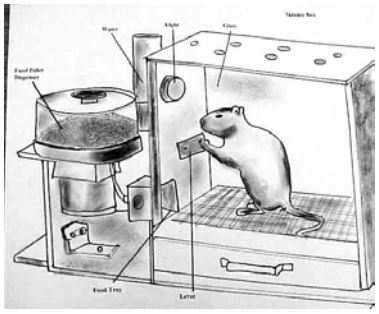
Terms Related to Operant Conditioning

- Discriminative stimuli
- Positive reinforcement
- Negative reinforcement

Slide # 28

No special notes. The slides that follow will discuss each of these terms.

Discriminative Stimuli



- A cue that signals some type of reinforcement is possible if the subject makes a particular response

Slide # 29

A further step in the Skinner Box experiment (pictured in the drawing above) involved rewarding the rat with food only when it pressed the bar when a light in the cage turned on. When the light was off, the rat received no reward or reinforcement no matter how many times it pressed the bar. The light is an example of a discriminative stimulus. A real-life example: A worker usually will only ask for a raise when his or her boss is in a good mood. Facial cues are prime examples of discriminative stimuli.

Positive Reinforcement

- Increases the chance that an individual will continue to behave in a certain way
- Examples

Slide # 30

Bullet # 1 Skinner distinguished between two types of reinforcement: positive and negative. In positive reinforcement, a response gains power or strength by being rewarded.
Bullet # 2 Everyday examples of stimuli that offer positive reinforcement include food, money, gifts, and even love or social approval.

Negative Reinforcement

- Involves removing an unpleasant stimulus in order to increase the chance that an individual will continue to behave in a certain way
- A two-way street
- Examples

Slide # 31

Bullet # 1 Negative reinforcement often involves "aversive stimuli" such as a someone nagging you, people giving you a disapproving look, or having romantic overtures rejected. Since we don't enjoy having to deal with any of these situations, in the future we tend to avoid behaviors that lead to them. Both positive and negative reinforcement can be used to either strengthen or weaken responses.
Bullets # 2–3 Reinforcement works as a two-way street. For example, babies cry in order to let their caregivers know when they are wet, tired, cold, or hungry. If a caregiver responds to the crying and gives the baby what it wants, then the baby has received positive reinforcement and will continue to cry whenever they require attention. On the other hand, the baby's crying works as a negative reinforcement for the caregiver. The caregiver finds the crying unpleasant and will try to do something that will make the baby stop.

Schedules of Reinforcement

- Fixed-ratio schedule
- Variable-ratio schedule
- Fixed-interval schedule
- Variable-interval schedule

Slide # 32

The timing and the frequency of rewards or reinforcement are very important in operant conditioning. Continuous reinforcement is when a behavior is reinforced every single time it occurs. This does not, however, always provide the best way to achieve successful conditioning. The different schedules of reinforcement listed in this slide each work best in different situations. (Note to teacher: the following slides contain descriptions of each schedule.)

Fixed-Ratio

- A set number of correct responses is needed before the reward can be obtained

Slide # 33

In fixed-ratio reinforcement, subjects receive a reward only if they provide a certain number of correct responses. Grading is a prime example of fixed-ratio reinforcement. Most teachers grade multiple-choice tests on a 100-point scale: students who score 90 or above receive an A, students who get 80 and above get a B, 70 to 79 rates a C, 60 to 69 earns a D, and anything below 60 gets the student an F. Fixed-ratio schedules tend to encourage subjects to work hard.

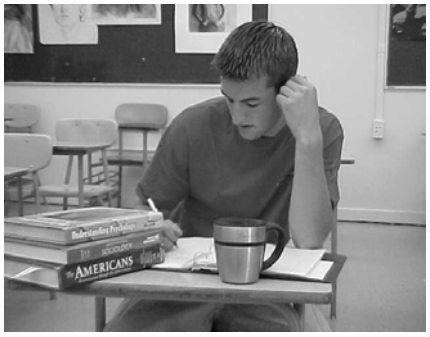
Variable-Ratio

- Rewards come after an unpredictable number of responses

Slide # 34

In variable-ratio reinforcement, rewards come unpredictably rather than in patterns. Slot machines provide a good example of variable-ratio reinforcement because they pay off unpredictably: pulling the handle a hundred times can yield no reward and pulling it just once can sometimes result in a jackpot. Animals often respond to variable-ratio reinforcement by working at a steady and high rate. Another good example of variable-ratio reinforcement occurs with door–to-door sales people and telemarketers, who never know how many people they will need to talk to before they make a sale.

Fixed-Interval



- A specific amount of time must pass before a response can produce a reward

Slide # 35

In fixed-interval reinforcement, a specific amount of time must pass before a response can produce a reward. When subjects typically gain some experience with a fixed-interval reinforcement schedule, they adjust their work rates. Upon finding that no reinforcement will occur for a period of time no matter how they behave, they learn very quickly to stop responding immediately after reinforcement is given. They start responding again toward the end of the fixed-interval. Thus, fixed-interval experiments tend to produce a period of inactivity followed by short bursts of responding. Teachers usually give tests and exams on a fixed-interval schedule. Often students procrastinate and put off studying until the night before the exam, then they study at a feverish pace. After the test is over, they return to their lax study habits, picking up the pace only when the next exam looms.

Variable-Interval

- Changing amounts of time elapse before a response will produce reinforcement

Slide # 36

In variable-interval schedule, the time at which the reinforcement occurs changes. For example, you try to reach a friend on the phone who has no call-waiting. The line is busy, so you keep trying and trying to get through. Reinforcement will occur the first time you manage to get through to your friend, but you do not know when this will happen. The response rate on a variable-interval schedule is usually slow but steady. Variable-interval schedules tend to produce slower responses than the other schedules., but most of the reinforcers we encounter in everyday life are on a variable schedule.

Response Chain

- Learned reactions that follow one another in sequence
- Each reaction produces the signal for the next

Slide # 37

Response chains occur when completion of a task requires performing a sequence of steps. Learning to swim successfully is an example of chaining: you must kick, use specific arm movements, and breathe all in a particular rhythm or sequence.

Shaping

- A technique in which a desired behavior is molded first by rewarding any act similar to that behavior, then requiring closer and closer approximations to the desired behavior before giving the reward

Slide # 38

Operant conditioning can involve some relatively complicated behavior like hitting a baseball, playing an instrument, or becoming a persuasive speaker. It is much more than just stimulus-response: it requires learning many tasks and then putting them all together in a specific order. The technique known as “shaping” uses reinforcement and past learned behaviors to create a new behavior. A real-life example: Trainers sometimes use shaping to teach animals how to perform tricks.

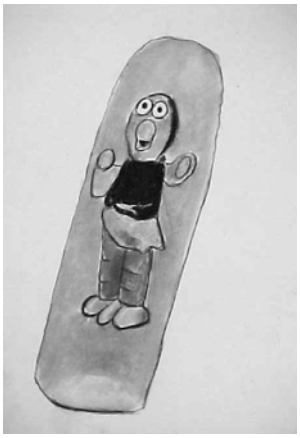
Social Learning

- A form of learning in which an animal or person observes and imitates the behavior of others

Slide # 39

In 1961, psychologist Albert Bandura (pictured in the drawing in this slide) conducted a study to show that children learn aggressive behavior by watching someone else. He called this “social learning.”

Bandura's Experiment



- Bobo doll, the "model"
- 2 types of social learning: cognitive, modeling

Slide # 40

Bullet # 1 Bandura's experiment involved placing an inflatable "Bobo doll" (similar to the one shown in this slide) in the corner of a room full of children. Next, the children would watch as an adult "model" punched the doll, sat on it, hit it in the nose repeatedly, and even struck it with a mallet then he kicked it across the room. Later, Bandura moved the youngsters to another room filled with many beautiful and attractive toys—and one Bobo doll. The children would behave extremely aggressively toward the doll. They punched, kicked it, and hit it just like the adult "model" had.

