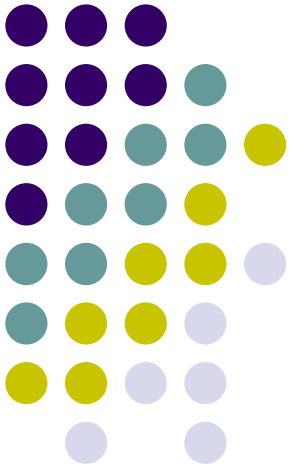
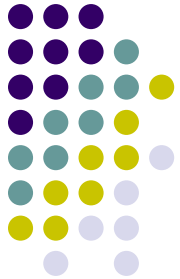
Cognition

AP Psychology:



Learning Targets:



- AP students in psychology should be able to do the following:
- Compare and contrast various cognitive processes:

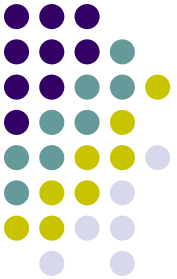
— effortful versus automatic processing;

— deep versus shallow processing;

— focused versus divided attention.

- Describe and differentiate psychological and physiological systems of memory (e.g., short-term memory, procedural memory).
- Outline the principles that underlie effective encoding, storage, and construction of memories.
- Describe strategies for memory improvement.
- Synthesize how biological, cognitive, and cultural factors converge to facilitate acquisition, development, and use of language.
- Identify problem-solving strategies as well as factors that influence their effectiveness.
- List the characteristics of creative thought and creative thinkers.
- Identify key contributors in cognitive psychology (e.g., Noam Chomsky, Hermann Ebbinghaus, Wolfgang Köhler, Elizabeth Loftus, George A. Miller).

Lesson One / Two: Models of Memory



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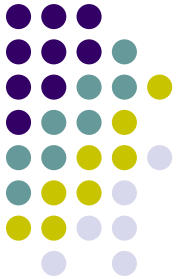
Lesson Introduction: Activity



- What you will need for this activity :Scrap paper and pen/pencil
- **Directions**: On the next slide there is a ten word list. Your task is to try to memorize as many of the words and their definitions in the next minute. After the minute is up, you will need to write down as many of the words as possible and their meanings. Do NOT take any notes during the one minute time period.

Word List:

- 1. abatjour - skylight or device to direct light into a room
- 2. balneary – bath
- 3. gambado - bound or spring of a horse; fantastic movement
- 4. madapollam - fine cotton cloth
- 5. xiphias - swordfish
- 6. taeniacide - killing of tapeworms
- 7. ocracy – government
- 8. ignify – to burn
- 9. nemorous – wooded
- 10. hawkshaw - detective

Discussion:

- 1. How many words and definitions did you remember?
- 2. What strategies did you use to remember the words and definitions?
- 3. How would your strategy(s) have been different if you would have had more time?
- 4. Do you think you'll remember any of these words or definitions later today?

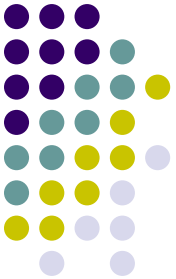
Introduction:

- "In order to profit from what you learn, you need to remember it."
- **Memory** – your capacity to register, store, and recover information over time.
- **Cognition** – all the mental activities associated with thinking, knowing, and remembering information

Models of Memory: #1

- How do we explain how memories are consolidated?
- **Information Processing Model** – Our mind is like a computer.
- 1. Encode – take in information (neural impulses)
- 2. Store – from a moment → lifetime
- 3. Retrieval – how easy is it to "open" up the memory that we want
- **Filter Theory** – (Donald Broadbent) – unimportant information is dropped, and important information is encoded into the next stage

Memory System Processes



Encoding
The process of transferring information from one memory stage to the next

Storage
The process of maintaining information in a particular stage

Retrieval
The process of bringing stored information from long-term memory to the conscious level in short-term memory

Levels of Processing: #2

- **Levels of Processing Model** (Craik and Lockhart) – How long and how well we remember information depends on how deeply we process the information when it is encoded.
- **Shallow processing** – We pay attention to physical characteristics that are highest in priority (crossing the street while driving), we don't pay attention to the small things.

Types of Encoding:

- **Semantic Encoding** – emphasizes the meaning of verbal input
- **Deep Processing** – occurs when we attach meaning to information and create associations between the new memory and existing memories. (elaboration)
- **Self-referent encoding** - One of the best ways to facilitate later recall is to relate the new information to ourselves

Three Stage Model: #3

- **Atkinson-Shiffrin Three Stage Model of Memory** – 3 different memory systems characterized by time frames (Sensory, STM and LTM)

  Sensory Memory – information from external events is held just long enough to be perceived

  Iconic Memory – an exact copy of visual information

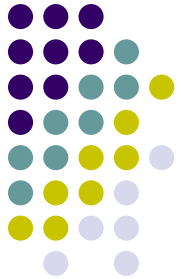
  Echoic Memory – auditory memory that lasts for about 4 seconds (long enough for us to hear the flow of information)

Other Terms:

Click the Pic for Brain Games!

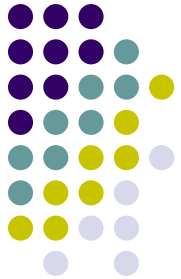
- Most of our sensory memory is lost
- **Selective Attention** – focus of awareness on a specific stimulus (small % of information is actually encoded)
- **Automatic Processing** – unconscious encoding that happens (think social learning)
- **Parallel Processing** – many things can be encoded at the same time
- **Effortful Processing** – encoding that requires our attention and conscious effort

What do you remember activity:



- The following activity is designed to get you thinking about how your brain decides to remember things.
- Let’s see what happens!

Lesson Two Objectives:

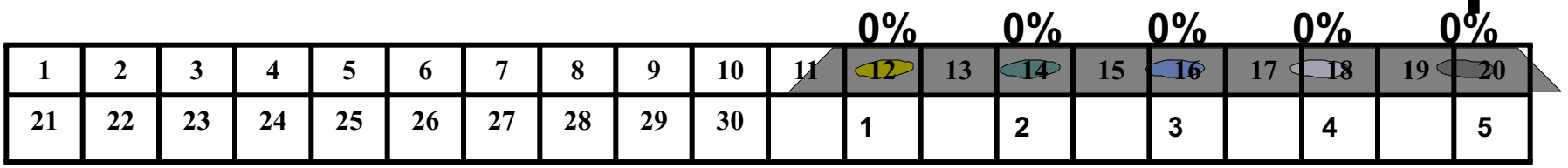


- **By the end of this lesson, I will be able to:**
- 1. Describe and differentiate psychological and physiological systems of memory (e.g., short-term memory, procedural memory).

- BUT FIRST – Let's go over the activity from yesterday

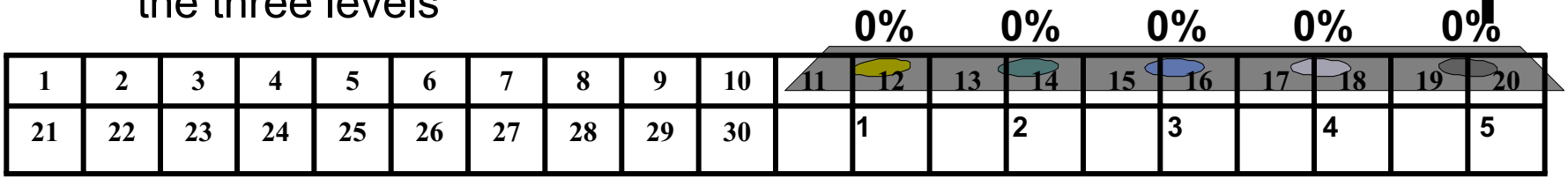
The three stages of the Atkinson-Shiffrin process of memory are:

1. Iconic, sensory, and procedural
2. Sensory, short term, and long term
3. Shallow, medium, and deep processing
4. Semantic, episodic, and procedural
5. Cerebellum, temporal lobe, and hippocampus

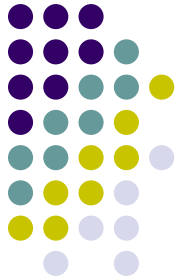


According to the levels of processing theory of memory:

1. We remember items that are repeated once or twice
2. Sporadic rehearsal will encode items into our long-term memory
3. Deep processing involves elaborative rehearsal, ensuring encoding into long-term memory
4. We can only hold 7 items in our short term memory before it's full
5. Input, output, and storage are the three levels



Discussion Starter: Turn and talk



- 1. What are some ways that seem to work for you when trying to memorize information?
- 2. Did some one teach this to you or did you learn it on your own?
- 3. Is it the school's responsibility to teach you how to "remember" information?

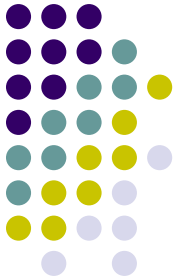
Short Term Memory:

- **Short Term Memory** – can hold a limited amount of information for about 30 seconds unless it is processed further.
- George Miller – we can process 7 unrelated "bits" of information at one time (phone #'s)
- We can hold memories longer if we **rehearse** the new information over and over again
- So….The more time we spend learning new information, the more we retain it. (even after we've learned it)

STM: Cont

- Additional rehearsal after learning is called **overlearning**.
- Chunking – placing information into meaningful units helps us to remember (the date)
- **Baddeley's Working Memory Model** – Visual memory briefly stores visual and spatial information from sensory memory.
- **Imagery** – Mental pictures
- This allows us to do more than one thing at a time.
- Example: Working out (talking while exercising)

Long Term Memory:



- **Long Term Memory** – relatively permanent and practically unlimited capacity memory system into which information from short-term memory may pass. (2 levels)
- Level 1 – Explicit/declarative memory – our LTM of facts and experiences we consciously know and can verbalize.
- Subdivision 1– Semantic memory – facts and general knowledge
- Subdivision 2 – Episodic memory – personally experienced events
- Level 2 – Implicit memory – our LTM for skills and procedures to do things
- Subdivision – Procedural memory – motor and cognitive skills (how we think and move) – we do these without thinking (tying shoes)


Discovery
EDUCATION

Your Thoughts:

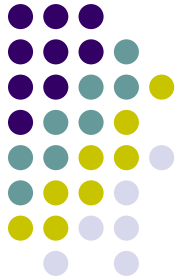
- What is your overall reaction to this video clip?


