

THINKING AND LANGUAGE

UNIT FIVE

COGNITION

- Cognition=thinking
- The mental activities associated with processing, understanding, remembering, and communicating
- Cognitive psychologists study mental functions: concept creation, problem solving, decision making, and judgment

CONCEPTUAL ORGANIZATION

- Concepts=Mental groupings of similar objects, events, and people.
- Ways to organize by concepts
 - Hierarchies: size based groupings
 - Definition: groups based on definition (or characteristics)
 - Prototypes: groups based on a model
 - Prototyping problems: things that don't fit our prototype take longer to ID (e.g. tomatoes as fruits)

CONCEPTS

TRANSPORTATION

Mental Groupings

Boats, Bicycles, Trucks

Prototypes

Toyota Camry

Hierarchies

Luxury, Mid-size, Economy

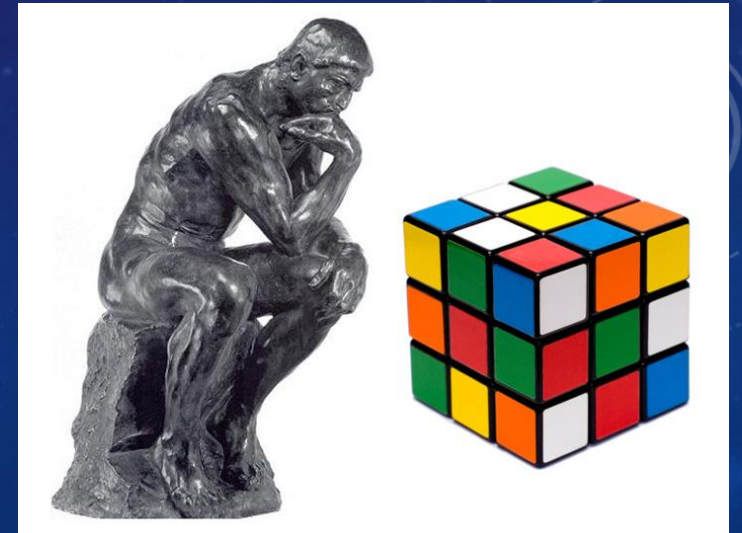
NINE-DOT PROBLEM

Draw no more than four lines that run through all nine dots without lifting your pencil

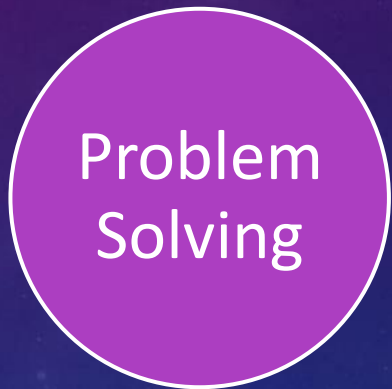
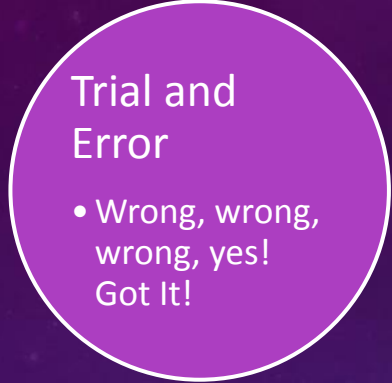


SOLVING PROBLEMS

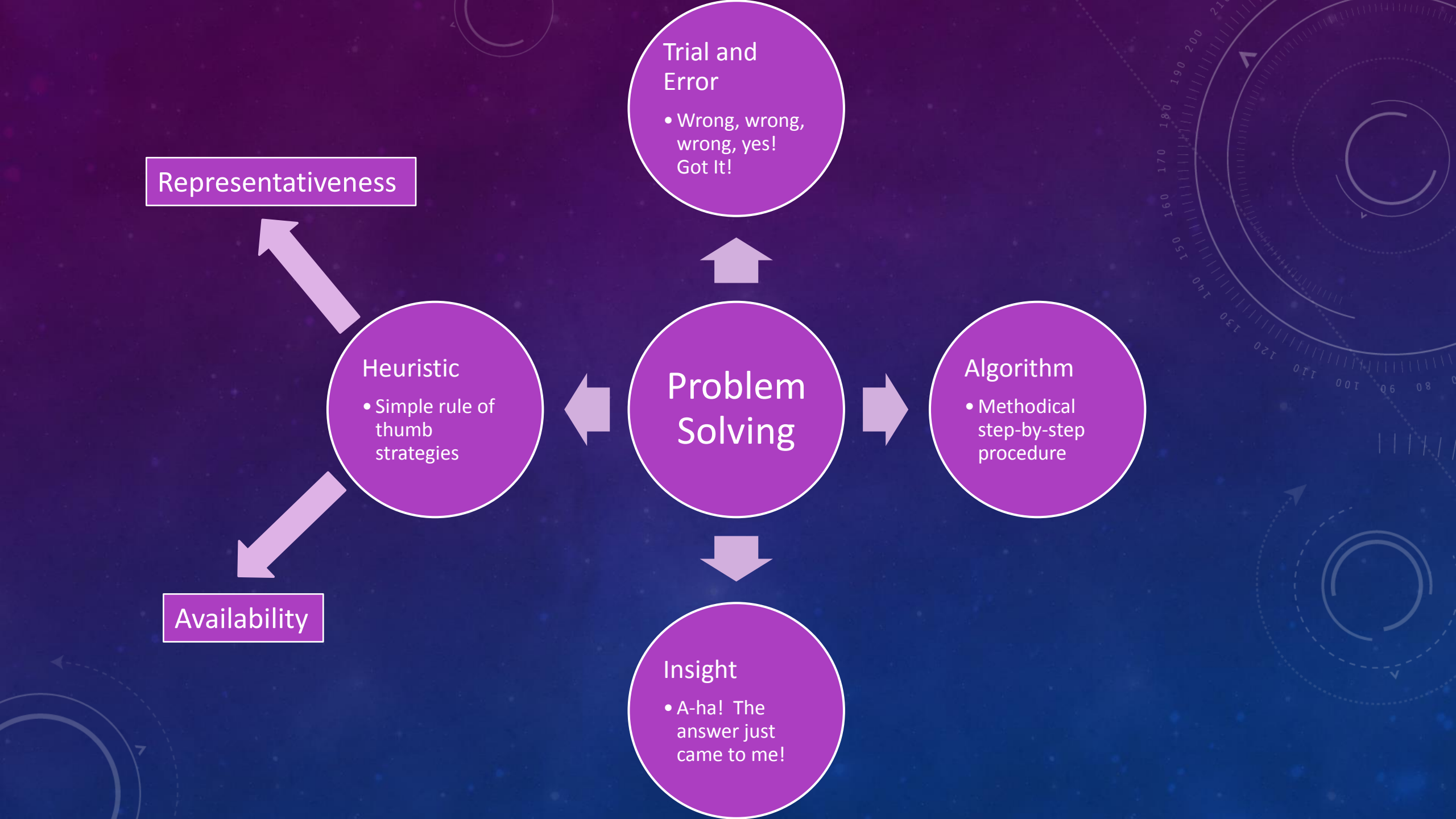
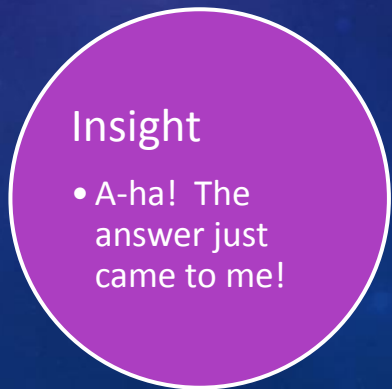
- Out of the box thinking: creative/alternative solution
- Trial and Error
- Algorithm: step by step procedure that yields a solution
- Heuristics: rule of thumb strategies that make solving problems easier
- Insight: miraculous solution