Bullet # 2 Social learning theorists believe that learning always has a larger purpose and goes beyond mere mechanical responses. These theorists have defined two types of social learning: cognitive and modeling.

Cognitive Learning

- A form of altering behavior that involves "mental processes"
- It may result from imitation or observation
- Cognitive map/latent learning

Slide # 41

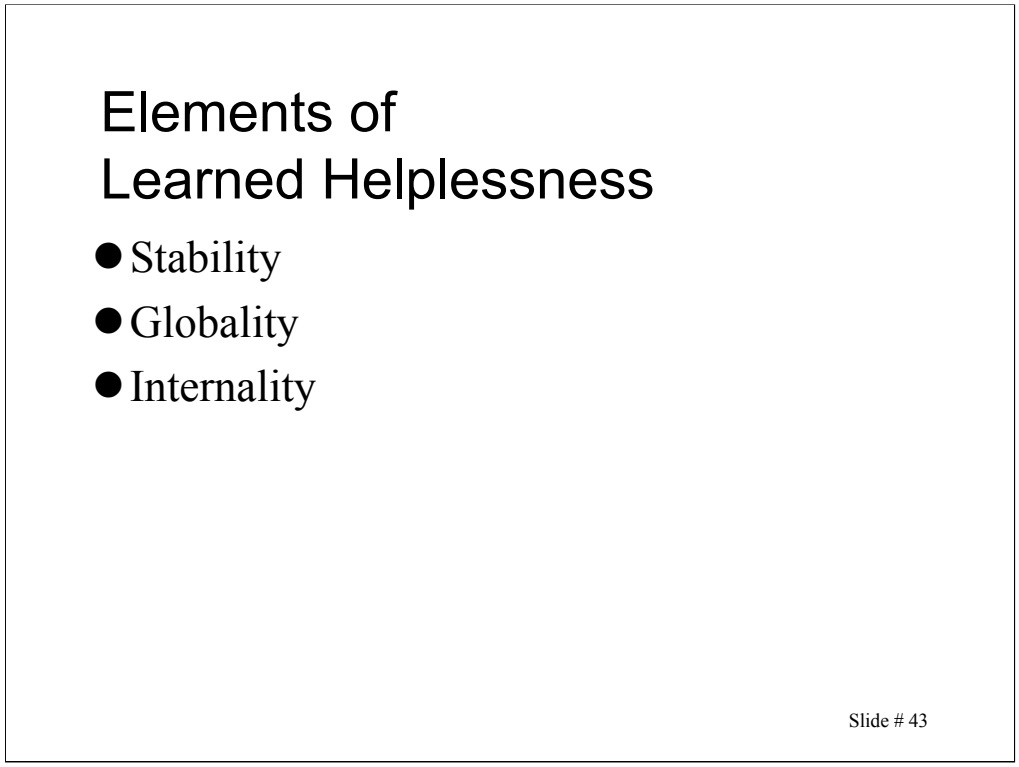
Bullets # 1–2 In the 1930s, psychologist Edward Tolman performed an experiment to demonstrate that learning involved mental processes as well as mechanical responses. He put a rat in a maze and allowed it to explore for a while without introducing any sort of reinforcement. Next, he would place food at the end of the maze and record the path that the rat took to get to the food. Eventually, the rat learned to take the shortest route. Tolman then blocked the shortest route, after which the rat would learn to take the next shortest route.
Bullet # 3 Tolman called this a "cognitive map" or mental picture, and he labeled this type of learning "latent learning" because it doesn't occur immediately.

Learned Helplessness

- A condition in which repeated attempts to control a situation fail
- A major cause of depression
- Latent learning and learned helplessness are both forms of cognitive learning

Slide # 42

If a person has numerous experiences in which his/her actions seem to have no effect, that person feel helpless because they have no control over the situation. In order for individuals to be energetic and able to try hard, they need to know that their actions can make a difference. If rewards come without any effort, a person never learns to work. If failure comes no matter how hard someone works, a person sometimes “gives up.” This is called “learned helplessness.”



Three elements can contribute to creating a feeling of learned helplessness.
Bullet # 1 Psychologist Martin Seligman defined "stability" as a person's belief that helplessness has resulted from a permanent characteristic. For example, if a student fails a math test, he or she can either decide that the problem is TEMPORARY ("Maybe I failed because I felt sick that day") or STABLE ("I never do well on math tests and never will").
Bullet # 2 The student could also characterize the failure as SPECIFIC ("I'm just no good at math tests") or GLOBAL ("I'm just dumb").
Bullet # 3 The student might also look at the failure as EXTERNAL ("This was a bad math test") rather than INTERNAL. People who attribute failure to their own internal inadequacies are more likely suffer from depression.

Modeling

- Learning by imitating others
- Observational learning
- Disinhibition

Slide # 44

Bullet # 1 The first time you engage in a new activity, you may not know how to behave. As you watch others, you begin to model or imitate what you see. For example, a young boy watching his dad shave might be inclined to try shaving himself. Another example: If you are listening to a motivational speaker and the crowd stands to applaud, you might feel obligated to applaud as well.
Bullet # 2 Albert Bandura calls this type of learning "observational learning." A subject is initially unable to perform a certain task or activity. The subject then watches a "model" perform the activity. After a sufficient amount of time has been spent observing, the subject can now perform the activity.
Bullet # 3 "Disinhibition" involves watching someone else engage in a dangerous or threatening activity without being punished. The observer may then find it easier to engage in the activity in the future. For example, someone who is terrified of snakes watches another person handle a snake without any incident or negative consequences. This type of observation may help alleviate the person's phobic reaction to snakes.

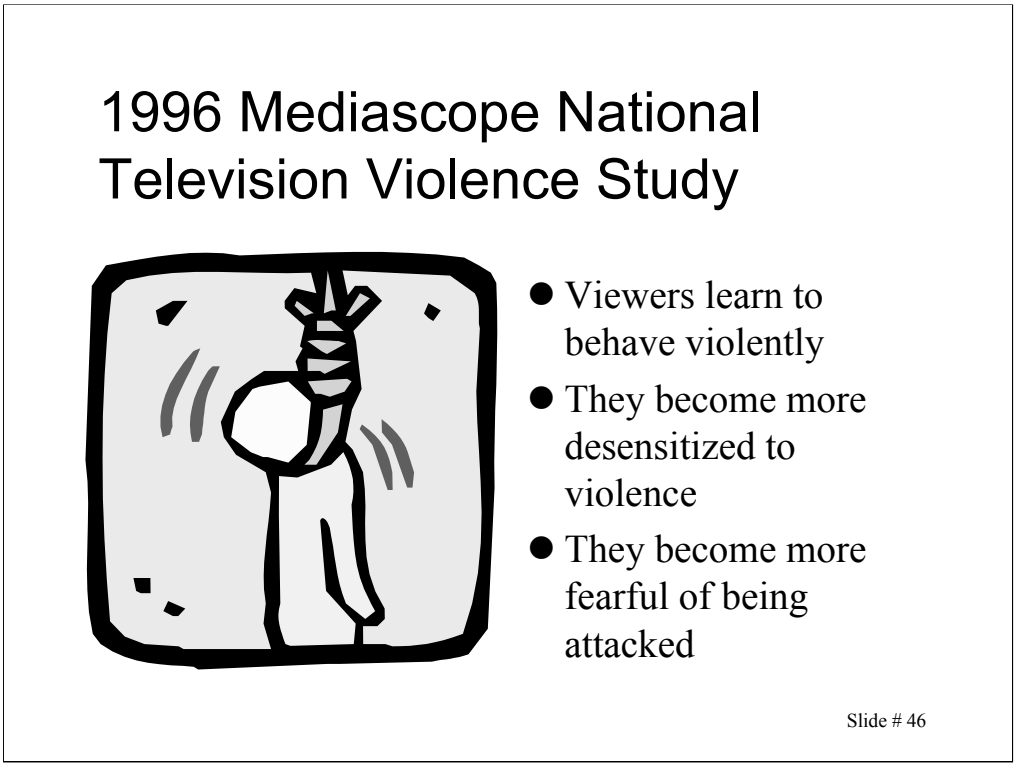
Applications of Observational Learning

- Children see television as a "model"
- Violence on television/violence in society
- Television and ADD

Slide # 45

Bullets # 1–2 If we accept that observational learning can be very effective, then the fact that many children see television as a "model" should raise some red flags. Before an individual turns 18, he or she will have viewed approximately 18,000 simulated murders on television. More than 3000 studies have tried to find out if a definite link exists between television violence and real violence. Will children learn to act violently if they see violent behavior modeled repeatedly on television? No definitive answer exists to this question, but the possibility that it could be true has caused some serious concern.