Discovery
EDUCATION

Your Thoughts:

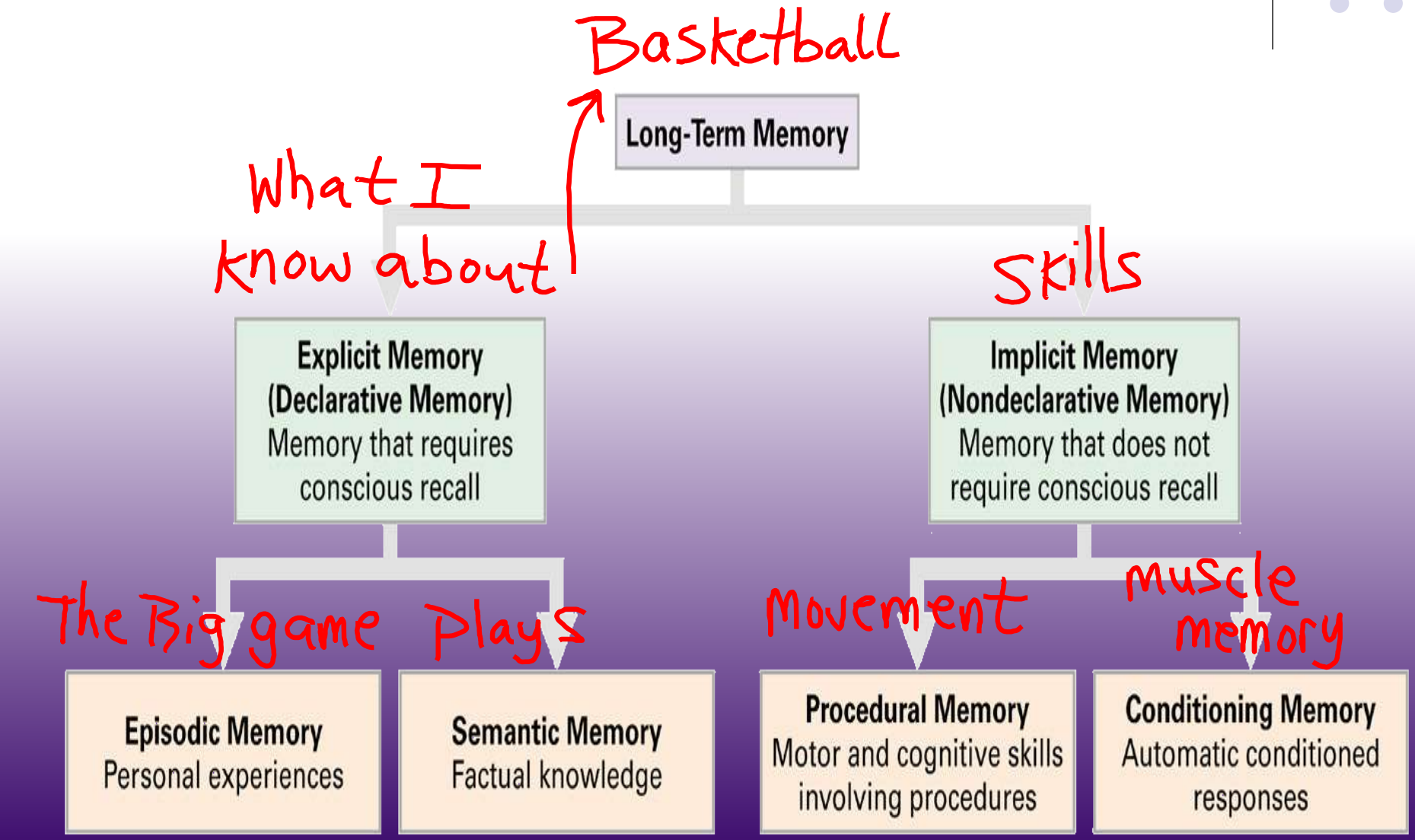
- What is your overall reaction to this video clip?

BBC: Memory Link

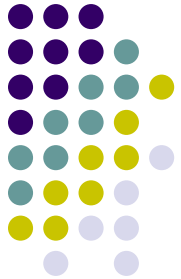


- http://www.bbc.co.uk/sn/tvradio/programmes/horizon/broadband/tx/memory/

Types of Long-Term Memory

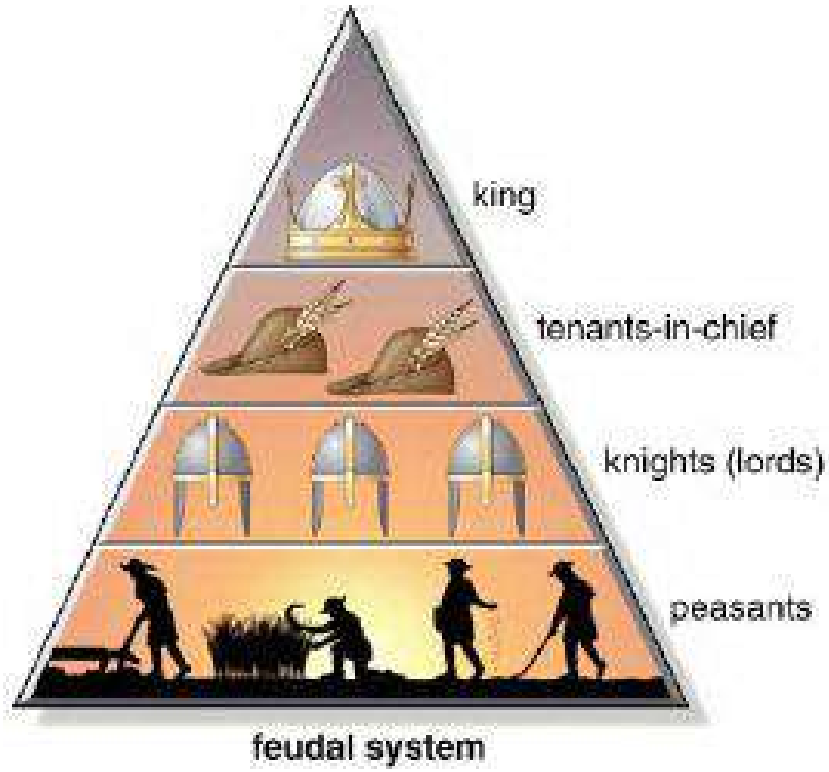


Lesson Three: Organization of Memories



- **By the end of this lesson, I will be able to:**
- Outline the principles that underlie effective encoding, storage, and construction of memories.

How is information in long-term memory organized? – Model #1



feudal system

- **Four Models**: Hierarchies, Semantic networks, schemas, and connectionists networks.
- 1. **Hierarchies** – systems in which concepts are arranged from more general to more specific
- Concepts – mental representations of related things (objects, events, etc.
- Prototypes – typical examples of the concept (robin = bird)

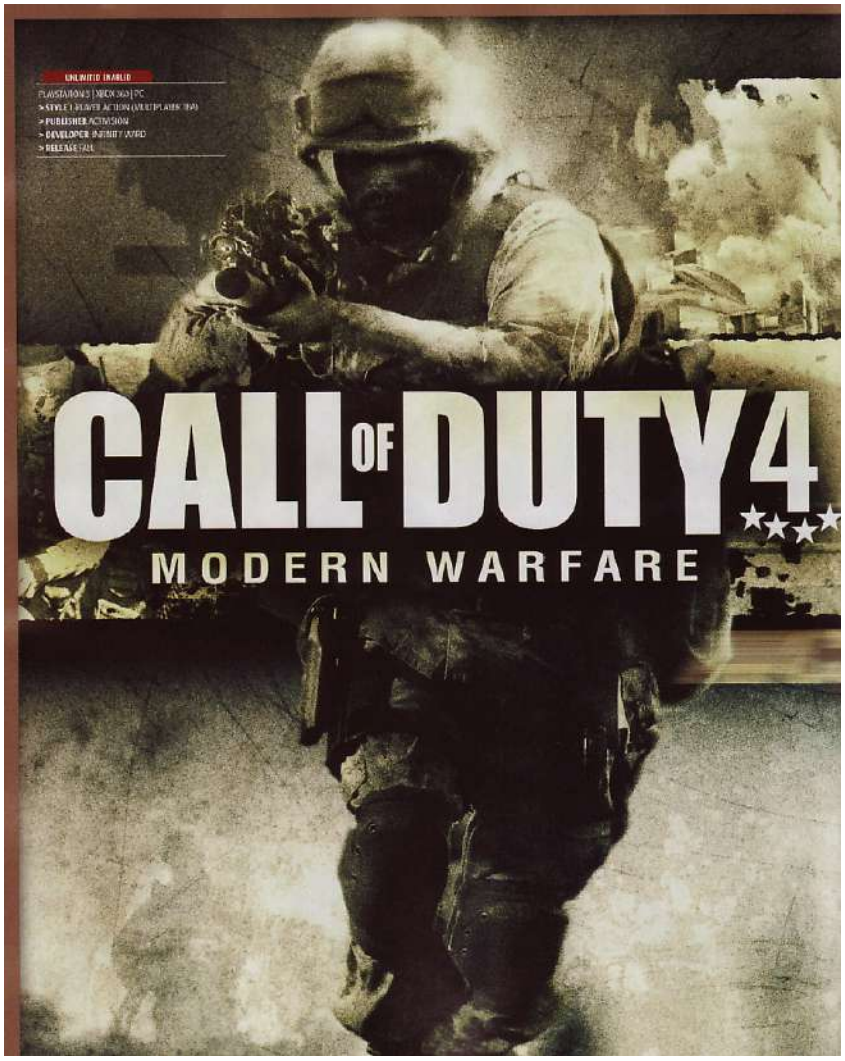
Model #2 – Semantic Networks

- **Semantic Networks** – more irregular and distorted systems with multiple links from one concept to another.
- Example – a bird is like a fly (wings), they both have vertebrae (like humans) and on and on…..
- We build "mental maps" that organize and connect concepts to let up process complex experiences.

Model #3 - Schemas

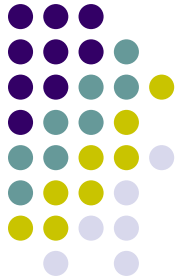
- **Schemas** – help us to integrate and adapt new experiences/info to old experiences/info
- A script is a schema for an event (elementary school)

Model #4 - Connectionism



- **Connectionism** – memory is stored throughout the brain in connections between neurons
- Neurons work together to process a single memory
- Artificial intelligence designs have used this idea to create more lifelike simulations and games. (they can learn and adapt to new situations)

Lesson Four: Biology of Long Term Memory and Retrieving Memory:



- **By the end of this lesson, I will be able to:**
- 1. Outline the principles that underlie effective encoding, storage, and construction of memories.
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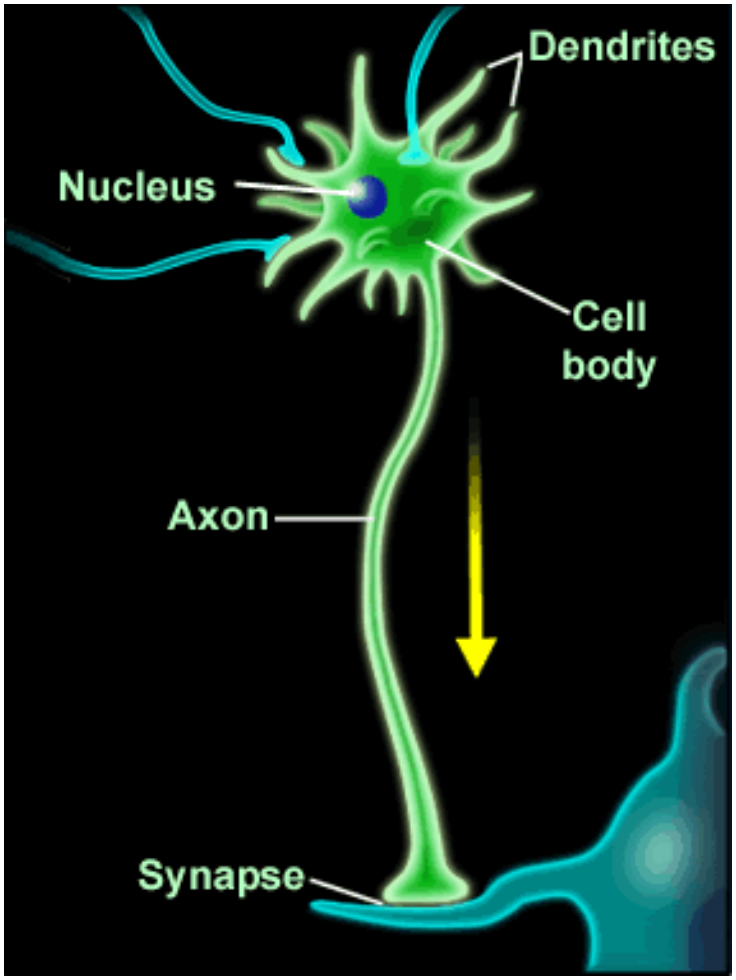
Biology of Long-Term Memory:



- Learning new information involves strengthening of neural connections at the synapses
- **Long term potentiation** – involves an increase in the efficiency with which signals are sent across the synapse within neural networks of long term memories.
- Over time, this requires your brain to use much less "processing power" in order to remember something.