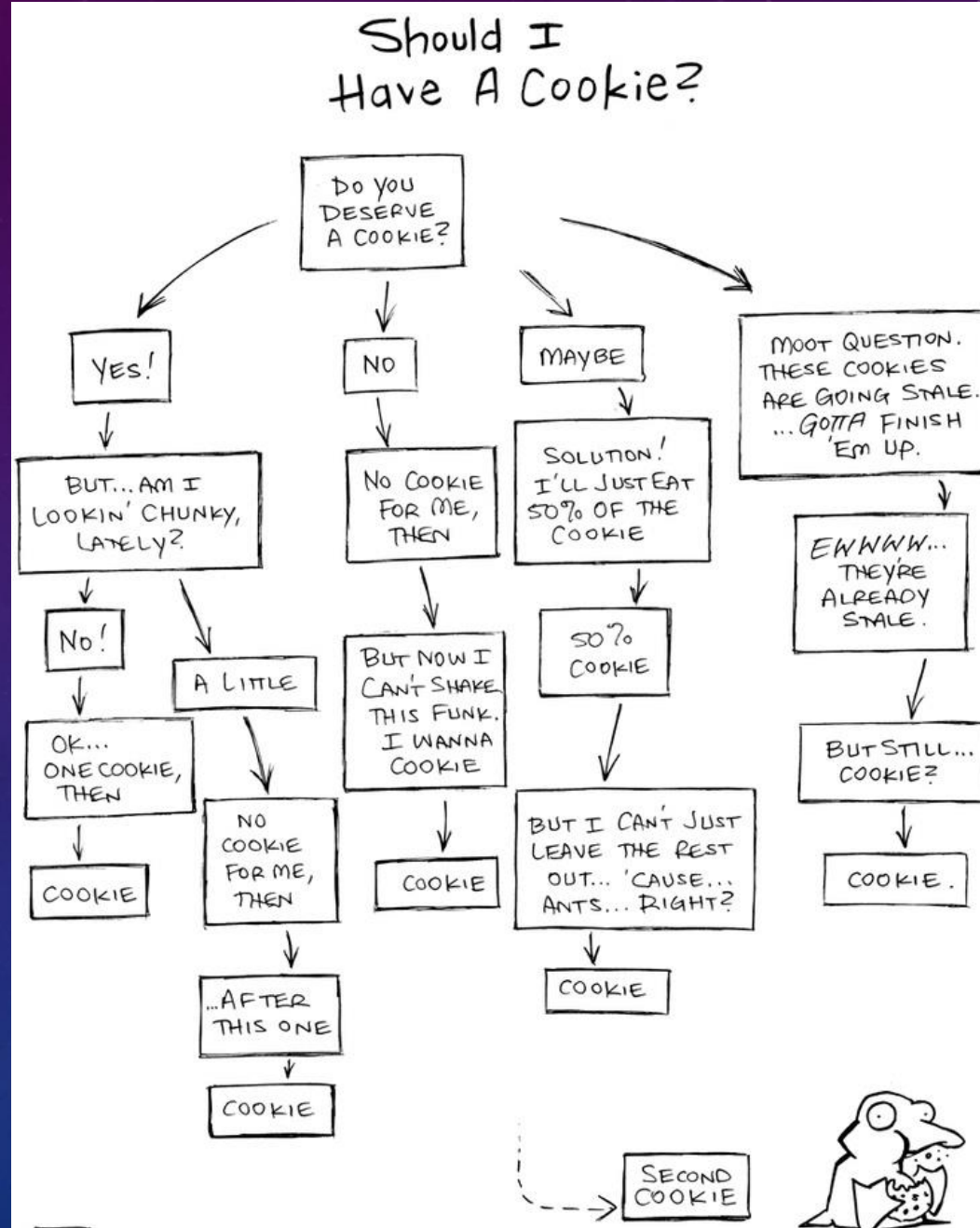
Representativeness



Availability



ALGORITHM



INSIGHT IN THE BRAIN

- The maker doesn't want it, the buyer doesn't use it, and the user doesn't see it. What is it?
- When you think of this answer, there is a burst of energy above the right temporal lobe above the ear (feeling of satisfaction)
 - This is how jokes operate!

HOW DO WE REALLY SOLVE PROBLEMS?

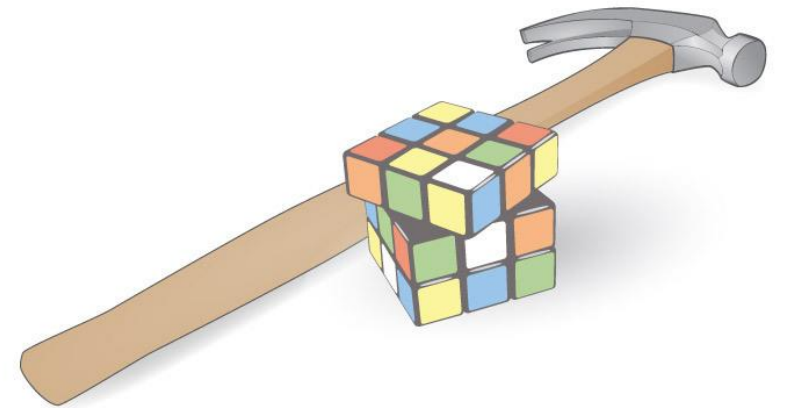
- Intuition
- In the moment

These are **quick!**

AND

- Heuristics help us do this!