Bullet # 3 Recent studies have suggested a link between Attention Deficit Disorder (ADD) and television viewing, especially in children who watch a lot of television during their earliest years. In addition, some psychologists believe that television can affect normal mental development by rewiring a child's brain in a number of different ways. Television is not a good "babysitter" and allowing children too much unsupervised viewing is probably not a good idea.



Bullets # 1–3 A 1996 Mediascope National Television Violence Study found that by watching violence on television, viewers run the risk of:

1. Learning to react and behave in a more violent fashion.
2. Becoming numb or desensitized to the violence they see on television.
3. Becoming more fearful of being attacked.

Study (cont.)

- Perpetrators go unpunished in 73% of all violent crimes depicted on television
- About half of the time, television depicts victims of violence as unharmed and/or showing no pain
- 25% of violent scenes involve handguns
- Only 4% of violent programs incorporate nonviolent themes as well
- Less than 3% of violent scenes feature close-ups, and 15% show no blood

Slide # 47

No special notes.

Behavior Modification

- Systematic application of learning principles used to change actions and feelings
- Helpful in overcoming fears
- Behavioral contracts

Slide # 48

Bullet # 1 Behavior modification uses the principles of classical conditioning, operant conditioning, and social learning to change people's feelings and actions. It usually works as a step-by-step progression.
Bullet # 2 Behavior modification can be especially useful in helping people overcome fears. It works gradually: first, a subject stands in an area marked on the floor with masking tape the same size as the elevator; the next step adds one wall, then another, and another until eventually a simulated elevator space has been created. Jane (pictured in this slide) may never completely rid herself of her fear of elevators, but behavior modification can help her reach a point where her fear seems manageable to her.
Bullet # 3 "Behavioral contracts" can sometimes facilitate the process of behavior modification. These contracts attach positive and negative reinforcers to certain behaviors. People who enter into behavioral contracts give their consent to the rewards and punishments that their personal behavior modification process will use, and also agree to the rules for when a reward or punishment will occur. These contracts often are part of the "shaping" technique for modifying behavior.

Human Memory

Slide # 49

In this next section, we will explore the human memory. According to some mathematicians, our brains store roughly 500 times as much information as in an entire set of the *Encyclopedia Britannica.*

Three Memory Processes

- Memory = the storage and retrieval of what one has either learned or experienced

1. Encoding
2. Storage
3. Retrieval

Slide # 50

See the next slides for specific information on each process.

Encoding

- Transformation of information so the nervous system can process it
- Types of codes:

1. Acoustic
2. Visual
3. Semantic

Slide # 51

Bullet # 1 Encoding is accomplished with the help of a great deal of sensory information (taste, touch, smell, sound, sight). In other words, you use your senses to help to create memories.
Bullet # 2 An acoustic code is when you say something out loud to yourself. A visual code is like a mental picture. A semantic code is an attempt to make sense of what you are trying to remember. For example, you might create an easily recalled acronym composed of the first letters of each word you need to remember. This is known as a mnemonic device. One well-known mnemonic device can help you remember the names of the Great Lakes: by simply remembering the word "HOMES," you know the first letter of each lake's name. These semantic clues can then lead you to recall the full names: **H**uron, **O**ntario, **M**ichigan, **E**rie, **S**uperior.

Storage

- The process by which we remember material acquired over a period of time

Slide # 52

After our brain encodes information, it stores the data much like putting files in a filing cabinet. How much information we can store relates to how it was encoded and how much effort went into the encoding process. Simple pieces of information can usually be stored for a long time, while more complex pieces of information can only remain stored for a very brief period.

Retrieval

- The process of obtaining information from storage
- Memory championships

Slide # 53

Bullet # 1 How information has been encoded and how much effort went into the encoding process determines not only how much information we can store but also how easily we can retrieve it.
Bullet # 2 In the 1997 Memory Championships (yes, such a contest does exist), the U.S. record holder successfully memorized the suits, numbers, and the order in which cards appeared in a freshly shuffled deck. A Russian known only by his first initials—S.S.—could repeat 70 randomly selected numbers in the precise order in which he had just heard them. He could also remember lists of hundreds of meaningless syllables as long as 15 years after he first learned them. Memory champions have excellent retrieval systems; others sometimes have trouble just opening the filing cabinet.

What is Memory Retrieval?

- The process of accessing stored information and making it available to our consciousness
- Some memories are retrieved easily
- Context-dependent memory effect

Slide # 54

Bullets # 1–3 The ability to retrieve long-held memories is one of the marvels of the human brain. Some memories, like a loved one's birthday, come to us quite easily; for others we need retrieval cues. Police detectives often take victims back to the scene of a crime to help jog their memories. This is called "context-dependent memory effect" (Tulving &Thompson, 1973).

Memory Stages

- Sensory memory
- Short-term memory
- Long-term memory

Slide # 55

Bullets # 1–3 In 1971, two psychologists named Atkinson and Shiffrin proposed a three–stage model of memory. The three stages were sensory memory, short-term memory, and long–term memory.
(Note to teacher: see following slides for an explanation of each stage.)

Sensory Memory



Slide # 56

Sensory memory involves information gathered by sight, hearing, taste, etc.

Sensory Memory (cont.)

- The storage system that holds memory of sensory impressions is short-lived
- Sensory register
- Iconic memory, eidetic imagery, echoic memory