Flashbulb Memory:

- **Flashbulb memory** – a vivid memory of an emotionally arousing event (9/11)
- During these moments the adrenal hormones trigger a release of energy for neural processes (this also gets your amygdala (storage of emotional memories) and hippocampus involved)
- This is why you will remember these events more clearly than others

More About the Brain:

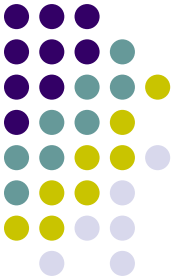
- Hippocampus and Left Frontal Lobe – especially active in encoding new information into memory
- Right frontal lobe – more active when we retrieve information
- Cerebellum – helps to store procedural memories (skills) and classically conditioned memories

Regions of the Brain and Memory:

Click the pic!

- Thalamus – helps to encode short term memories
- **Hippocampus** – involved in putting information from STM to LTM
- Destruction of the hippocampus = **anterograde amnesia** - the inability to put new information into LTM
- **Retrograde amnesia** – memory loss for a segment of the past (blow to the head) – could result from Long term potentiation process being disturbed

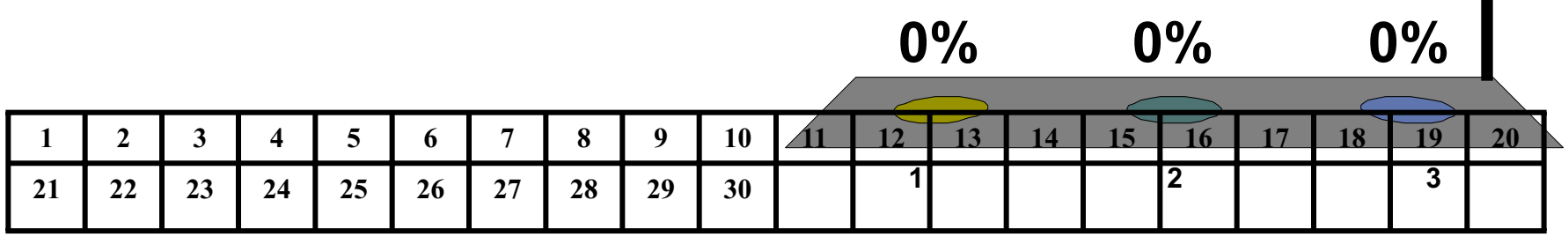
Reactions: Turn and Talk (2 minutes)



- What did you think about the video?

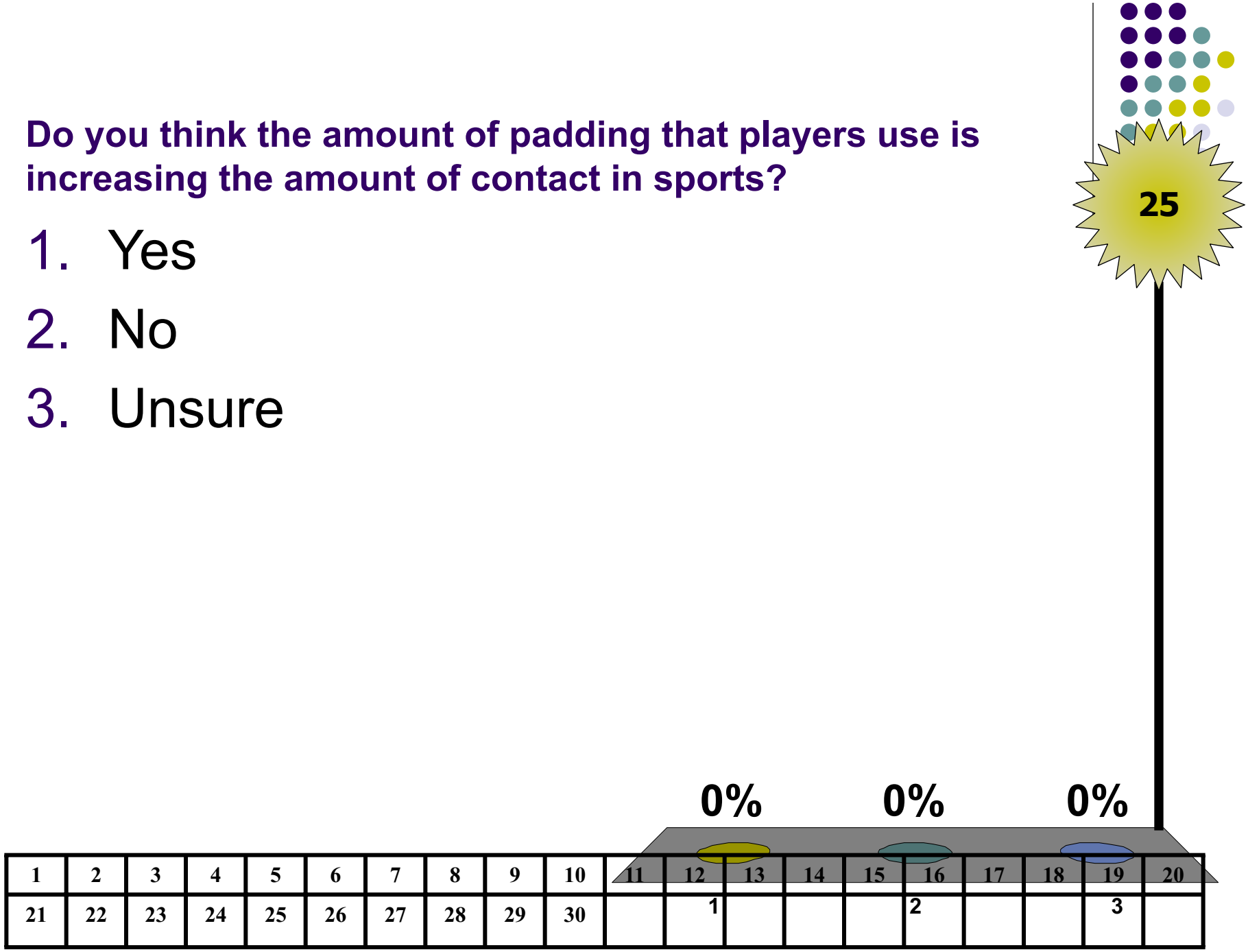
Should there be an age limit on contact sports?

1. Yes
2. No
3. Unsure



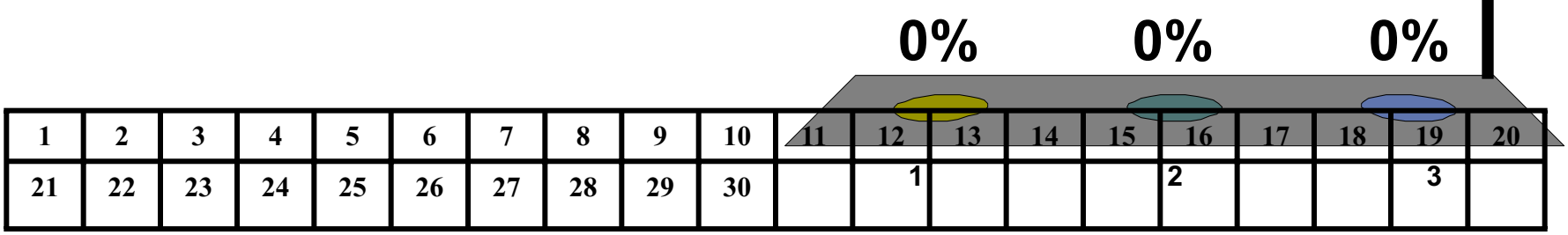
Do you think the amount of padding that players use is increasing the amount of contact in sports?

1. Yes
2. No
3. Unsure



Should the NFL, NHL, etc. be responsible for the mental health of it's players after they've retired from the sport?

1. Yes
2. No
3. Unsure



Lesson 4: Objective

- **By the end of this lesson, I will be able to:**
- 1. Describe strategies for memory improvement

Retrieving Memories:

- Retrieval – the process of getting information out of memory storage
- **Recognition** – m/c questions
- **Recall** – essay
- When we need to remember something we often aim to **reconstruct** the idea in our mind

Retrieval:

1. ATMOSPHERE
2. CHEMICALS
3. COLOR
4. CURRENT
5. DENSITY
6. ECLIPSE
7. GRAVITY
8. HURRICANE
9. ORBIT
10. TEMPERATURE
11. RADIATION
12. MERCURY
13. MELT
14. OBSERVATION
15. PRECIPITATION
16. POLLUTION
17. SPACE
18. DECAY
19. EROSION
20. AXIS
21. EVAPORATE
22. FORECAST
23. LIQUID

When remembering a list of words, we tend to remember the first and last words best – **serial position effect**

Example: Presidents of USA

Primacy effect– remembering the first words

Recency effect – remembering he last words

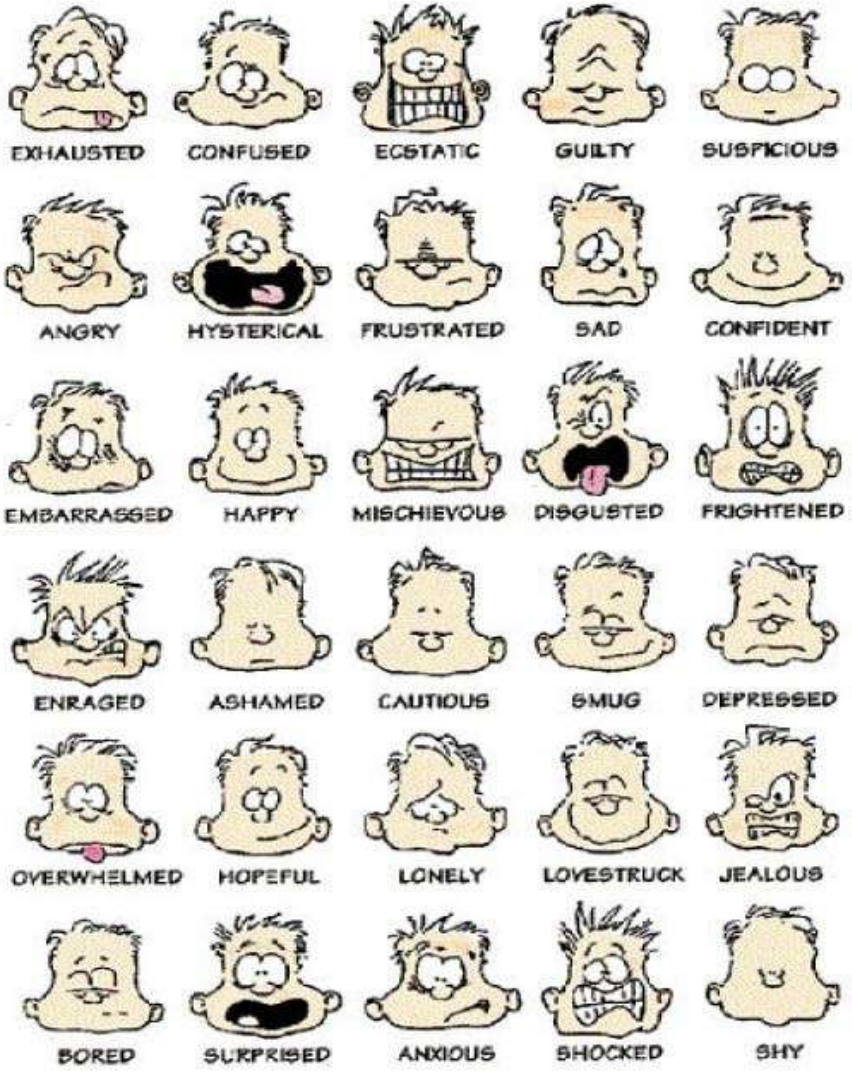
So, What Helps us Remember?