SOLVE problems



PROBLEMS WITH PROBLEM SOLVING

- Confirmation bias: search for information that confirms out ideas
 - Changing hypothesis requires greater cognitive effort than maintaining the same hypothesis
 - Harder to deal with negative information than positive information
 - Self Fulfilling Prophecy

BELIEF BIAS

- Belief bias=distorting logic based on our preexisting beliefs
 - Supporting evidence based on plausibility rather than logic
 - Syllogism Example: True or False (replace men with scarecrow)
 - Some professors wear ties
 - Some men wear ties
 - Some professors are men
- Belief perseverance=hanging onto our beliefs even when we know them to be wrong
 - Republicans watch Fox and Democrats watch NBC, and showing the network to the opposite group only leads them to find more information to support their side
- Remedy: asking people to consider the opposite situation



FIXATION

- Fixation: inability to see a problem from a new perspective
 - Mental: approach a problem based on what has worked in the past
 - Functional: the tendency to think of things only for their usual functions

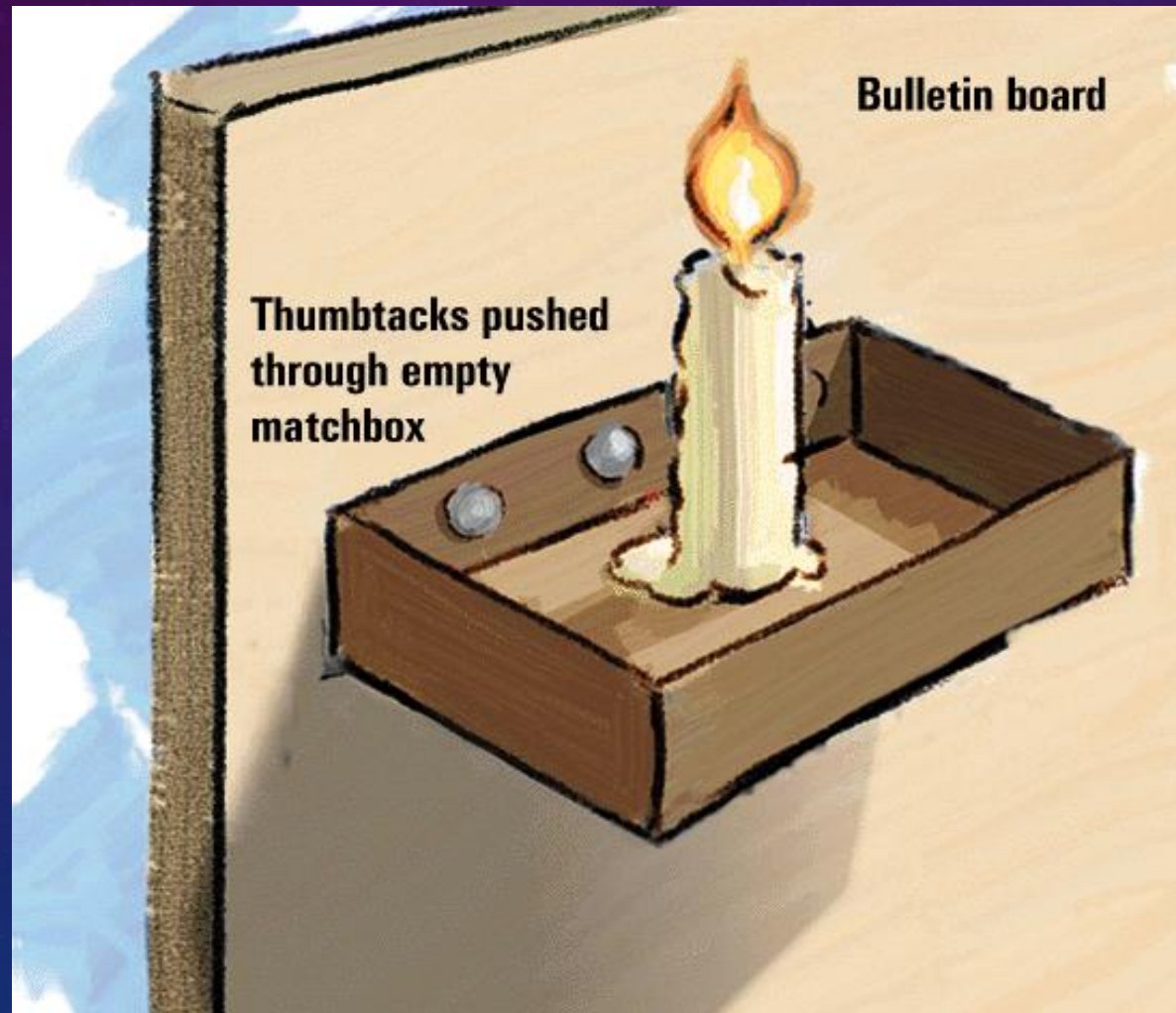


CANDLE STICK PROBLEMS



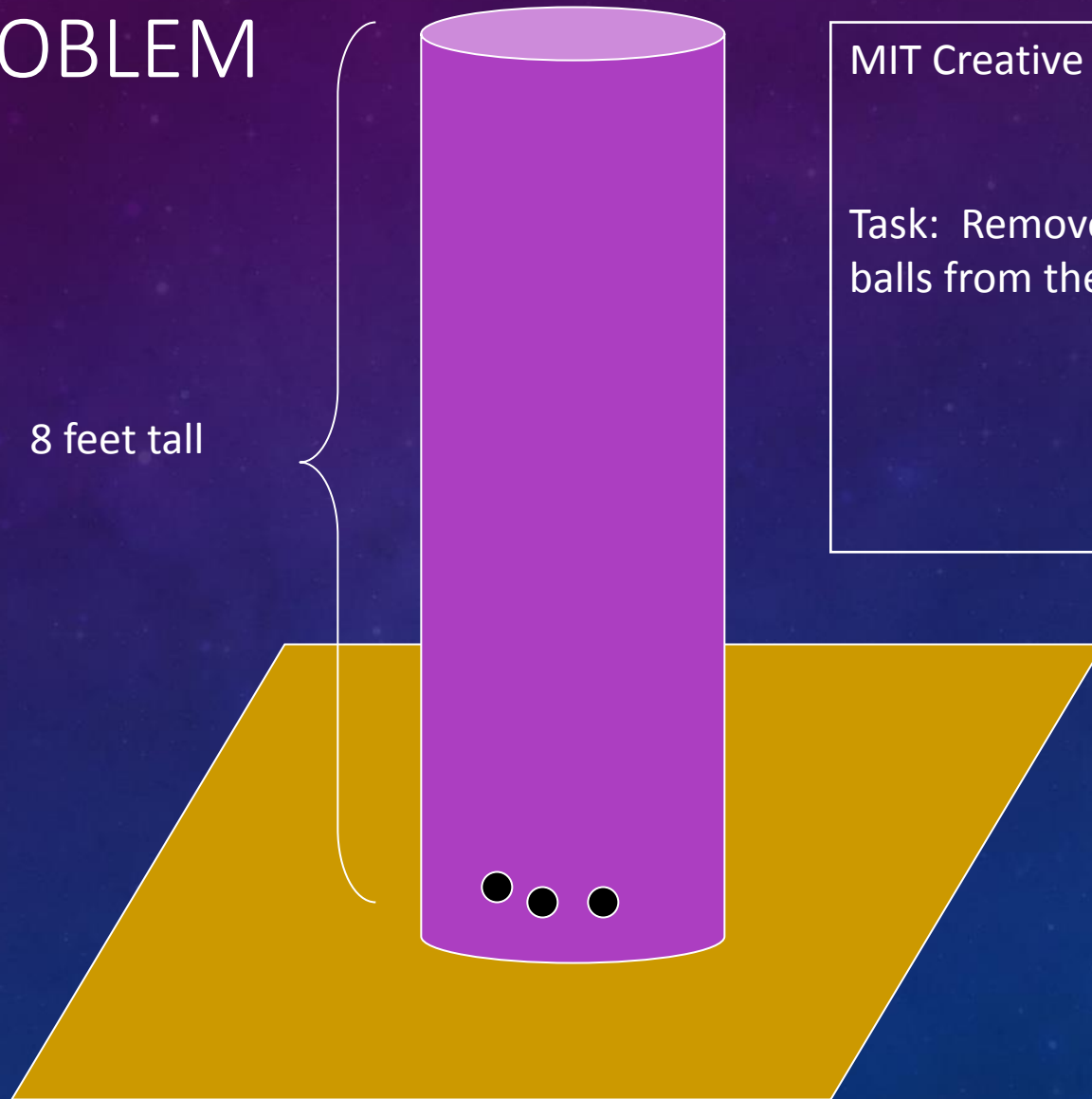
Using these materials, how would you mount the candle on a bulletin board?