Slide # 57

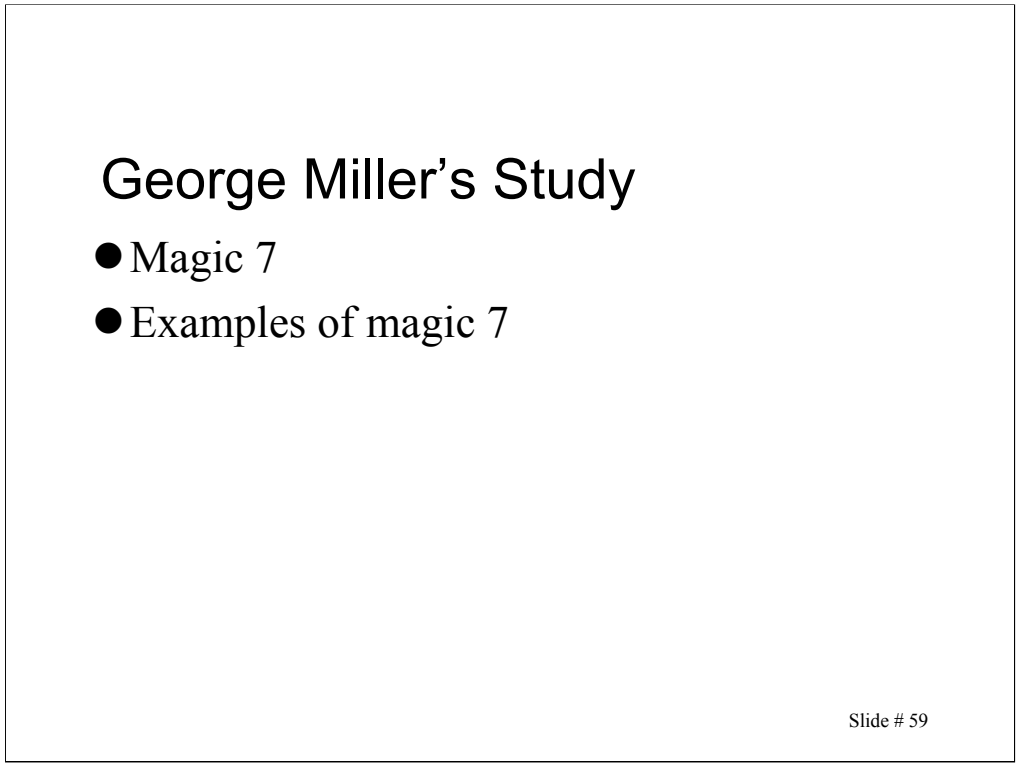
Bullet # 1 Sensory information constantly floods your brain, and your brain holds this sensory data in storage for only a very short period of time—seconds, perhaps even less. After that period, the information gets replaced by new data.
Bullet # 2 The temporary "storage bin" in our brain is known as the "sensory register."
Bullet # 3 Visual memory is called "iconic memory." "Eidetic imagery" refers to photographic memory, and "echoic memory" is auditory memory.

Short-Term Memory (STM)

- Allows for the brief retention of newly acquired information, usually for a maximum of 30 seconds

Slide # 58

Bullet # 1 Short-term memory is also sometimes called “working” memory. According to some psychologists, short-term memory lasts for only about 30 seconds, depending on the effectiveness of both the visual and acoustic coding. An example: You call information to find a specific phone number. You then attempt to keep that phone number in your mind (usually by repeating it to yourself) just long enough so that you can dial it.



Bullet # 1 In the 1950s, psychologist George Miller completed a series of studies on short-term memory, focusing in particular on determining its capacity. He discovered that STM can retain about seven items (plus or minus two). He called this the "Magic 7."

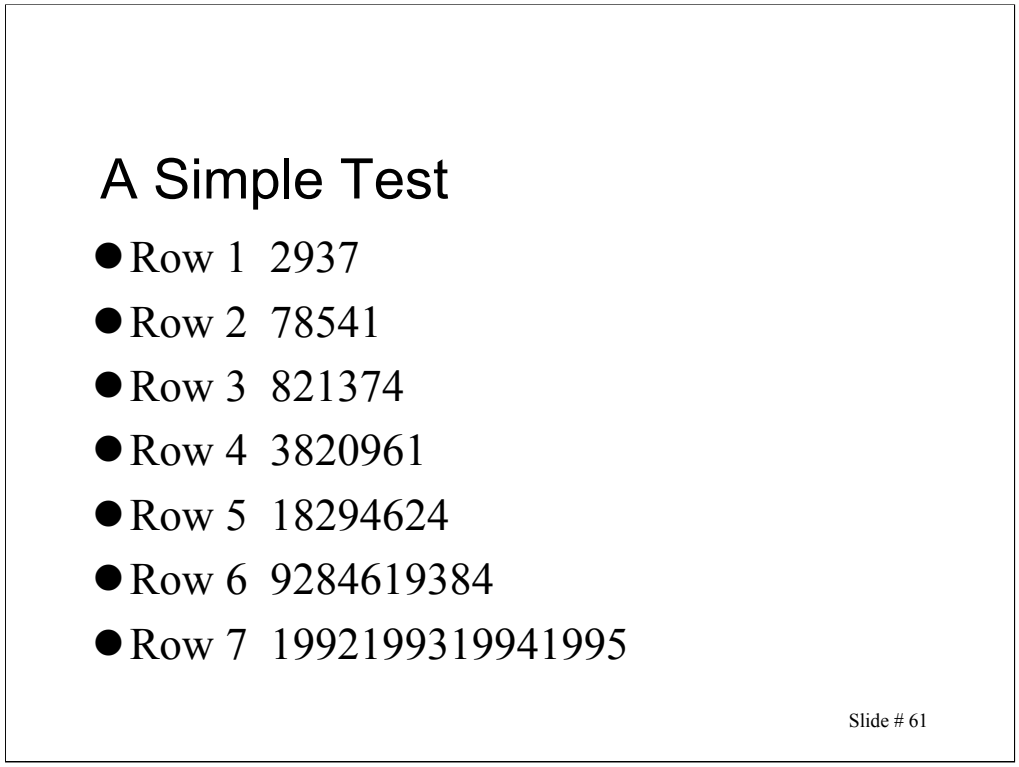
Bullet # 2 Patterns of seven appear in many places: Shakespeare's seven ages of man (from *As You Like It*), the seven wonders of the world, the seven deadly sins, and even Snow White's pals the seven dwarfs. In addition, think about this: how many digits do you need to dial to reach a telephone number in your area code?

Chunking

- The process of breaking down a large amount of information into smaller chunks
- Chunking makes recall easier

Slide # 60

"Chunking" is a tactic that makes it easier for us to remember things. When we use chunking, we break large amounts of information into smaller, more manageable segments.



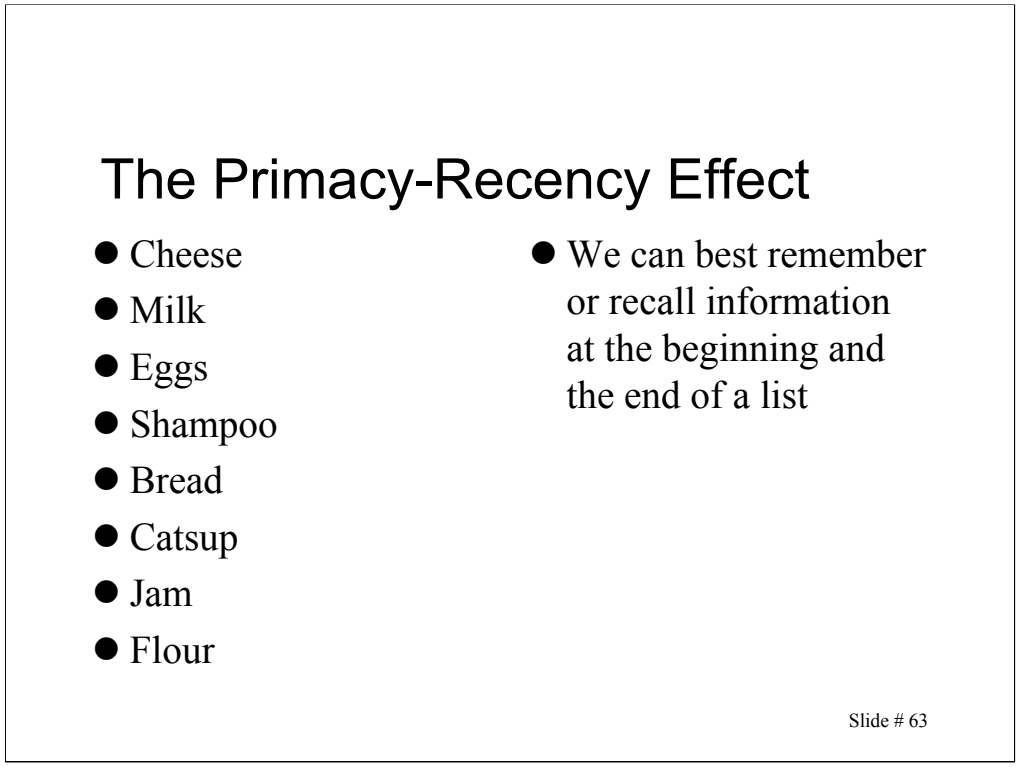
Look at these rows of numbers. Which rows do you find easiest to remember? If you used chunking, you probably had no trouble with row seven: even though it contained a 16-digit number, the number consists of four chunks of consecutive years (1992, 1993, 1994, 1995). Instead of remembering sixteen bits of separate information, you would only need to remember four bits—a task which falls within the short-term memory capability of nearly all people.