- **Retrieval Cues** – Reminders associated with information we our trying to get out of memory.
- **Priming** – hints (the NNNNNAAAAA……ZI'S!)
- *Studying Hints*–
- short sessions with rest – Distributed Practice
- Long sessions – Massed Practice (cramming)
- DP works better

More Retrieval Help:

- **Mnemonic Devices** – ROY G. BIV, **M**y **V**ery **E**ducated **M**other **J**ust **S**erved **U**s **N**ine **P**ies
- **Method of Loci** – use associations of words on a list with visualization of places on a familiar path (chicken, corn, bread)
- Chicken pecking at the door because it wants some corn that is out in the field, but all we have is some old bread that is in the garage.

What Affects Retrieval?



- Our recall is best when we recall information in the same setting in which we encoded it (the environment becomes part of the memory) – **context dependent memory**
- Example – taking a test in the same room that you learned the information (AP REVIEW?)
- Mood may also play a factor – **Mood congruence**
- **State- dependent** – drunk person remembers where they left something when their drunk instead of sober.

Why do we forget?

- 1. Failure to encode
- 2. Decay of stored memories
- 3. Inability to access stored memories
- 4. Motivated forgetting

#1: Failure to Encode Information:

- **Encoding failure** results from sensory information never entering LTM because we did not pay attention to them.
- Example:
- 1. What is on the front of a dollar bill?
- 2. What is on the back of a dollar bill?

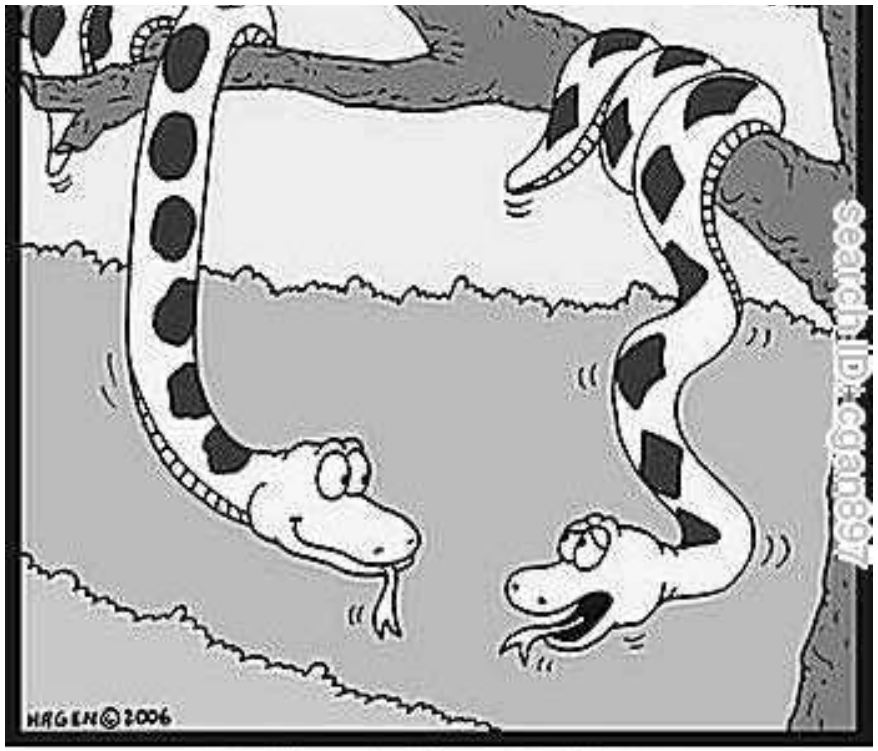

FEDERAL RESERVE NOTE
THE UNITED STATES OF AMERICA
I 68482353 F
ONE DOLLAR


THE UNITED STATES OF AMERICA
ONE
IN GOD WE TRUST
ONE
ONE DOLLAR

#2: Decay of Stored Memories:

- **Decay of stored memories** happen as a result of a gradual fading of physical memory
- Example: Foreign language – if you don't use it, you lose it!
- **Relearning** – we should learn the same information quicker than before (AP Review)
- If relearning the same information takes as much time as before – our memory has decayed.

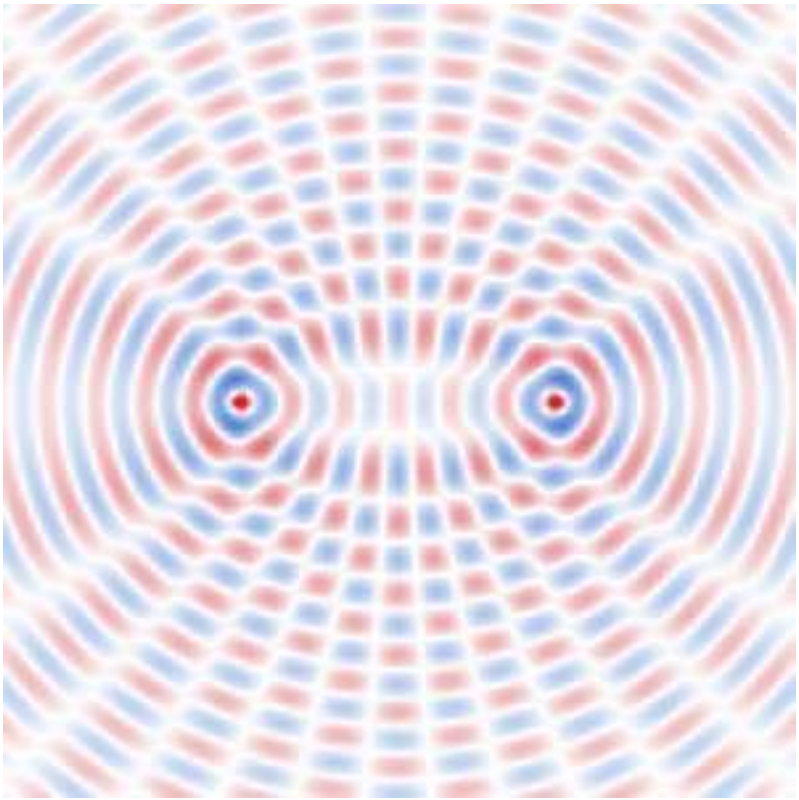
#3: Inability to access information from LTM:



- Inability to access information from our LTM happens because of:
  1. Insufficient retrieval cues
- 2. **Interference** – learning similar items may prevent retrieving others

Tip of the tongue phenomenon – we know that we know something, but can't pull it out of our memory

Two Types of Interference:

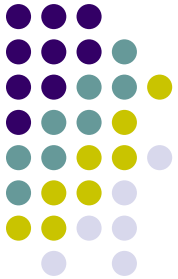


- **Proactive** – something we learned earlier disrupts the recall of something we experience later (taught incorrectly)
- **Retroactive** – new learning effects the recall of older information (new phone #s)

Interference Application:

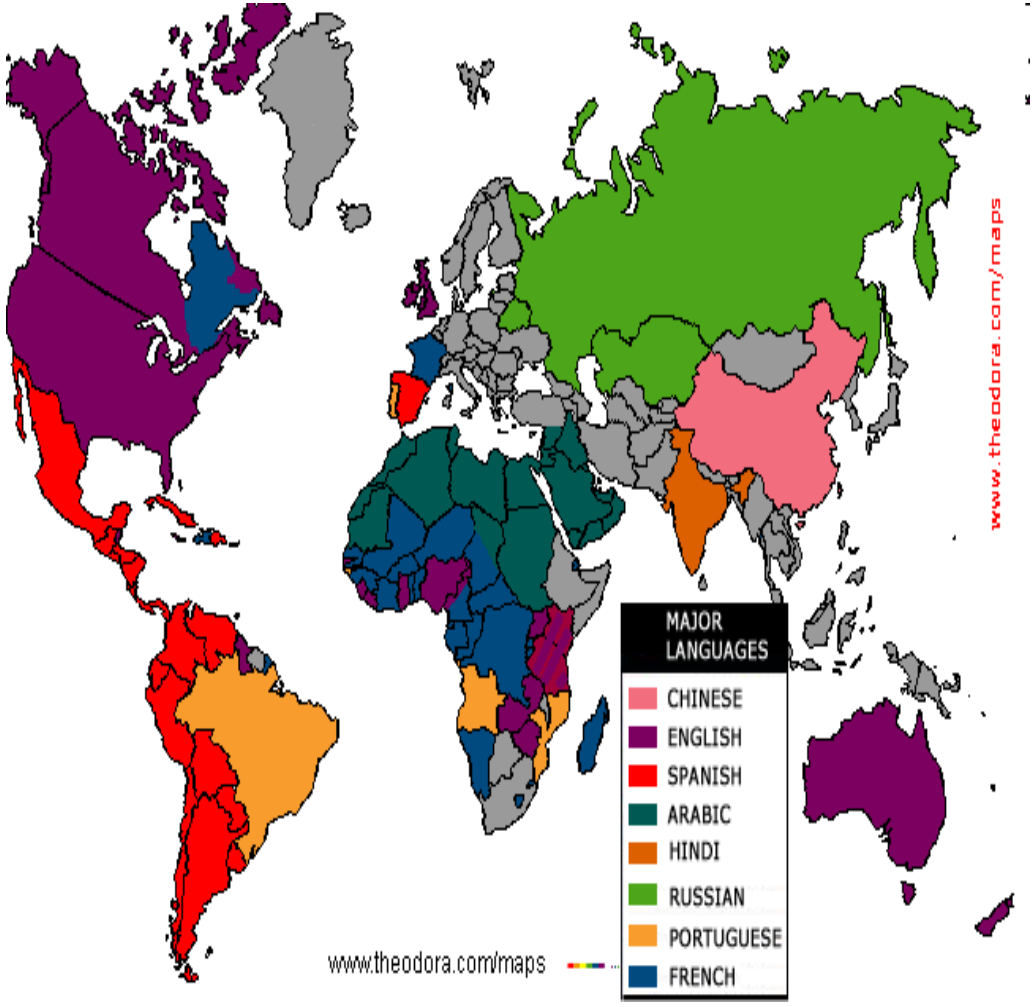
- **Confabulation** – we fill in the missing details with what we want to remember (accident scene – if we were the cause)
- **Misinformation effect** – occurs when we incorporate misleading information into our memory of an event (fight in school – rumors)
- This is also called misattribution error (line up – weapon focus)

So.. What Have We Learned?



- 1. Over learning – keep practicing
- 2. Relate material to ourselves
- 3. Mnemonic devices
- 4. Minimize interference
- 5. Space out study sessions
- 6. Frequent testing of knowledge
- Question: Of all of these, which do you think you will use the most?