SOLUTION



PING PONG PROBLEM

8 feet tall



MIT Creative Engineering Class:

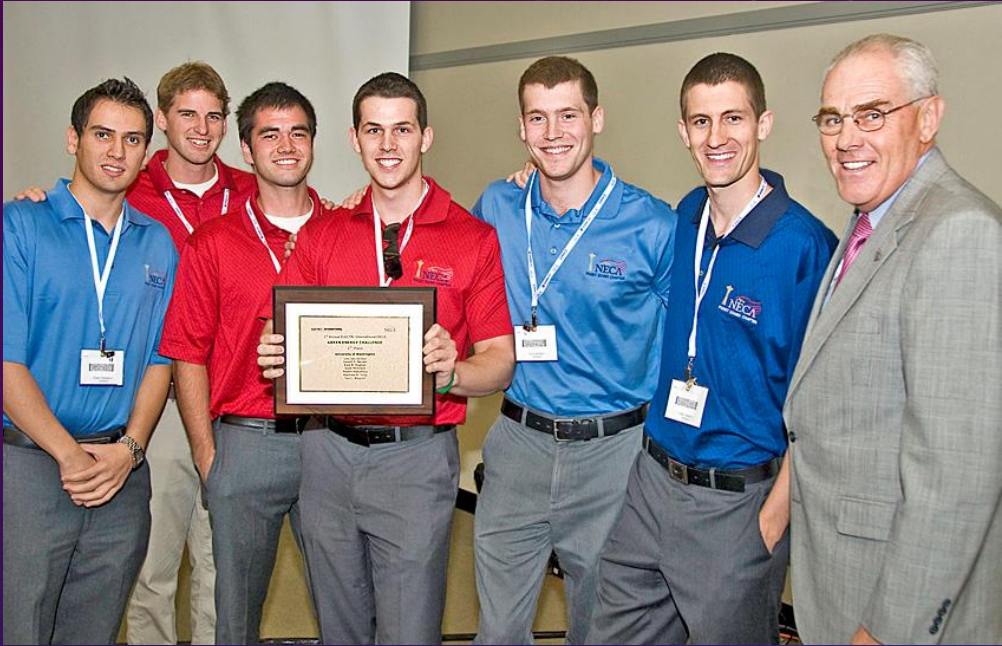
Task: Remove the Ping-Pong balls from the tube.

<http://www.archive.org/download/MIT3.A24F04/ocw-3.A24-gibson-demo-220k.rm>

TVERSKY AND KAHNEMAN AND REPRESENTATIVE HEURISTICS

“Tom W. is of high intelligence, although lacking in true creativity. He has a need for order and clarity, and for neat and tidy systems in which every detail finds its appropriate place. His writing is rather dull and mechanical, occasionally enlivened by somewhat corny puns and by flashes of imagination of the sci-fi type. He has a strong drive for competence. He seems to feel little sympathy for other people and does not enjoy interacting with others. Self-centered, he nonetheless has a deep moral sense.”

1. What major do we think Tom is?
2. How many students are in that major at Average College X



??

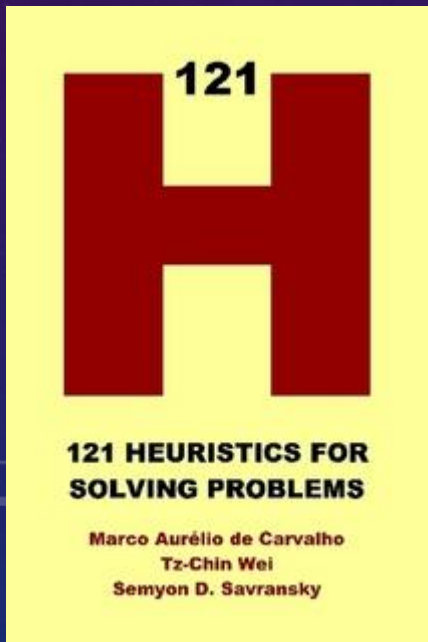


??



HEURISTICS PROBLEMS

- Representativeness Heuristic: judging things based on how well they fit our prototypes (stereotypes)
 - How does this lead to error? Over predicts the likelihood that the example fits the prototype → **overconfidence**
 - Exceptions to the rule
 - Encourages us to forget logic or statistics



HEURISTICS PROBLEMS

- Availability Heuristic: The faster and more easily we can recall something, the more common we expect it to be.
 - Why does this lead to error?
 - Many factors affect memory: timing, distinctiveness, concreteness
 - Examples: After watching shark week, are you afraid to go swimming in the ocean? (keep in mind only 100 shark attacks are reported/year world wide!)



OBSTACLES TO PROBLEM SOLVING, THINKING, AND JUDGING

Overconfidence

Overestimate the accuracy
Of our knowledge and judgements



Belief Bias

Pre-existing beliefs will cloud
logical reasoning.

Framing

The way an issue/question is posed
Can influence judgment/decision.

Check out Table 10.1 on
page 408!