Maintenance Rehearsal

- A system for remembering which involves repeating information to oneself without looking for any underlying meaning

Slide # 62

"Maintenance rehearsal" is a conscious process in which you repeat information you want to remember over and over again in your mind. If anything interrupts your rehearsal for even for a short period of time, you likely will lose the information. In the photo in this slide, Kellie is trying to memorize a list of terms for a psychology quiz, but D'Lisa disrupts Kellie's maintenance rehearsal by trying to talk to her.



Note to teacher: Give the class a few seconds to read the grocery list shown on the left part of this slide. Next, switch off the slide and ask students to write down as many items from the list as they can remember. Discuss the following with the class:
Which items did you remember? Were they at the beginning, the middle, or the end of the list? The primacy-recency effect explains why people can best remember information at the beginning and the end of a list. We have the most time to rehearse the information from the beginning of the list, and information from the end of the list is still stored in short-term memory.

Long-Term Memory

- The storage of information over an extended time
- Information in long-term memory is organized by categories or features

Slide # 64

Bullet # 1 Long-term memory (LTM) allows us to retain information for periods of time well beyond the capacity of short-term memory. Information can remain in long-term memory for days, weeks, or even for the rest of a person's life. In addition, long-term memory has no limits on its storage capacity.
Bullet # 2 Long-term memory organizes information by categories or features.

Types of Long-Term Memory

- Semantic memory
- Episodic memory
- Declarative memory
- Procedural memory

Slide # 65

No special notes. See following slides for descriptions of each.

Semantic Memory

- Knowledge of language, including its rules, words, and meanings
- Retaining facts
- Semantic memory is not imprinted on our brains

Slide # 66

Bullet # 1 For many years, memory research tended to focus on how long information could be stored. In 1972, Canadian psychologist Endel Tulving proposed that we actually have two types of memory: semantic (which holds our knowledge of language) and episodic (which holds memories of our own life's experiences).
Bullet # 2 Semantic memory essentially involves facts. It functions as a sort of encyclopedia that we carry around in our heads. It allows us to remember who wrote *Moby Dick,* or how to spell "disenfranchise," or on what day the Japanese attacked Pearl Harbor.
Bullet # 3 Semantic memories are not indelibly etched on our brains. Periodic maintenance rehearsal can help strengthen semantic memories.

Episodic Memory

- Memories of one's own life (also includes the time experiences occurred)
- Like a personal diary

Slide # 67

Bullet # 1 We use episodic memory to store important information from experiences in our life. Episodic memory has also been called "autobiographical memory."
Bullet # 2 Episodic memory is like a personal diary or journal. It can remind us what we had for breakfast, when we had our tonsils removed, the day we graduated from high school or college, or what we were doing when we heard about the terrorist attacks on 9/11. For older adults, knowing about the assassination of John Kennedy is semantic memory; remembering where they were when they heard the news is episodic memory.
Note: The drawing in this slide shows the assassination of Lee Harvey Oswald by Jack Ruby.

Declarative Memory

- Holds knowledge that can be called forth consciously as needed
- "What" and "that"

Slide # 68

Bullet # 1 Declarative memory has also been called "explicit memory." It holds facts and personal information that require a conscious effort to bring to mind.
Bullet # 2 Declarative memory allows us to know "what" and "that." For example,we remember "what" street we live on, and we know "that" two plus two equals four.

Procedural Memory

- Memory of learned skills that do not require conscious recollection
- We gradually lose the ability to describe what we are doing when we perform these skills

Slide # 69

Procedural memory involves skills that we learn as we mature, such as swimming, driving, or tying a tie. Eventually, we perform these skills so automatically that we lose the ability to describe to others how we do them.
Other types of procedural memories involve specific fears we develop and things we learn through classical conditioning.

Retrospective vs. Prospective Memory

- Retrospective memory: past experience or events and previously acquired information
- Prospective memory: things you need to do in the future

Slide # 70

Chronology distinguishes retrospective memory from prospective memory: retrospective memory focuses on the past; prospective memory focuses on the future. Remembering appointments, who to call in case of an emergency, and what we need to buy at the grocery store are all parts of prospective memory.

Muscle Memory

- Relying on muscles to perform complex motor skills such as riding a bike, dancing, typing, hitting a baseball

Slide # 71

Muscle memory is a type of procedural memory that relies on our muscles to perform complex motor skills. Dancers and athletes possess this type of memory. It helps them to give consistent performances at different times.

Flashbulb Memories

- What were you doing when…?
- Usually involves stressful or emotionally arousing personal or historical events

Slide # 72

Bullet # 1 "Flashbulb memories" are considered episodic because they ask, "Where were you when…?"
Bullet # 2 Flashbulb memories often involve important historical events like the first moon landing, JFK's assassination, or the 9/11 attack.
Note: The airbrush painting in this slide depicts the scene from a famous photograph of the assassination of Robert Kennedy.

Flashbulb Memories (cont.)

- Anderson & Conway (1997) coined the term "flashbulb memory"
- Permanently seared into the brain

Slide # 73

Flashbulb memories are so named because they seem to have been permanently seared or etched into the brain like the flash of light from a camera. Many of us share a flashbulb memory of the 9/11 attacks.
Special note: The portrait in this slide shows a New York City firefighter who bravely risked his life to save others.

Eyewitness Testimony

- Memory does not always work like a camera that records and retrieves snapshots of events
- Eyewitness testimony can be flawed
- Misinformation effect

Slide # 74

Juries often assign great importance to eyewitness testimony, however eyewitness testimony can be flawed. Memory does not always work like a camera. Elizabeth Loftus (pictured in the drawing in this slide), a leading expert on eyewitness testimony, has pointed out that many people are wrongly accused and convicted of crimes each year because of faulty eyewitness testimony. In one study, she found that giving people misinformation about a crime they have witnessed can cause them to make major mistakes in recall.

Schemas

- Conceptual frameworks that a person uses to make sense of the world
- Sets of expectations

Slide # 75

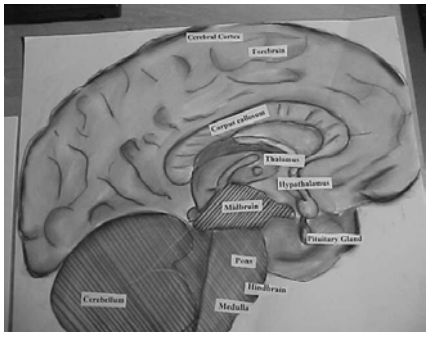
Bullet # 1 On some occasions, we reconstruct our memories by using what psychologists call “schemas.” Schemas are conceptual frameworks that help us make sense of the world.
Bullet # 2 We construct schemas based on expectations created by past experiences.
Note: This slide shows a portrait of Frank J. Huttle, a WWII Air Corps pilot. His bravery and sacrifice represent elements of popular schemas many of us have about pilots.

Schema Violation

Slide # 76

Schemas are learned generalizations about objects, events, and people. People get surprised when the expectations that underlie their schema are not met. The painting on the left of the slide depicts a female combat pilot. In the past, widely-held schemas held that only men could be pilots: people would assume that since the person in the painting is a woman, she couldn't possibly be a pilot. The roles of women in combat have since changed dramatically. The photo at the right of the slide shows Kristin Freberg Graham, a West Point graduate who won the Bronze Star while serving in the Iraq war. In the past, schemas assumed that female soldiers didn't engage in armed combat or head a combat unit. Graham, however, was put in charge of a platoon of 30 engineers—nearly all of them men. She said in an interview, "I have never had a problem just because I'm female."