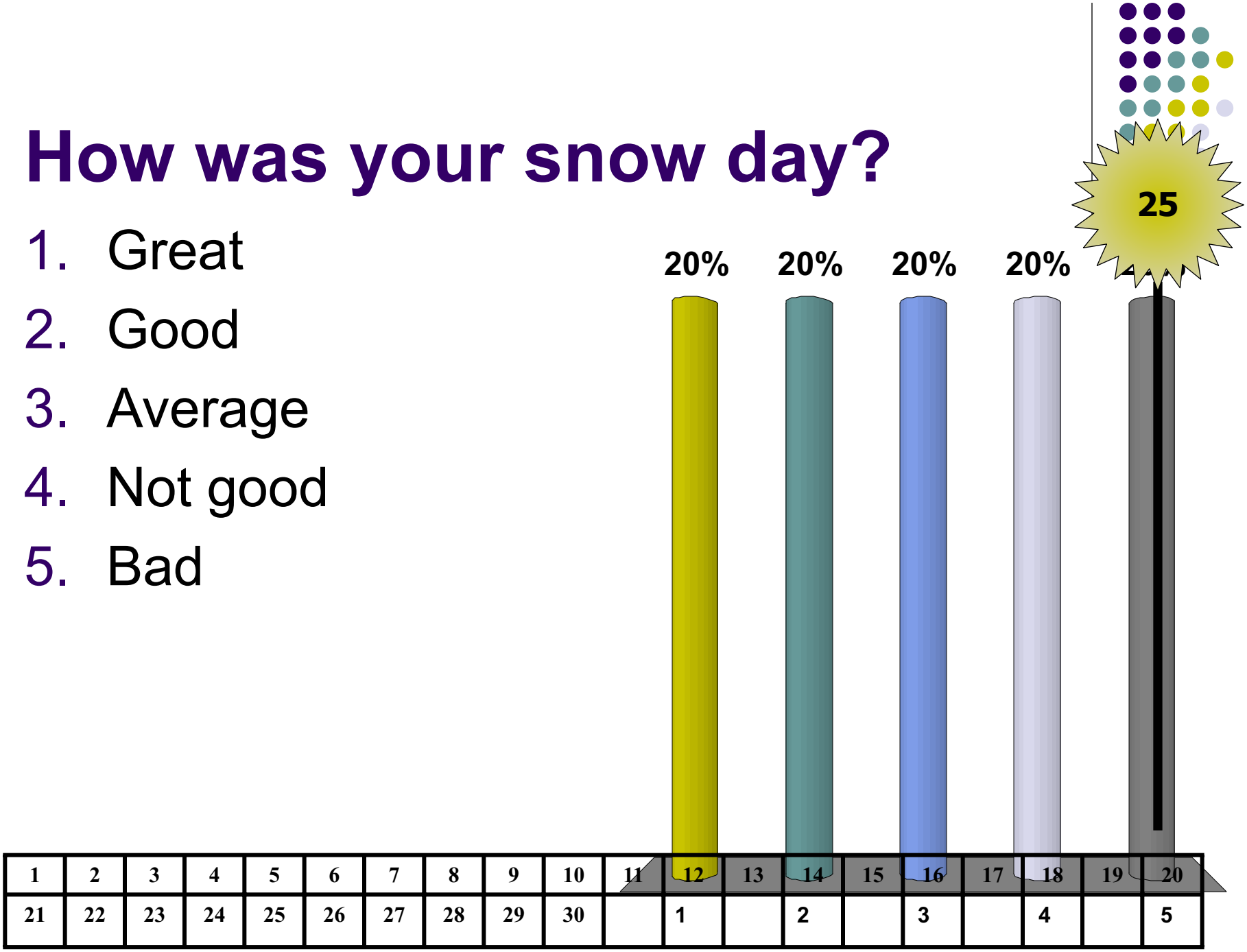
Lesson Five – Language Acquisition



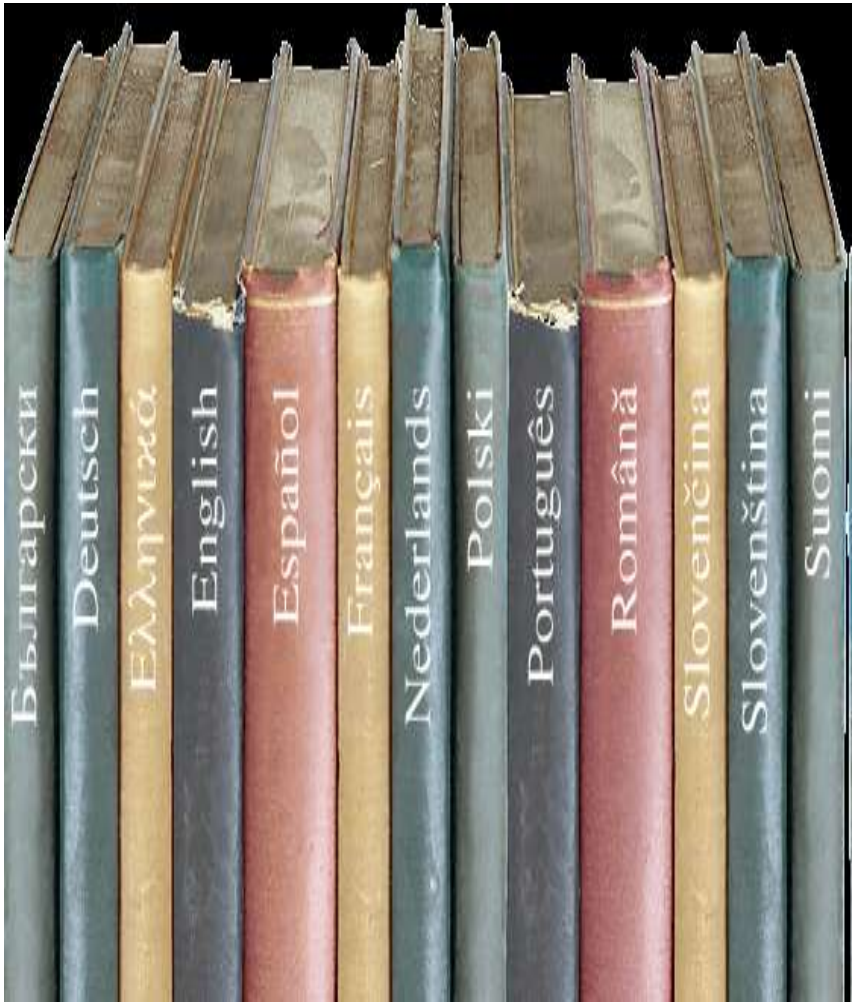
- By the end of this lesson, I will be able to:
- 1. Synthesize how biological, cognitive, and cultural factors converge to facilitate acquisition, development, and use of language.

How was your snow day?

1. Great
2. Good
3. Average
4. Not good
5. Bad

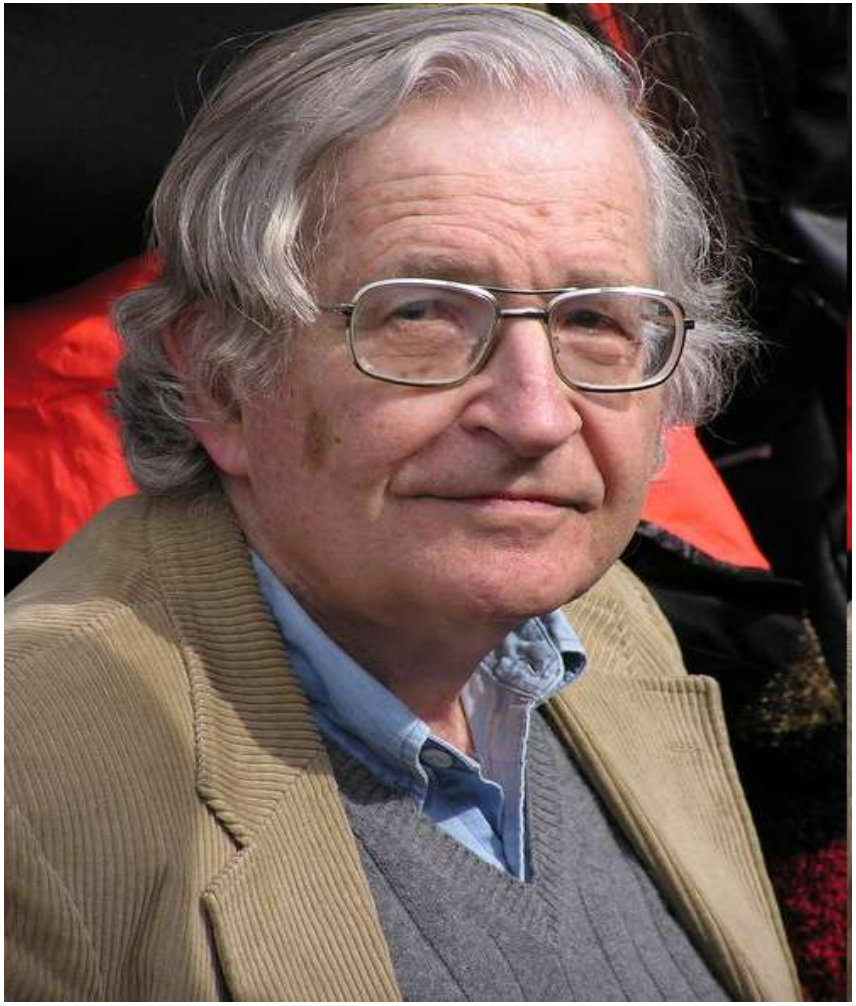


Why are we talking about language acquisition?



- In order to speak a language, one must have a basic memory of sounds, words, and the context in which to use those words.
- **Language** – a flexible system of spoken, written, or signed symbols that enable us to communicate our thoughts and feelings.

Theories of Language Acquisition:



- Language is learned through social learning
- **Nativists** – argue that we are born with a biological predisposition for language (Noam Chomsky)
- **Behaviorists** – argue that we develop language by imitating sounds we hear to create words (B.F. Skinner)

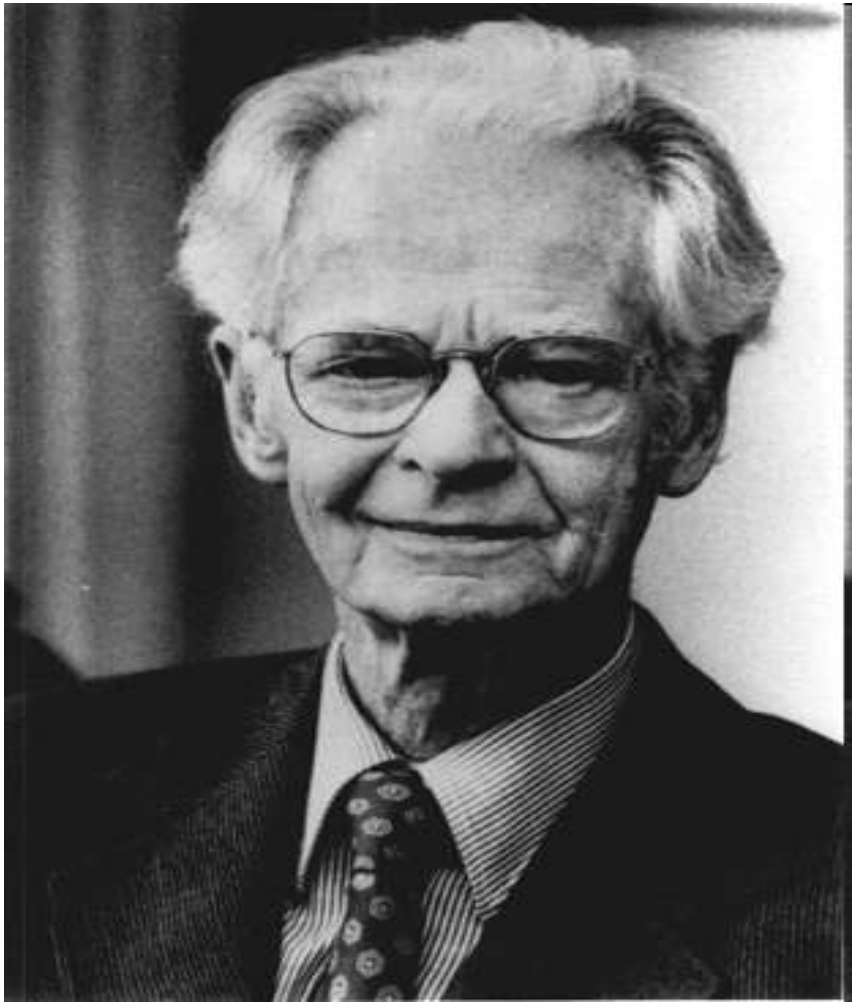
Noam Chomsky:

- **Chomsky** – our brains are prewired for a universal grammar of nouns, verbs, subjects, objects, and questions.
- He developed the idea of a **LAD – "language acquisition device"** – in which grammar "switches" turn on as children are exposed to language.