OVER CONFIDENCE

- Overconfidence=tendency to overestimate the accuracy of our knowledge and judgments
- Examples??
- Low confidence is emotionally problematic
- Learning towards overconfidence→more happiness, easier time making tough decisions, seem more credible
- Prompt and relevant feedback helps adjust confidence levels productively



FRAMING

- Framing=when the same material is presented in different ways it changes the outcome or affect.
- 90% of college students believe condoms are effective when told they work 95% of the time versus 40% when the have a 5% failure rate
- Do you buy the \$100 coat or the \$150 coat on sale for \$100 (hint it's the same coat)
- Business and marketing implications???





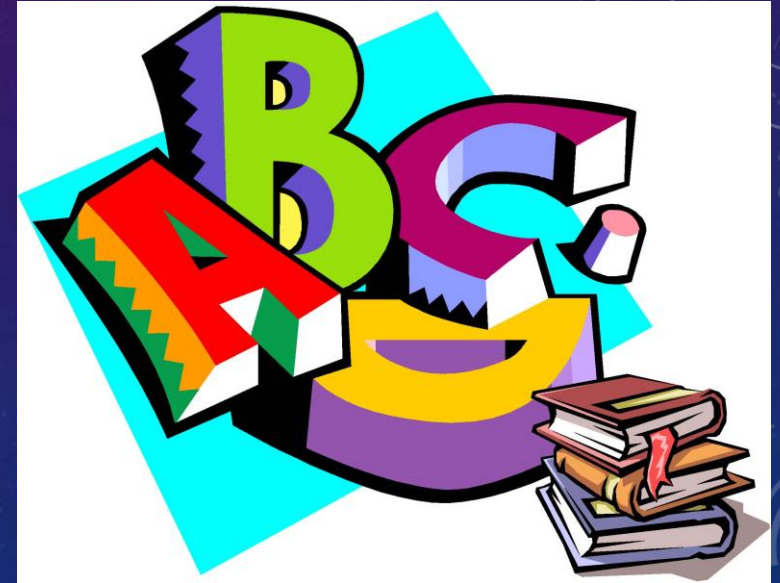
LANGUAGE

The jewel in the crown of cognition

LANGUAGE

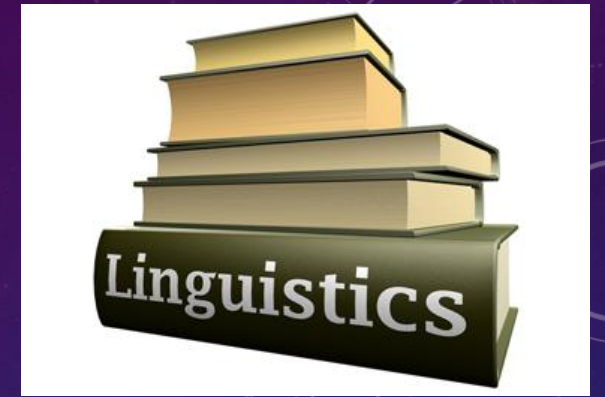
- Language=spoken, written, or signed words the ways we combine them to communicate memory.
- Human language capacity allows us to understand complex sentence

Human Essence



Transmit civilization's accumulated knowledge across generations.

CHARACTERISTICS OF LANGUAGE



- Semanticity-sounds of language convey meaning
- Arbitrariness-no connection between symbols (words) and meanings
 - Ex. “Dog” has no resemblance to a 4-legged creature
- Flexibility-language is changeable and “inventible”
 - Ex. New use for because, change in the purpose of the period, Mc-!
- Naming-we assign name to all objects, feelings, emotions, ideas, concepts
 - Imagine this sentence 50 years ago: “I will Google it on my tablet.”
- Displacement-can talk about past, present, future
- Productivity-rules can be provided in novel context

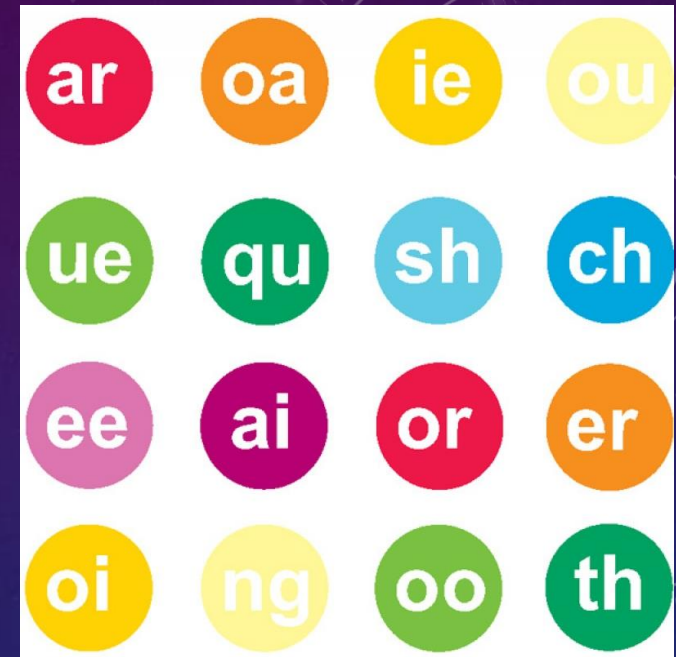
STRUCTURE OF LANGUAGE

- Language is made up of building blocks
 1. Phoneme: smallest distinct sound unit
 2. Morpheme: smallest unit of meaning
 3. Grammar: system of rules that allow us to communicate effectively



PHONEMES

- Phonemes=basic sounds
- Number of phonemes
 - Each language has a different number of phonemes
 - English=40
 - 869 total phonemes in human speech
- Phonemes do not cross language divides well
- Fun Fact: even sign language has phonemes
- What are the phonemes in “phonemes”?



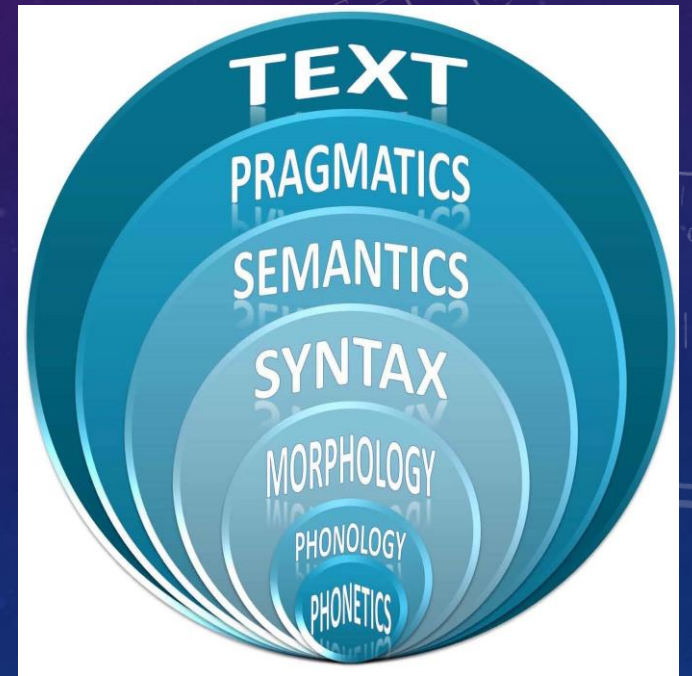
MORPHEME



- Morpheme=chunks of words that show meaning
- (Usually) multiple phonemes add to a morpheme
 - Exceptions: “l”, “a”
- Morpheme examples: prefix, endings, root words, etc.
- Types of morphemes
 - Free: can stand as their own word
 - Bound: can only be part of a word
- What are the morpheme’s in the word: unbreakables