Memory and the Brain



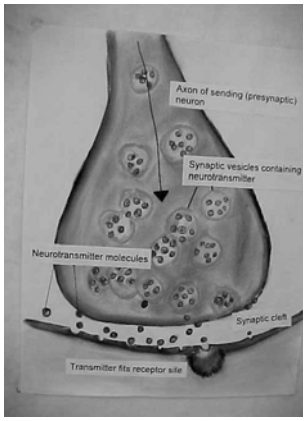
- How and where are memories stored in the brain?
- The striatum (deep in the frontal cortex)
- The hippocampus and the amygdala

Slide # 77

Bullet # 1 Psychologists don't know for certain how and where long-term memories are stored in the brain. They also suspect (but have yet to prove) that the information storage process involves physiological changes and/or changes in brain structure.

Bullet # 2 Psychologists theorize that two structures of the brain are related to memory: the hippocampus and the amygdala, both part of the limbic system. Most psychologists also believe that memory storage involves a very complicated chemical process that result in things ranging from decreased potassium levels to heightened levels of glucose.

The Biological Basis for Memory



- The human brain has billions of neurons and trillions of synapses
- How to track down specific networks of cells where memories are stored
- Aplysia

Slide # 78

Bullet # 1 Any individual neuron in the brain may have as many as 10,000 synaptic connections with other neurons. Since the brain has billions of neurons, the amount of synaptic connections numbers in the trillions. The diagram in this slide shows a single neuron.

Bullet # 2 Finding out exactly how the brain stores memories is like looking for a needle in a haystack. Some memory researchers have tried to simplify their task by studying a large sea snail (Aplysia) that possesses only 20,000 neurons.

Erik Kandel

- A molecular biologist/Nobel Prize winner
- Experiments with sea snails
- Neurotransmitter released into synapse

Slide # 79

Bullet # 1 Award-winning scientist Erik Kandel helped unravel the biological basis of memory.
Bullet # 2 Since learning results in the formation of new memories, Kandel set out to prove that sea snails were capable of learning new responses to certain stimuli. He started with a simple conditioned stimulus, squirting the snails with water until they became habituated to it and it no longer caused them to move. Next, he paired the squirt with a mild electric shock. By itself, the electric shock would cause the snails to withdraw their gills (their breathing apparatus). After pairing the squirt with the shock, the snails would withdraw their gills when squirted with water alone because they anticipated the shock.
Bullet # 3 Kandel observed that the amount of neurotransmitters released into the synapses between the nerve cells that controlled the withdrawal reflex increased as the snails learned the conditioned response. He thus proved that memory formation involves biochemical changes that occur at the synaptic level.

Retrieval and Recognition Exercise

- Look at the picture and name this dwarf from Walt Disney's "Snow White and the Seven Dwarfs"
- Write down or make a list of as many of the seven dwarfs that you can remember

Slide # 80

Note to teacher: Let students know that this exercise involves what psychologists call a "cognitive task." Give students a couple of minutes to complete the exercise, then go on to the next slide.

Seven Dwarfs

- The following list includes the names of all seven dwarfs. Which ones are correct?
- Tubby, Grouchy, Gabby, Fearful, Sleepy, Smiley, Jumpy, Hopeful, Shy, Droopy, Dopey, Sniffy, Wishful, Puffy, Dumpy, Sneezy, Lazy, Pop, Grumpy, Bashful, Cheerful, Shorty, Nifty, Happy, Doc, Wheezy

Slide # 81

Many people find it easier to remember the names of the seven dwarfs if they can choose from a list. That's why multiple-choice questions are easier than fill-in-the-blank questions.
Answer: Sleepy, Grumpy, Happy, Sneezy, Dopey, Doc and Bashful.

Forgetting

- Decay
- Memory loss
- Interference

Slide # 82

Bullet # 1 Everyone forgets things from time to time. From a psychological standpoint, forgetting occurs when information we once held in our long-term memory becomes unavailable. The term "decay" describes the fading away of memories over time. Things stored in short-term memory decay rapidly.
Bullet # 2 We know that a blow to the head or electrical stimulation (ECT) of certain parts of the brain can cause memory loss. When memory loss occurs, short-term memories go first; in most cases, the majority of long-term memories remain in place.
Bullet # 3 "Interference" occurs when previous memories block or erase a newer memory. Freud did not see interference as accidental or random. Instead, he believed that people subconsciously use interference to block memories of frightening experiences. He called this process "repression."
Note: Boxers who get knocked out (like the one depicted in this slide) often forget what led up to the knockout.

Amnesia

- Often caused by a traumatic injury to the brain, such as a concussion
- Retrograde amnesia
- Anterograde amnesia

Slide # 83

Bullet # 1 A severe, traumatic blow to the head can sometimes cause amnesia (loss of or gaps in memory). Football players who receive concussions that knock them unconscious may not remember anything about the play in which they were injured or other events that preceded the injury.
Bullet # 2 Losing memories of past events is called retrograde amnesia. A person with retrograde amnesia may not remember what took place months or even years before. In most cases, memories return gradually; however, full recovery seldom occurs.
Bullet # 3 In one case of anterograde amnesia, a patient known as "H.M." had to have his hippocampus removed in order to prevent constant epileptic seizures. After the operation, both his long-term and short-term memory appeared to be normal. Two years later, however, he could not remember his new address after he'd moved or how to get there. When told that his uncle had died, he grieved in a normal fashion, but he later began to ask why his uncle had not visited him recently. The surgery had destroyed the mechanism that transfers information from short-term memory to long-term memory.
Note: This slide shows a portrait of Troy Aikman, formerly of the Dallas Cowboys. He suffered four concussions which eventually ended his playing career.

Retrograde Amnesia

Slide # 84

This slide shows a painting of Alabama businesswoman Patsy Cannon. In a car accident in 1986, she received a severe head injury. She had to relearn almost everything, finding that she had forgotten the names of people, places, and things. She couldn't even recognize her own daughter. The image on the right depicts Patsy before her accident; the image on the left shows her as she looks today. After recovering from her accident, she became an advocate for people who have suffered brain injuries.

Childhood Amnesia

- A normal phase of development that accounts for the lack of memory before the ages of 3 or 4
- Dissociative amnesia

Slide # 85

Bullet # 1 What's your earliest memory? Most people can't recall events that occurred before they were three or four years old (Pillemer, 1999), probably because children at that age lack sufficient language acquisition. Memories that form before language develops don't get organized the same way in the brain. Freud called the failure to recall early life experiences "infantile amnesia." He believed that painful memories were selectively repressed or forgotten and pushed deep into the unconscious.
Bullet # 2 Dissociative amnesia involves memory loss that has not been caused by injury, disease, or other physical factors. It often results from stress.