Chomsky Strikes Again!

- Chomsky also believes in a **critical period** for language development.
- He believes that if children are not exposed to language before adolescence, they will be unable or find it extremely difficult to acquire language (Genie)

The Other Side: Skinner



- **B.F. Skinner** felt that children learn language by association, reinforcement, and imitation.
- Parents shape their children to speak – encouraging them to make sense of the babbling and "broken" speech
- Children are encouraged to speak because they are praised for it and soon realize they can better interact with their environments.

So.. Who's Right?

- Guess what? – it's a combination of both!
- We are biologically prepared but also acquire language through social learning
- Cognitive neuroscientists agree that children must establish the neural connections for language during the first few years of life

Unlike B.F. Skinner, Noam Chomsky believes that children:

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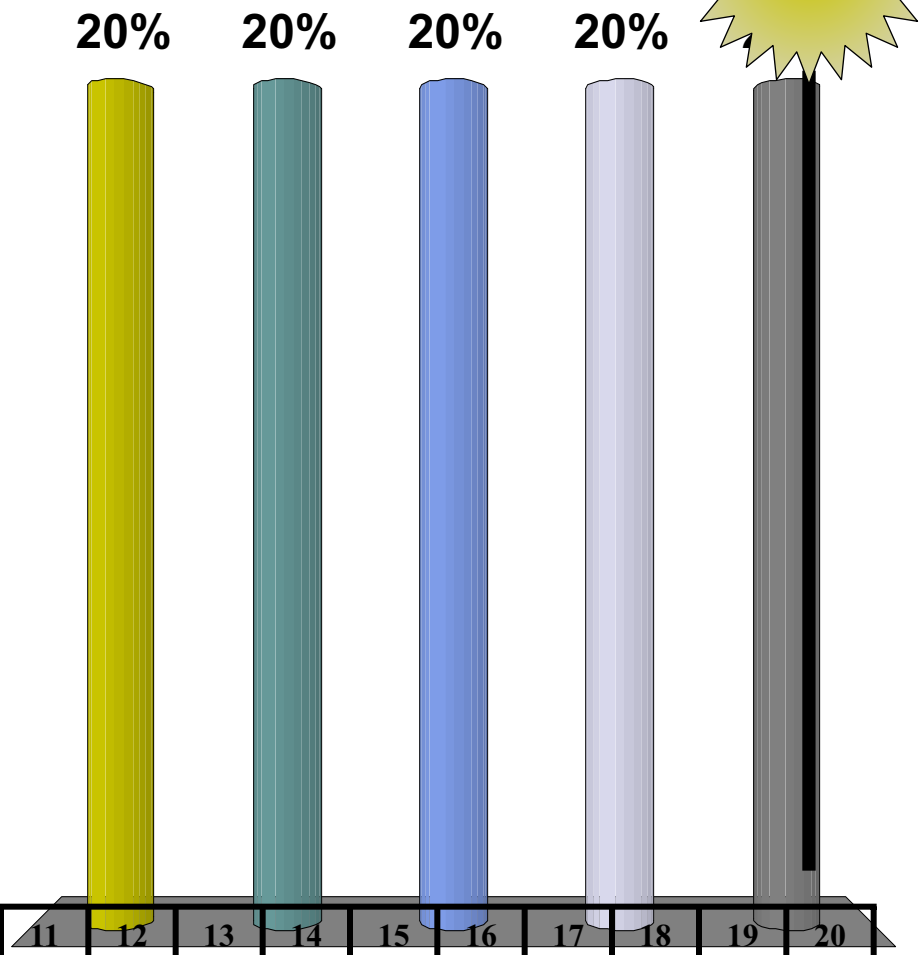
1. Learn to speak by mimicking the sounds around them
2. Speak more quickly if their parents correct their mispronunciations early
3. ✓ Are hard-wired for language acquisition
4. Learn language more quickly is positive rewards are given to them
5. Can learn to speak correctly only during a critical age



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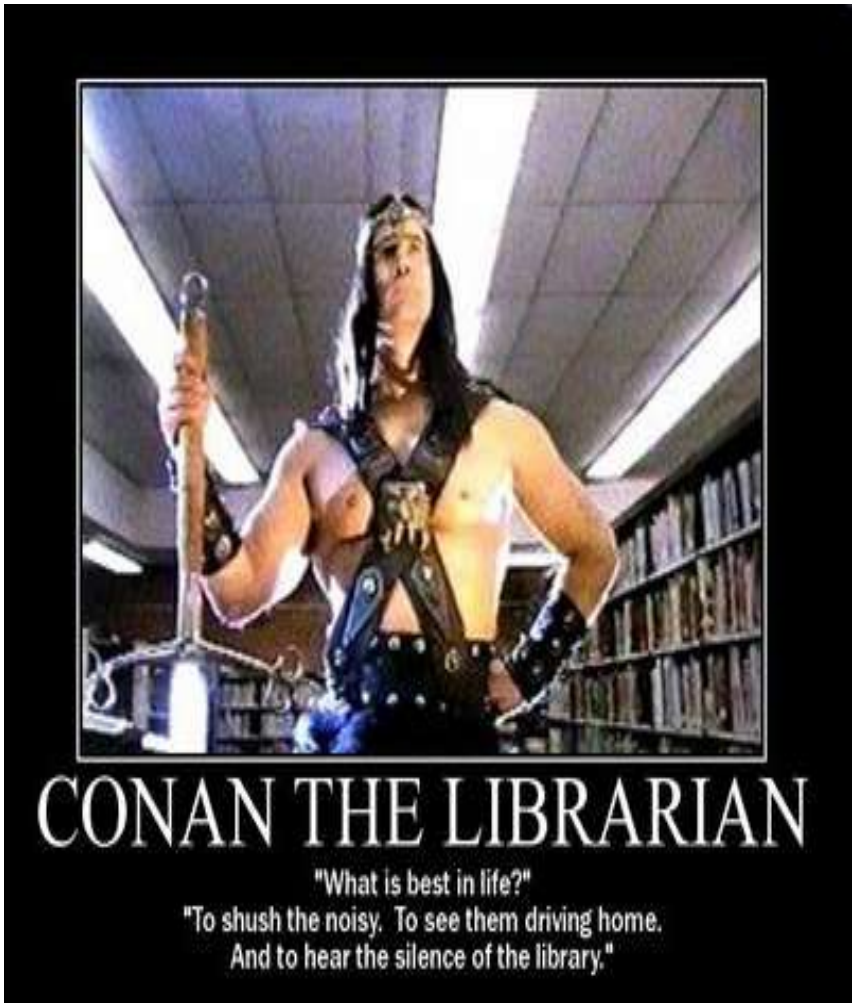
Building Blocks:

- **Phonemes** – language's basic sound units
- **Morphemes** – the smallest meaningful units of speech (prefixes, simple words, suffixes, etc.)
- Most morphemes are a combination of phonemes
- FARM – three phonemes (f – ar –m) , one morpheme (farm)

Combination Rules:



Click the PIC!!

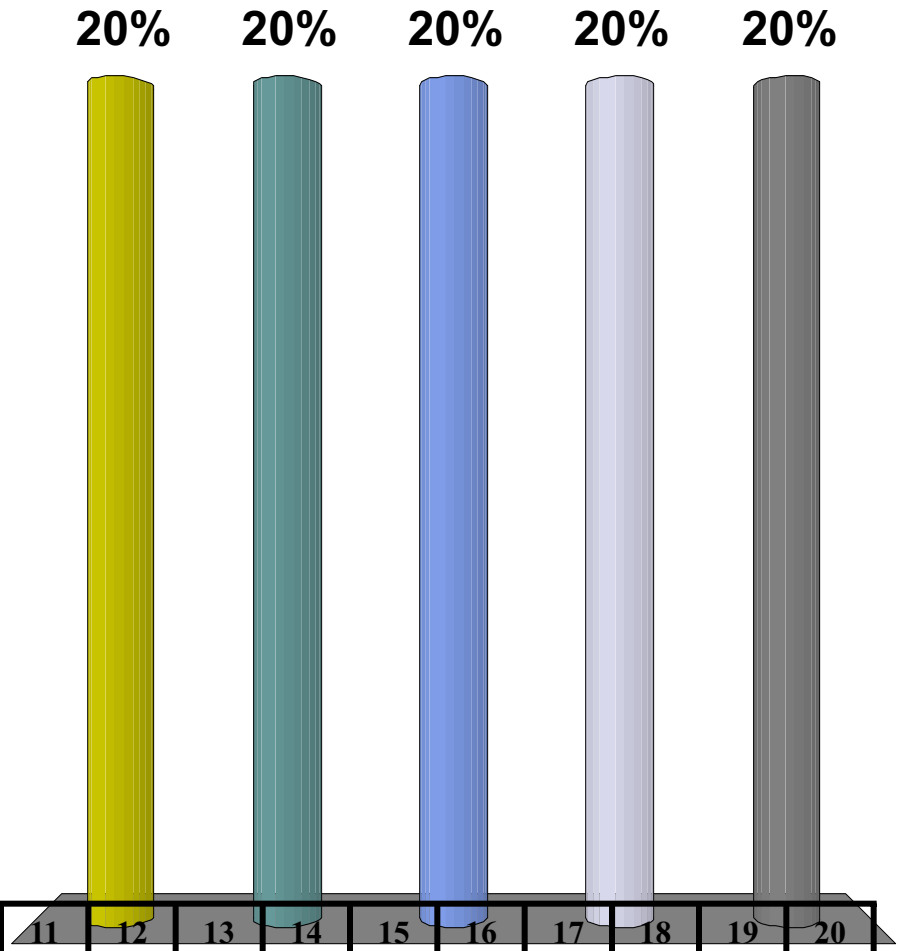
- **Grammar** – each language has a system of rules that determine how sounds and words can be combined and used to communicate meaning.
- **Syntax** – the set of rules that regulate the order in which words can be combined into sentences
- “Yellow Balloon Big”

Combination Rules: Cont.

- **Semantics** – set of rules that help us to derive meaning from morphemes, words, and sentences.
- **Sentences have:**
- 1. Surface structure – particular words or phrases
- 2. Deep structure – underlying meaning (think politicians)
- Example: "Helping the people in Darfur should be a priority for developed nations."