GRAMMAR

- Grammar=rules of a language
 - Syntax: rules used to determine word order/structure
 - Syntax rule example: adjectives go before nouns
 - Semantics: rules used to determine meaning
 - Semantics rule example: –ed=past tense



LEARNING LANGUAGE



- Born without language
- Receptive language
 - By four months babies read lips and discriminate sounds
 - Ability to comprehend speech
- Productive language
 - Ability to create speech

BABBLING STAGE

- Four months
- Babbling is not mimicking adult sounds
- Babies of deaf parents babble with their hands



ONE WORD STAGE

- Ten months: babbling mimics language
- One year babies enter the one word stage
- Use sound to communicate meaning
- One syllable → full words but not full sentences



TWO WORD STAGE

- Eighteen months
- Language expands one word per day
- Characterized by telegraphic speech
- Two word sentences: noun+verb
- Following the two word stage children graduate to full sentences.



LANGUAGE ACQUISITION

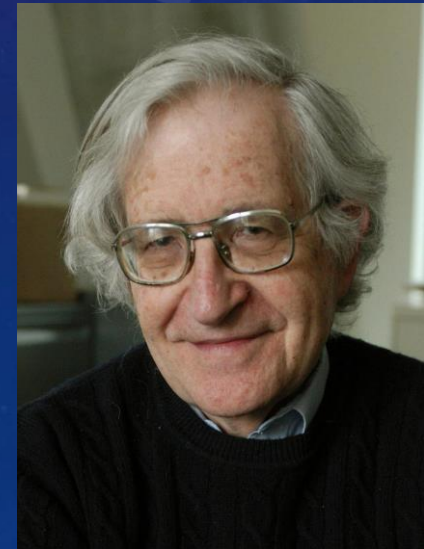


Skinner and Operant Conditioning

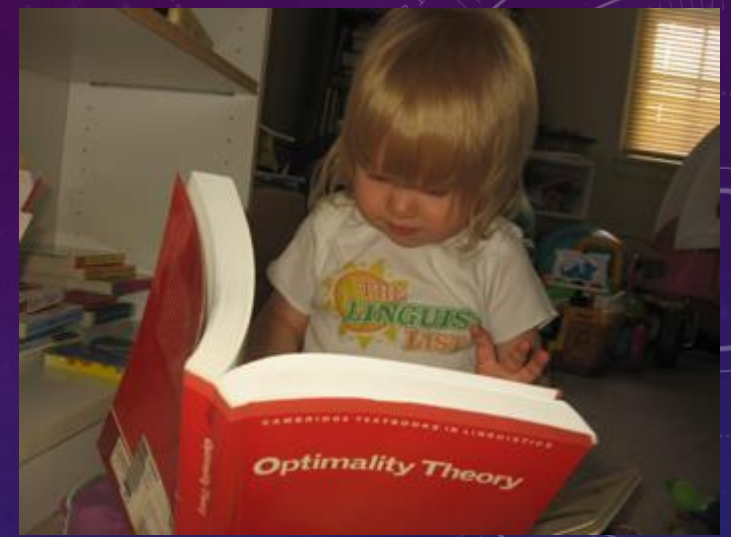
- Association: words match images
- Imitation
- Reinforcement (less reinforcement=slower learning)

LANGUAGE ACQUISITION TAKE 2: CHOMSKY'S INBORN UNIVERSAL GRAMMAR

- Noam Chomsky (1928-), father of modern linguistics. MIT Prof
- People learn too quickly for it all to be operant conditioning
- Most errors children make stem from logical grammar rules
- People make up their own language even in isolation
- Language acquisition device allows us to learn languages
- Surface Structure; Phonemes, morphemes, words, and sentences
- Deep Structure: Meaning



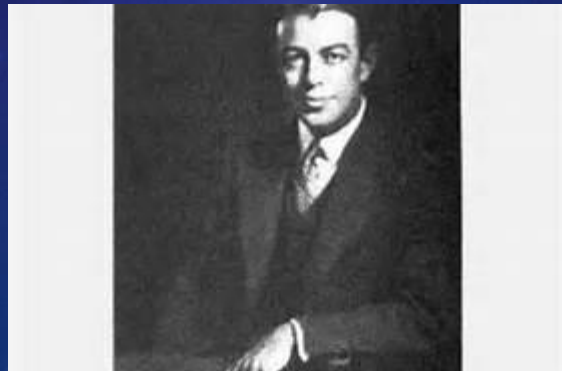
LANGUAGE ACQUISITION



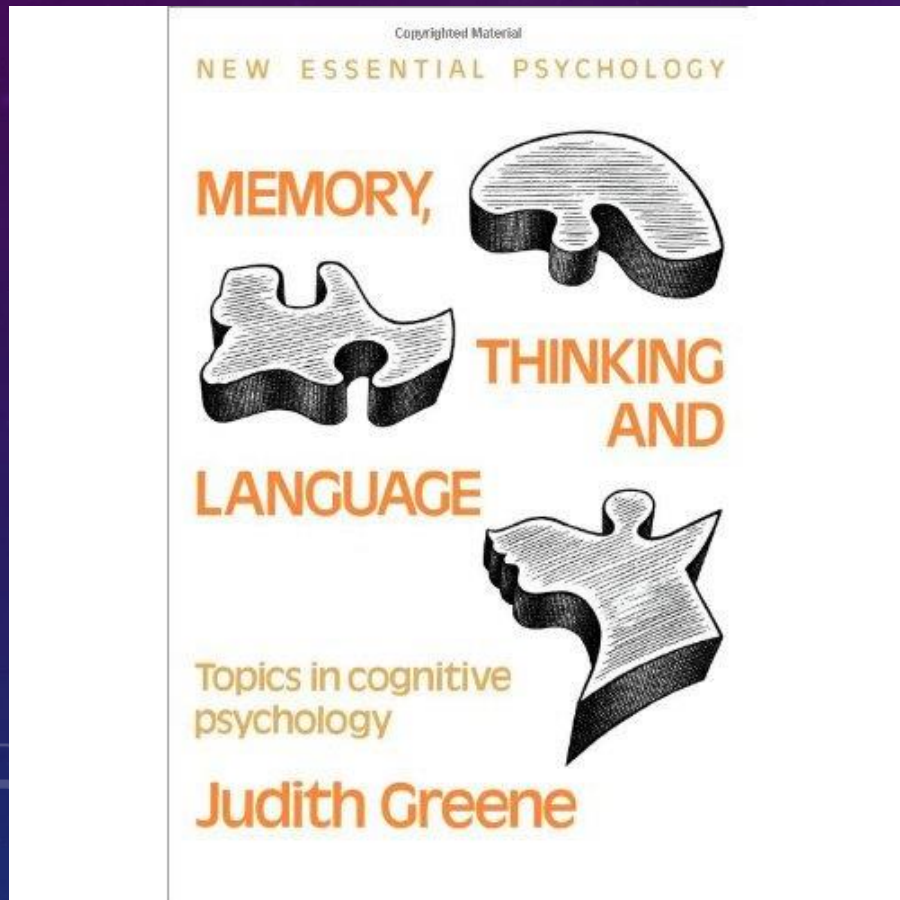
- Statistical Learning
 - Our brains figure out the probability that syllables go together
 - Babies follow language patterns
- Critical Period
 - Critical period is a time close to birth when an organism is highly sensitive to outside stimulus
 - Window for learning language
 - Birth-Seven
 - Same goes for sign language