Thinking and Problem Solving

Slide # 86

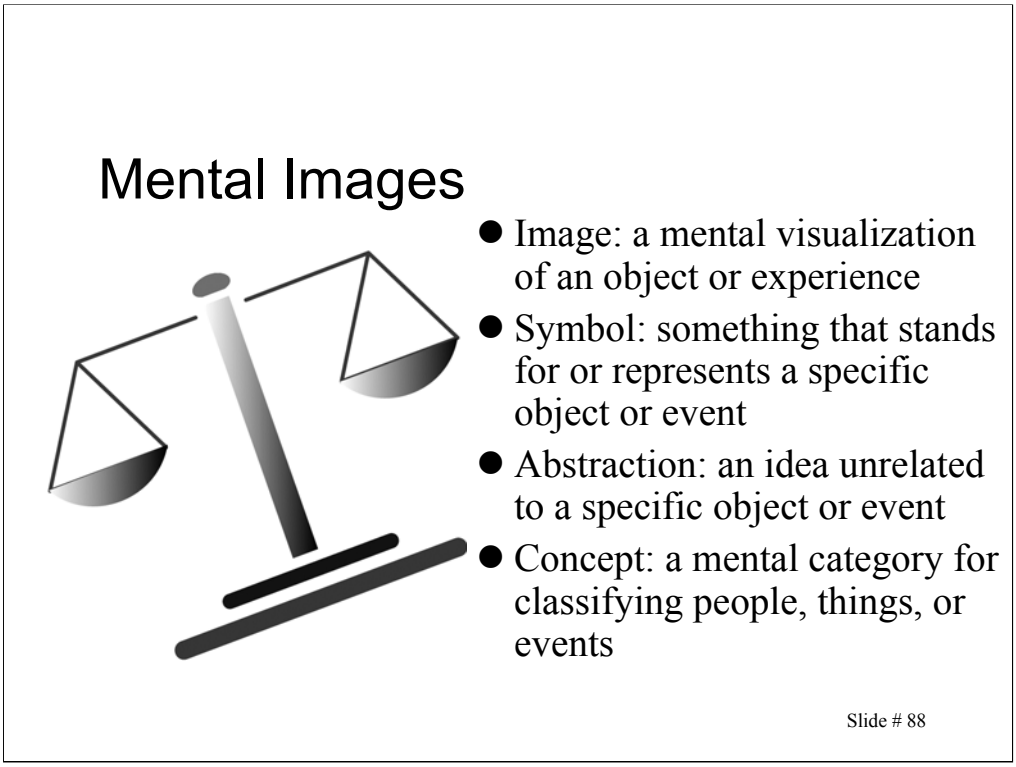
How do we think? How do we solve problems? Creativity is a form of thinking where we combine information in new ways. Creative thought is a basic mental ability that nearly everyone possesses to some degree. In this next section, we will examine how we think, how we develop language, and how language affects our thinking.

Thinking

- Changing and reorganizing information stored in memory
- Creates new information
- Thinking = a mental representation and manipulation of material

Slide # 87

Bullets # 1–2 If all the human brain could do was remember and retrieve information, we'd be little more than a camera or a basic computer database. We need to go beyond memory. Storage and retrieval are not enough. It is what we do with stored information that is important. When we think, we put together combinations of words from our memory and create new information.
Bullet # 3 The process of thinking actually involves manipulating a series of mental images.



Bullets #1–3 When we think, we are really just processing mental images. Symbols represent specific objects or events; abstractions represent ideas unrelated to specific objects or events. For example, the scales shown in this slide are a symbol of something specific: our system of justice. The idea of "justice," however, is an abstraction; it brings up the philosophical question, "What is justice?" Concepts are mental categories for classifying people, things, or events (Komatsu, 1992).

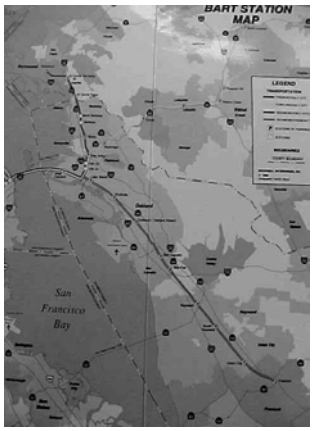
Conceptual Thinking

- Prototype: a representation of a concept
- Rule: a statement about relationships between concepts

Slide # 89

Bullet # 1 The following are examples of concepts: music, art, animals. These concepts arise from common attributes of objects that belong to each category. For example, when we think of the concept of "animals," a whole range of organisms may come to mind. Concepts allow us to "chunk" large amounts of information. Sometimes when you think of a concept, you may actually think of a specific representation. For example, when you think about the concept of "animals," you may picture a lion. Such a representation is called a "prototype."
Bullet # 2 A "rule" is an example of a more complex relationship between concepts. For example, we all know that a person cannot be in two places at the same time. This rule illustrates the relationship between two basic concepts: "place" and "time."
Mental images, symbols, concepts, prototypes, and rules provide the building blocks for thinking.

Mental Rotation



- The ability to hold and manipulate mental images helps us with many cognitive tasks
- Mental imaging can spark creativity

Slide # 90

Bullet # 1 If someone gave you directions on how to get somewhere, which of the following would you find easiest to follow?

1. Take two lefts and then an immediate right as you enter the freeway
2. Make a left turn at the McDonalds, then turn left again at the Costco. When you see the bridge, take the next right.

Visual images tend to be much easier for us to remember.

Bullet # 2 Mental imaging can lead to some very creative ideas and solutions to problems. For example, when Einstein was working on his Theory of Relativity, he created a mental image of himself riding on a beam of light.

Kinds of Thinking

- Direct/convergent thinking
- Non-directed/ divergent thinking
- Insight

Slide # 91

Bullet # 1 All of us think in different ways. “Directed thinking” (also known as “convergent thinking”) is a logical attempt to solve a problem. It relies on the use of symbols, concepts, and rules.
Bullet # 2 “Nondirected thinking” (also known as “divergent thinking”) is a type of free-flowing consciousness that doesn’t use specific steps to solve a problem. This type of thinking depends more on manipulation of mental images. Non-directed thinking commonly occurs when people get bored or daydream. Though it may seem as if the brain is just idling during times like these, it actually continues to process information and can produce some unexpected insights. Scientists and artists often come up with some of their best ideas using this type of thinking.

Strategies for Problem Solving

- Algorithm: a step-by-step technique used to solve a problem
- Heuristic: a "rule of thumb" problem-solving technique

Slide # 92

Bullet # 1 Problem solving requires the use of certain strategies. One such strategy is an "algorithm," which involves a fixed set of procedures. If we follow the algorithm correctly, it will lead us to a solution. Examples of algorithms include mathematical and scientific formulas. For example, if we multiply two numbers according to the basic multiplication algorithm (i.e., the rules of multiplication), we will get a correct answer every time.

Bullet # 2 Another problem solving strategy is called a "heuristic." Many times the algorithm method works too slowly. Heuristics provide problem-solving "shortcuts." They involve "rule of thumb" strategies that simplify the problem and help solve it more quickly. For example, if someone comes to you with a problem, you might advise him might to do something that worked for you in a similar situation in the past. Sometimes heuristics can produce faulty decisions however, because we often ignore relevant and important information when we take shortcuts.

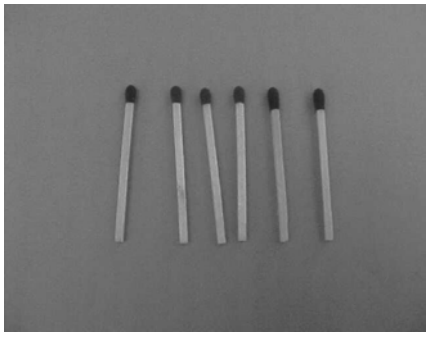
A Heuristic Application

Slide # 93

Do you think the man in this photograph works as a professor or as a construction worker? If you said professor, your judgment was probably influenced by what psychologists call ‘heuristic representation.” You probably assumed from your past experience that a man with glasses is more likely to be a professor than a construction worker.

Obstacles in Problem Solving

- Mental set
- Functional fixedness



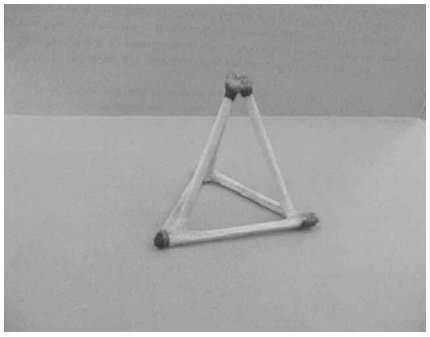
Slide # 94

Bullet # 1 Sometimes certain strategies become fixed or cemented into the problem-solving process, a situation known as “mental set.” Mental set is a habitual pattern or strategy of problem solving. For example, an old joke goes, “What is black and white and read all over?” The answer is a newspaper. When you say the word “read” however, the person listening to the joke might hear it as “red.” This may happen because you’d previously mentioned two colors (black and white) in the joke, and the listener makes a logical leap to conclude that the word must be “red” to fit in with the series of colors. If they make this assumption, they won’t be able to solve the riddle.