Phonemes are:

1. The rules of grammar that dictate letter combinations in language
2. The smallest unit of sound in a language
3. The smallest unit of meaning in a language
4. Semantically the same as morphemes
5. About 100 different words that are common to all languages



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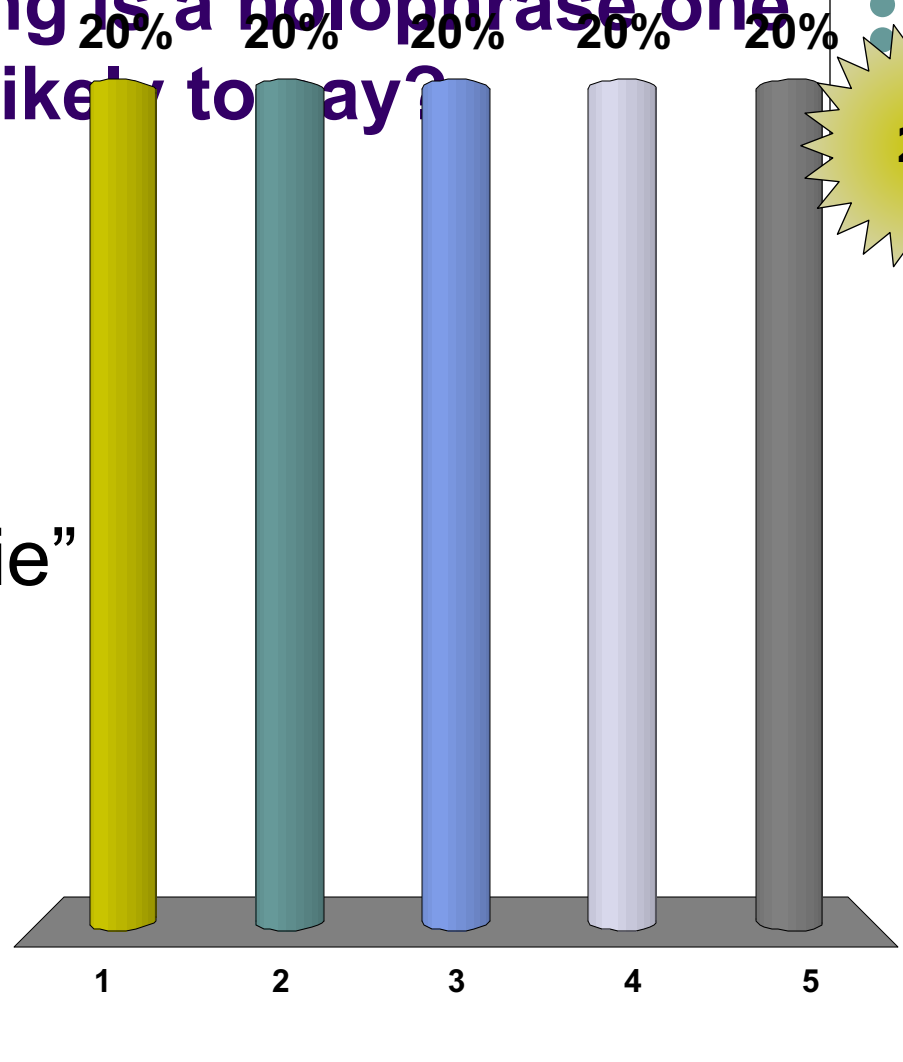
Language Acquisition Stages:

- The following are the series of stages we all go through when trying to communicate:
- 1. **Babbling** – production of phonemes (sounds)
- 2. **Holophrase** (1st b-day) – one word conveys meaning (Go!)
- 3. **Telegraphic speech** (age 2-3) – the use of one verb and one noun – “eat cookie”
- **Overgeneralization** – child applies grammar rules without making appropriate exceptions (I goed to the store)

Which of the following is a holophrase one year old Amanda is likely to say?

1. “Mmmmm”
2. “Gaga”
3. “Eat apple”
4. “I eated the cookie”
5. ✓ “Bottle”



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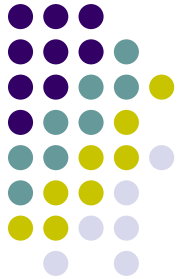
Lesson Six: Thinking

- **By the end of this lesson, I will be able to:**
- 1. Identify problem-solving strategies as well as factors that influence their effectiveness.

Class Activity: Height Line

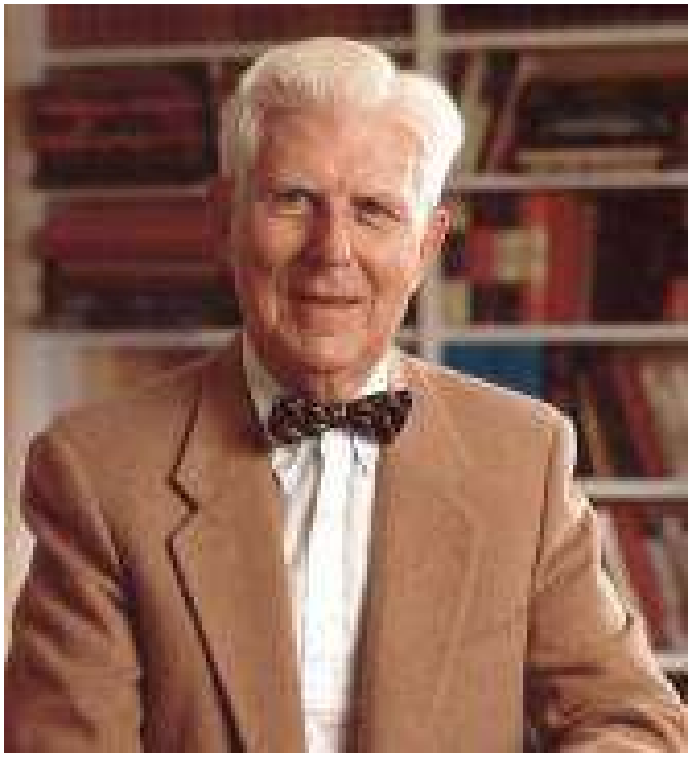


- As a class, you must organize yourselves in order of height from tallest to shortest. The catch: You need to do this with your eyes closed! Good luck!

Thinking: An Introduction

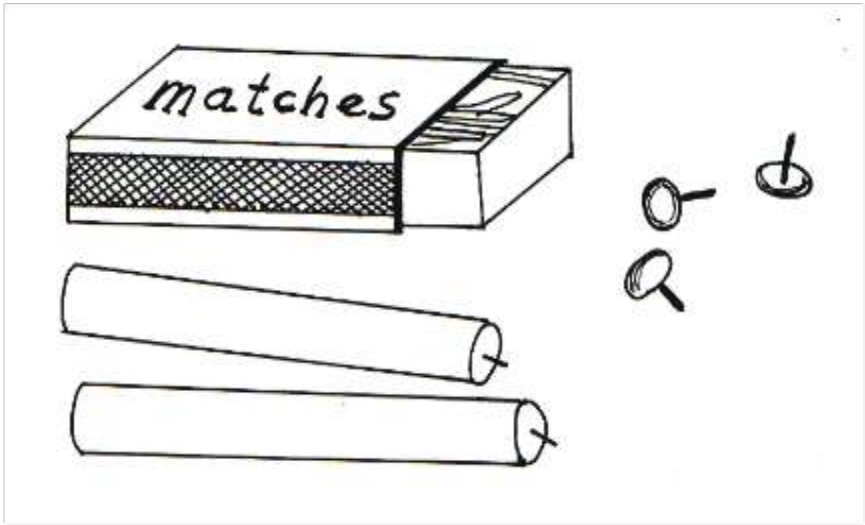
- Why is it that some people figure out a problem quicker than others?
- It may be that they use previous or new problem solving strategies
- **Thinking** – Affects our language, which in turn affects our thoughts.

Benjamin Whorf:

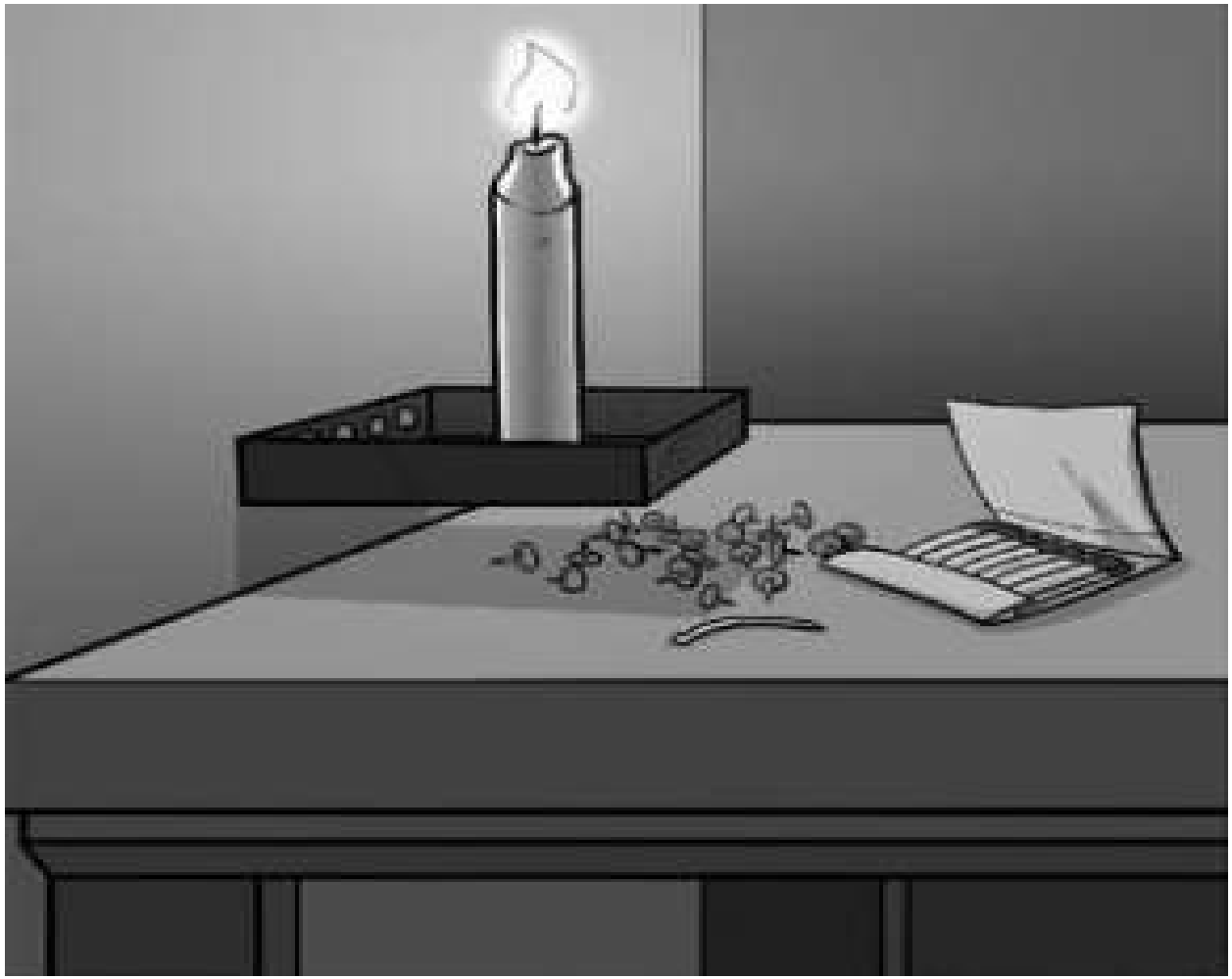


- **B.W**. – Language guides and determines our thinking
- Different languages cause people to view the world differently
- People who speak more than one language report a different sense of themselves depending on the language they are speaking at the time
- **Criticism** – language isn't the only thing that affects us, the environment also plays a large role

Metacognition:



- **Metacognition** – thinking about how you think
- This helps you reason through things in order to solve a problem.
- Dunker's candle box example (1945)



So….how do we solve problems?