LANGUAGE INFLUENCES THINKING

- Whorf's Linguistic Determinism Hypothesis: language determines the way we think
 - Different personalities based on language
 - Cultural values are reflected in language and thus reflect itself in thought
 - Examples?



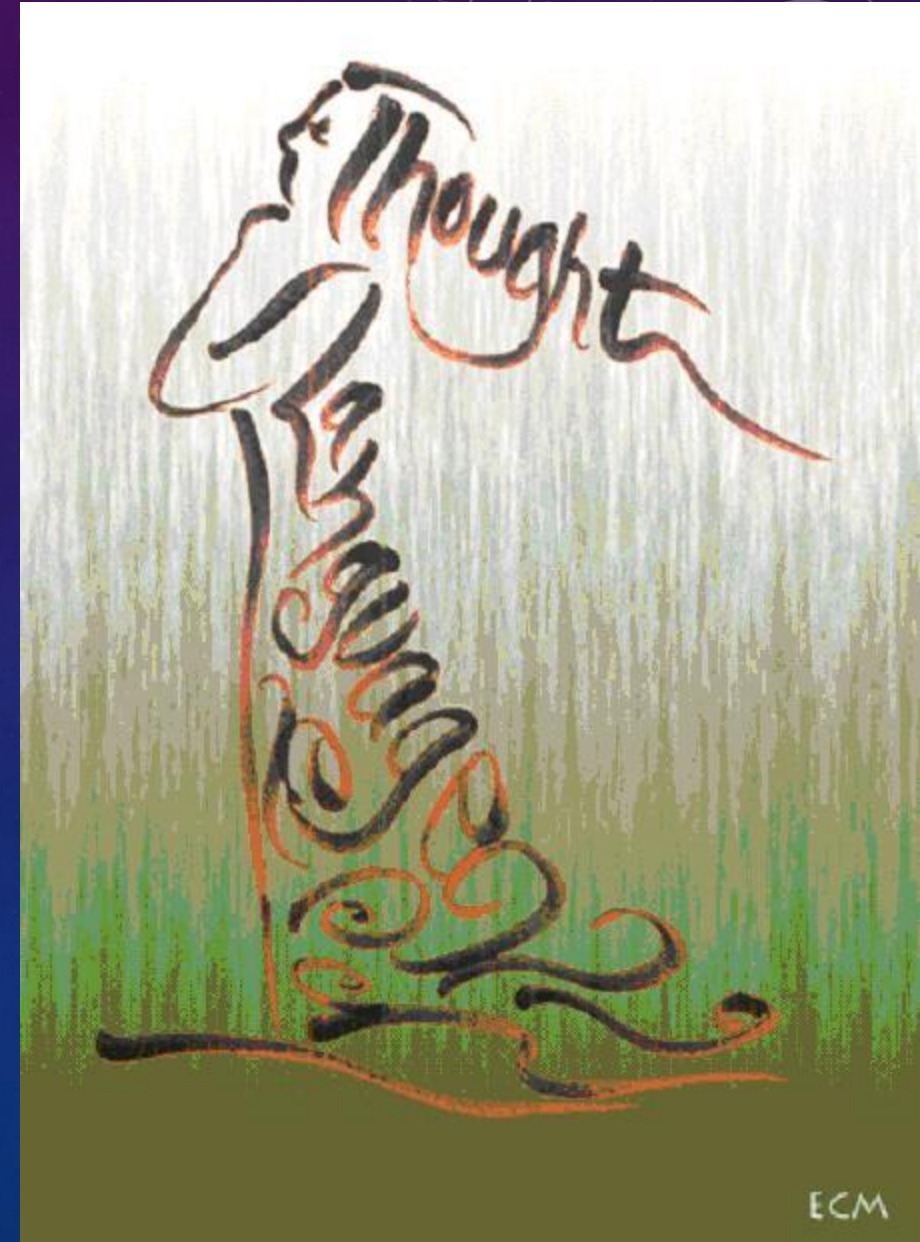
BUT *DETERMINES*???



- Determines is a bit too strong, but definitely influences
 - Cultures without words for shapes, still see shapes
- How hard is it to differentiate between shades of the same color
 - <http://www.boreme.com/posting.php?id=30670>
- How can language affect the way we think?
 - Racial terms
 - Gender based terms
- Thinking also affects language!