Bullet # 2 Another problem called “functional fixedness” occurs when a person can’t imagine new functions for familiar objects. In other words, people become set in their ways of thinking about certain things and tend to make assumptions that can sometimes hinder problem solving. For example, look at the picture in this slide. How could you arrange these six matches so that they form four equilateral triangles. Most people try to solve the problem in a two-dimensional way. (Note to teacher: see the next slide for the solution.)

Rigidity Can Be Overcome

- Rigidity is less likely to occur with unusual problems



Slide # 95

Rigidity can be overcome if and when a person understands that their strategy doesn't work for the problem at hand. Repeated failure forces them to look for a new solution. Rigidity becomes less of an obstacle when the problem is unusual. A person confronted with something completely out of the ordinary will not have an ingrained set of assumptions to fall back upon and won't even try to apply old, rigid solutions.

Creativity

- The ability to use information in new and original ways
- All problem solving requires creativity
- Creativity includes flexibility
- Recombination and insight

Slide # 96

Bullet # 1 Creativity involves using information we've acquired in new and original ways. Psychologists do not know why some people can think more creatively than others.
Bullet # 2 All problem solving requires some degree of creativity.
Bullet # 3 "Flexibility" is the opposite of rigidity. For example, how many uses can you think of for a brick? The more uses a person can come up with, the more flexibility he or she shows.
Bullet # 4 "Recombination" means to rearrange the basic elements of a problem in order to arrive at a solution. Recombination forms a vital part of creativity. "Insight" is the sudden realization of a solution to a particular problem. When a person gets stumped by a problem and takes a break to engage in another activity, the solution to the problem might suddenly present itself. It can seem as if the answer has come out of nowhere.

Language

Slide # 97

Language is a communication system composed of either verbal symbols (such as words), visual symbols (such as the sign language that hearing-impaired people use), or some combination of verbal and visual symbols. In the photos in this slide, American Sign Language teacher Kristen Fraisse spells out the word “language” using hand signs. “Grammar” is a set of rules governing the use of words, phrases, and sentences to express meaning.

How We Acquire and Use Language

Slide # 98

Language is such an integral part of our culture it is nearly impossible for us to envision life without it. Language is so critical that even those who cannot hear or speak have found other ways to communicate. Deaf people even dream in sign language. Without some form of communication, our thinking could not even exist. Acquisition of language thus becomes perhaps the most important skill we pick up in the course of our lives.

Early Language Acquisition

Slide # 99

In our lifetimes, we must learn thousands of words and many rules of grammar in order to communicate and make sense of what others communicate to us. One of the most important steps in the acquisition of language is reading. Reading on a frequent basis to very young children helps acclimate them to language and prepares them to start reading themselves.

The Structure of Language

- Four rules
  1. Phonemes
  2. Morphemes
  3. Syntax
  4. Semantics

Slide # 100

No special notes. See the next slides for an explanation of each.

Phonemes

- Individual sounds that are basic structural elements of language
- 100 different and recognizable sounds

Slide # 101

Bullet # 1 Phonemes are individual sounds that provide the basic structural elements of language. For example, consonants and vowels are phonemes. Phonemes can even be a single letter like a “t” or a combination of letters like “sh.”
Bullet # 2 Humans can produce about 100 different, distinct sounds. Languages do not use all 100 sounds: for example, English employs about 43 sounds, other languages use as few as 15 sounds, and some languages incorporate as many as 85 sounds.
Note: Just as we form spoken words from phonemes, signs in any sign language also are made up of basic components. The Dictionary of American Sign Language lists 18 or 19 hand shapes, 24 movements, and 12 locations.

Morphemes

- The smallest unit of meaning in a given language
- Made up of one or more phonemes
- Phonemes are units of sound, morphemes are units of meaning

Slide # 102

A morpheme is a unit of meaning made up of one or more phonemes. A morpheme can be a word, a letter, a prefix, or a suffix. The words “book,” “love,” and “reason” are single morphemes. “Loves,” “relearn,” and “walked” have two morphemes (“love” and “s,” “re” and “learn,” “walk” and “ed”).

Syntax

- Language rules that govern how words can be combined to form meaningful phrases and sentences
- Syntax varies from language to language

Slide # 103

Bullet # 1 "Syntax" is a set of rules for combining phrases, sentences, or words in order to express thoughts. We need syntax in order to understand what others say and to be understood by others. English syntax follows certain grammatical rules such as placing adjectives in front of nouns.
Bullet # 2 Every language has its own particular rules of syntax.

Semantics

- The study of meaning in language
- The same word can have different meanings

Slide # 104

"Semantics" focuses on the meanings of different words. It also looks at how the same word can have two different meanings. These two sentences illustrate how semantics operate: "Do you mind if I sit next to you?" and "A mind is a terrible thing to waste." Clearly the word "mind" has different meanings in each of these sentences. Our knowledge of semantics helps us realize which meaning applies to which instance. In the first sentence, "mind" functions as a verb; in the second sentence, it functions as a noun.

How Do Children Learn Language?

- B.F. Skinner and operant conditioning
- Behavior is reinforced with smiles and attention
- Children understand before they speak
- Children learn language through observation

Slide # 105

Bullets # 1–2 B.F. Skinner theorized that children learn language through operant conditioning. When children utter sounds similar to adult speech, adults reinforce their behavior with smiles, hugs, etc. This encourages children to repeat those sounds, and eventually they learn to talk.
Bullet # 3 Many psychologists have criticized Skinner's ideas. For example, they cite the fact that children can understand language before they can speak or receive any rewards for speech-like sounds.
Bullet # 4 Some psychologists believe that children learn language through simple observation.

Noam Chomsky

- A mental program
- LAD
- Infants possess an innate capacity for language
- Transformational grammar

Slide # 106

In 1957, Noam Chomsky theorized that children inherit a mental program that enables them to learn grammar. He called this program "LAD," which stands for "language-acquisition device." He also believed that infants possess an innate capacity for language. Chomsky created the notion of "transformational grammar," which he defined as "a system for describing the rules that determine all the sentences that can possibly be formed in any language."

Stages of Language Development

- Birth/infancy: cries, distress
- 2 months: cooing
- 4 months: babble
- 9 months: babbling is refined

Slide # 107

Infants go through four stages of language development.
Bullet# 1-4 At birth, infants cry and make sounds which indicate some distress. By the age of two months, they begin to "coo" (i.e., long, drawn-out sounds like "oooh"). At four months, infants reach the first stage of language development and begin to babble. By the time children learn to babble, they have begun to gain some control over their vocal chords. By nine months, infants have refined their babbling to include sounds that comprise words in their native language. Deaf children "babble" by using hand signals, which they repeat over and over again.

Stages (continued)

- By 1 year: single words are uttered
- By 2 years: two words together (50–100 words)
- By 4 years: complete sentences

Slide # 108

Bullet # 1 By about one year of age, infants begin to utter single words. They often describe familiar objects or people (“dada,” “mama,” “doggie”). At this stage, children may use single words to express or describe more complicated thoughts. For example, if they say “da” they may want to know where their daddy is.
Bullet # 2 Toward the end of the second year, children begin to place two words together to express ideas (e.g., “me play”). “Right there” might mean, “You stay right there, I will be right back.” By two years of age, children often have a vocabulary of between 50 and 100 words.
Bullet # 3 By the age of four, children begin to form complete sentences.