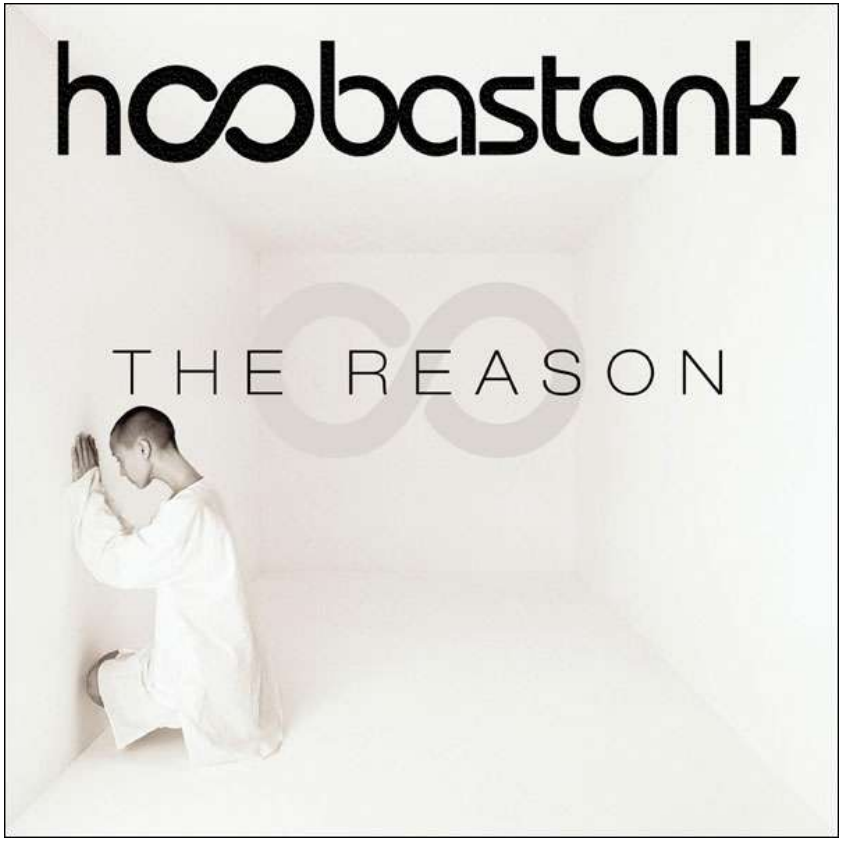
- Most problem solving includes a series of steps
- **Algorithm** – Slow, step by step procedure that guarantees a solution to many types of problems
- **Heuristics** – Mental shortcuts (I before E, except after C)

Solving Problems:

"Thinking outside of the box is difficult for some people. Keep trying."

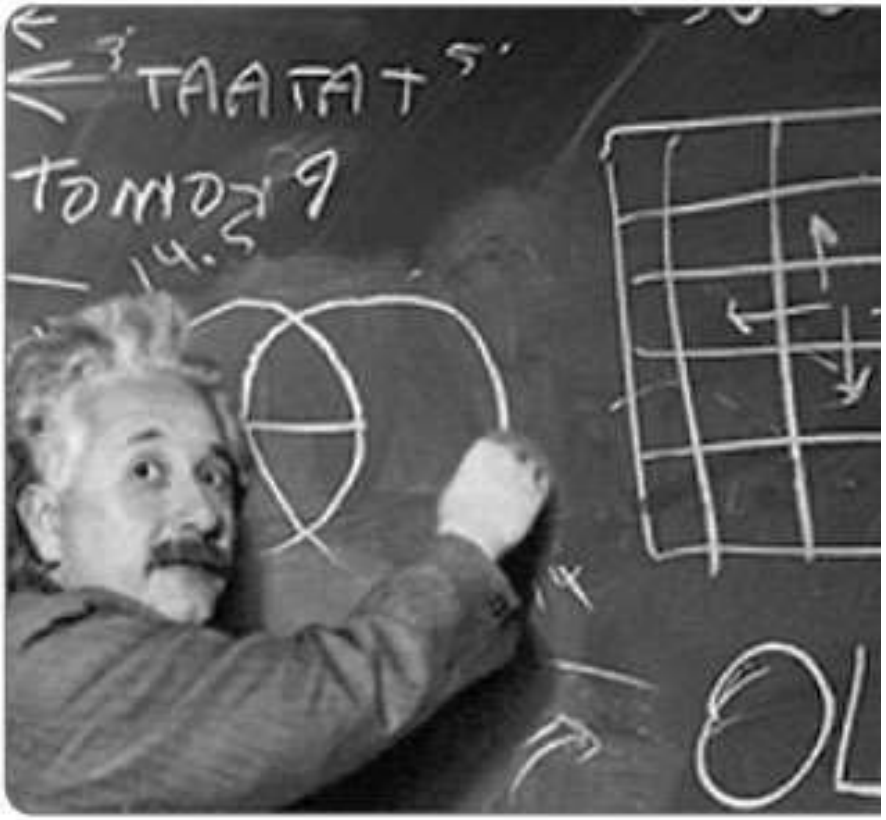
- **Insight** – Solution to a problem suddenly comes to us (NEBOTYA)
- **Trial and error approach** – see what works and what doesn't (this works best when our choices are limited)

Types of Reasoning:



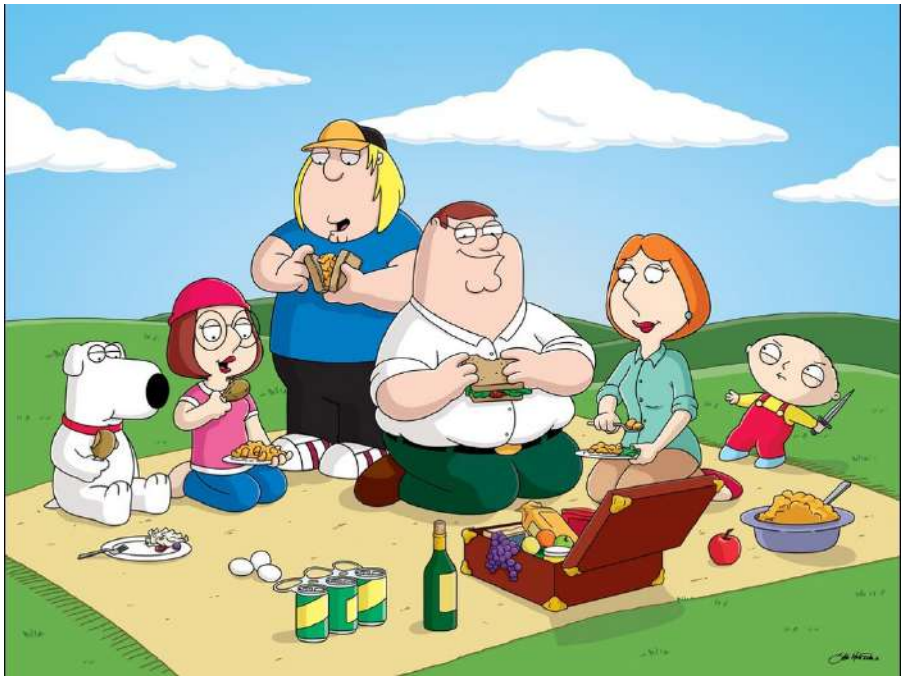
- **Inductive** – Reasoning from specific → general (HS kids at RHS → All HS kids)
- **Deductive** – Reasoning from general → specific (much more logical)
- Deductive reasoning is based on widely known assumptions and rules

Lesson Six: Continued



- **By the end of this lesson, I will be able to:**
- 1. Identify problem-solving strategies as well as factors that influence their effectiveness.

Obstacles to problem solving:

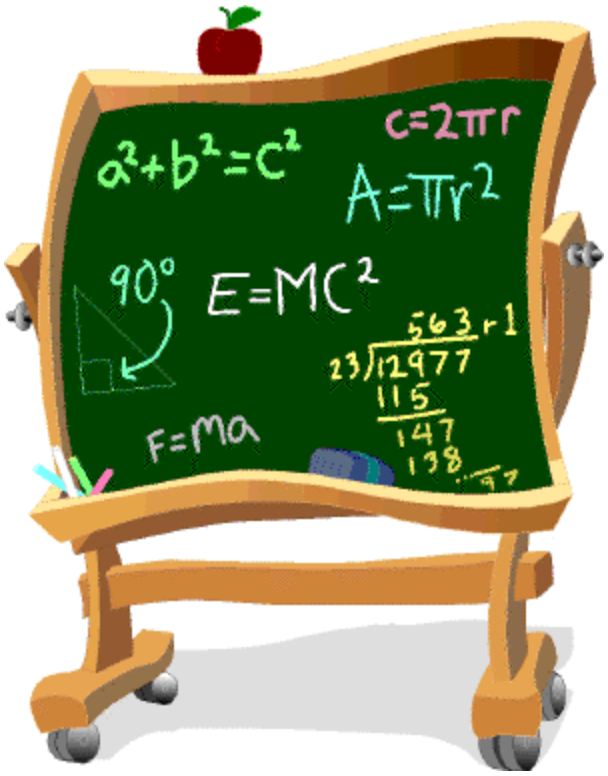


- What can hinder our ability to solve a problem?
- **Fixation** – Inability to look at a problem from a fresh perspective
- We might be using a prior strategy that didn't work
- **Functional fixedness** – failure to use an object in an unusual way (picnic example)

Why do we make illogical choices? (Tversky/Kahnmen)

- Normative studies – ask how we ought to make decisions
- Descriptive studies – look at how decisions are actually made
- Under conditions of uncertainty, we often make strange decisions based on intuition (our gut)

When we are uncertain we use…

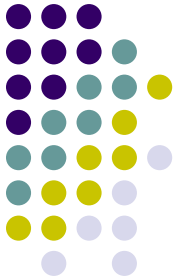


- **Availability heuristic** – estimate the probability of certain events in terms of how readily they come to mind
- Example – safety of car vs. airplane
- **Representative heuristic** – mental shortcut by which a new situation is judged by how well it matches a stereotypical model or prototype
- Example: I love math → math professor (this can't work for everyone)

Framing and Advertising:

- **Framing** – refers to the way a problem is posed (choose your words wisely)
- Example – 90% fat free vs 10% fat (which are you more likely to buy?
- Example – how many miles long is the Mississippi River?
- A. 150
- B. 175
- C. 250
- D. 2500
- E. 5000

The fallibility of eyewitness accounts:



- Your Thoughts
- 1. Why do you think that people have such a hard time identifying witnesses / crimes effectively?
- 2. Is there a better way to ID criminals instead of a line up?
- 3. What do you think about the fact that over 250 “criminals” have been released from jail because DNA testing shows that they didn’t commit the crime?

Lesson Seven: Objectives

- **By the end of this lesson, I will be able to:**
- 1. Identify problem-solving strategies as well as factors that influence their effectiveness.
- 2. List the characteristics of creative thought and creative thinkers.

Creativity and thinking:

- **Creativity** – the ability to think about a problem or idea in new and unusual ways and come up with unconventional solutions
- **Convergent thinkers** – use problem solving strategies directed toward one correct solution to a problem
- **Divergent thinkers** – produce many answers to the same question (this is a characteristic of creativity)
- Most studies show that brainstorming is the best strategy to use when faced with a problem.

Biases:

- Have you ever made a biased decision? When and why?
- **Confirmation Bias** – tendency to search for and use information that supports our preconceptions and ignore information that refutes our ideas
- Why do we hold on to old beliefs?
- **Belief Perseverance** – tendency to hold on to a belief after the basis for the belief is discredited.

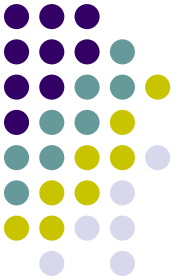
Bias: continued

- **Belief Bias** – the tendency for our preexisting beliefs to distort logical reasoning, making illogical conclusions seem valid or logical conclusions seem invalid. (Muslim Extremists)
- **Hindsight Bias** – the tendency to falsely report after the event, that we correctly predicted the outcome of an event. (elections, sports, etc.)

Overconfidence Bias:

- **Overconfidence Bias** – the tendency to underestimate the extent to which our judgments are incorrect.
- While reading a section on problem solving errors, we may believe that we make errors less often than most people.

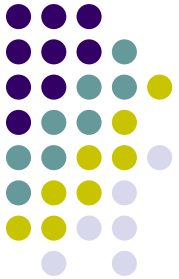
Bystander Effect:



- Do we make poor decisions based on morals, safety, etc?
- How can we know we should help with something, but just stand and watch?
- **Bystander Effect** – We assume that others will help, when in fact, they are thinking the same thing.
- Let's look at an example.

Class Discussion:

- 1. What does the bystander effect say about human nature?
- 2. Do you think you'd help if put in this situation?
- 3. How do you think we can help people to help others in these types of situations?



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