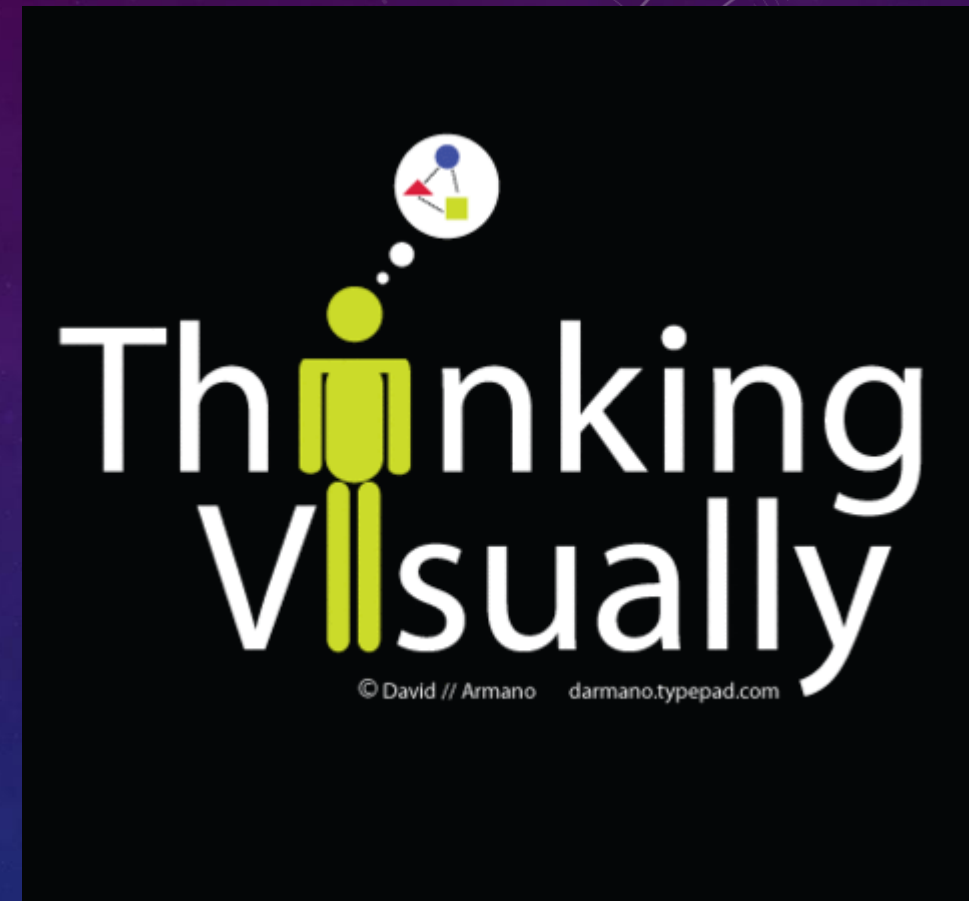
AFFECTS OF LANGUAGE ON THINKING

- Building vocabulary improves cognitive abilities
- New words correlate with new ideas and new ways of thinking
- Again, same holds true for sign language
 - Signing fluency is highly important in building cognitive capabilities
- Benefits of being bilingual
 - Better abilities to isolate thoughts and focus



THINKING IN WORDS OR PICTURES

- Certain thoughts come first in words
- Others first in images
 - Which way is hot water in the shower?
 - Artists, composers, designers
- Visualization techniques
 - Rehearsal actually improves performance
 - Process simulation is more valuable and effective than outcome simulation

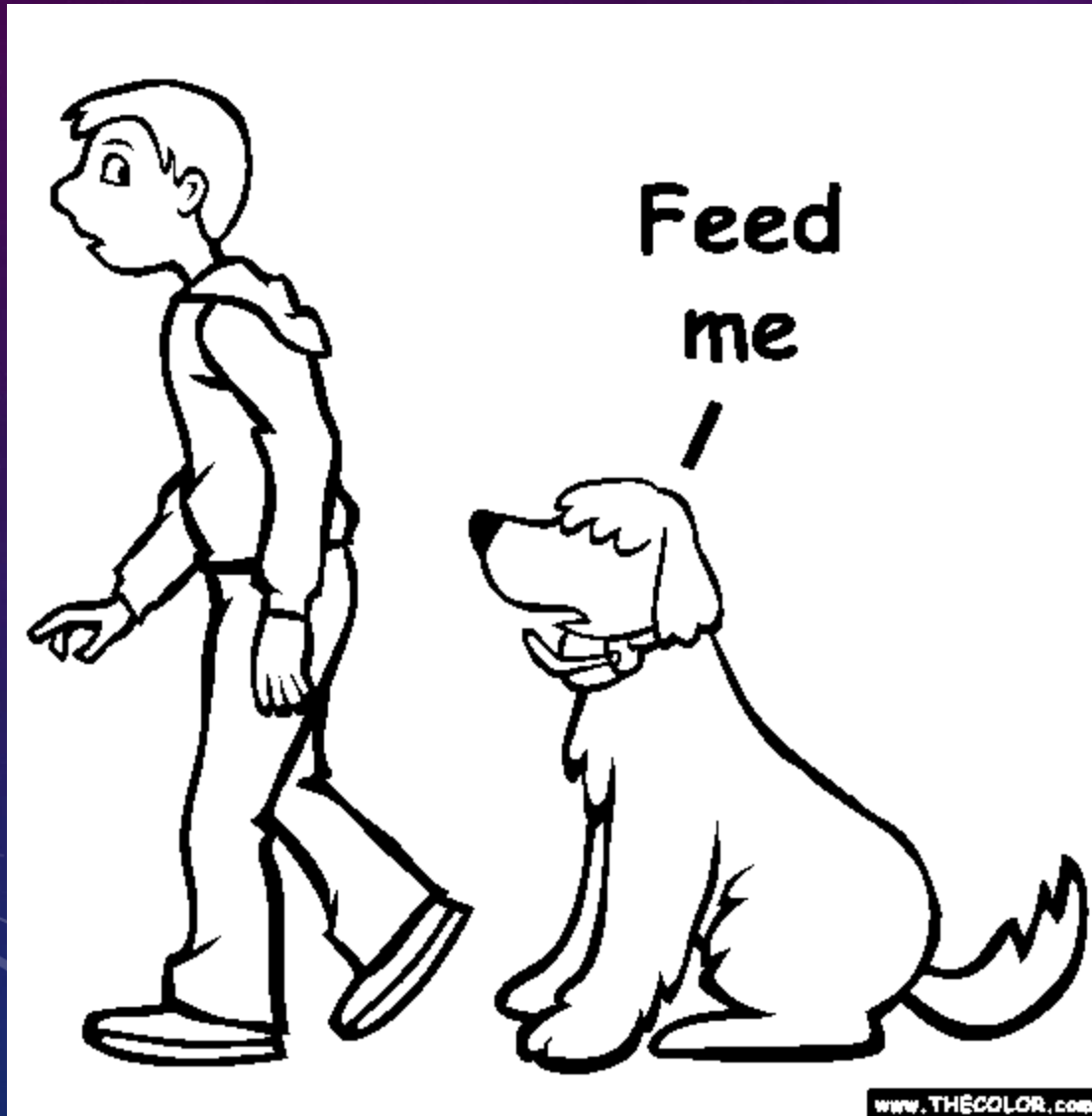


THINKING AND ANIMALS

- Apes think and form concepts
- Pigeons sort objects into categories
- Chimpanzees solve problems with insight!
 - Kohler watched chips try to reach fruit outside of their reach. Answer to solve the problem was insight.
 - And they use tools!
- Dolphins use tools too



LANGUAGE AND ANIMALS



- Yes animals communicate!
 - Rico, the dog, can identify 200 different items!
- Apes
 - Sign language
 - Human language may have emerged from gestures
 - Apes can combine words in novel combinations

ARGUMENTS AGAINST APE LANGUAGE

- Limited vocabulary
- Learning is highly difficult
- Mimicking and training
- Lack syntax

