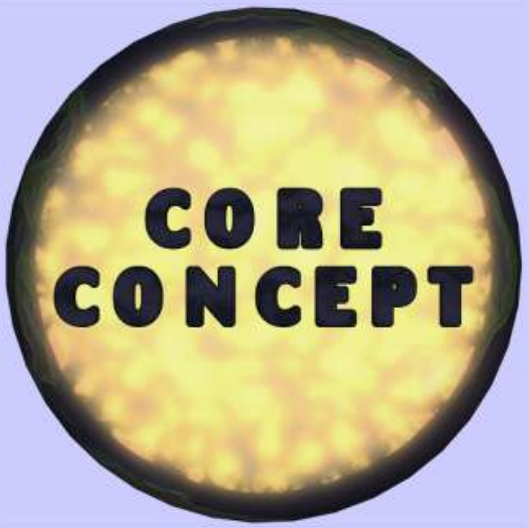
Chapter 7

Cognition

Student Slides

What is Memory?

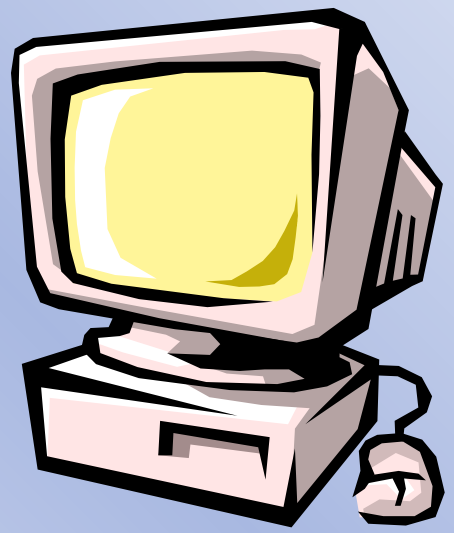


Human memory is an information processing system that works constructively to encode, store, and retrieve information

What is Memory?

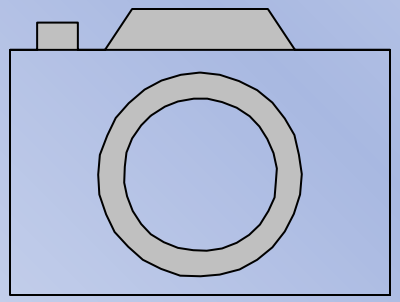
Memory –

Any system – human, animal, or machine – that encodes, stores, and retrieves information



-Metaphors for Memory

Cognitive psychologists see human memory more as an interpretive system, such as an artist, rather than a system that takes an accurate recording, such as a video recorder



-Human Memory is Good at:

Information on which attention is focused

Information in which we are interested

Information that arouses us emotionally

Information that fits with our previous experiences

Information that we rehearse

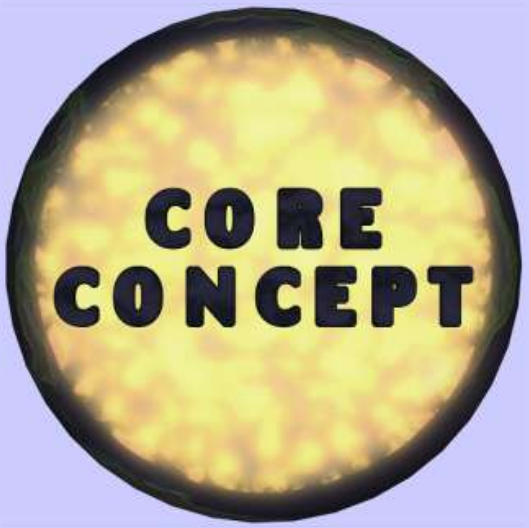
Memory's Three Basic Tasks

Encoding

Storage

Retrieval

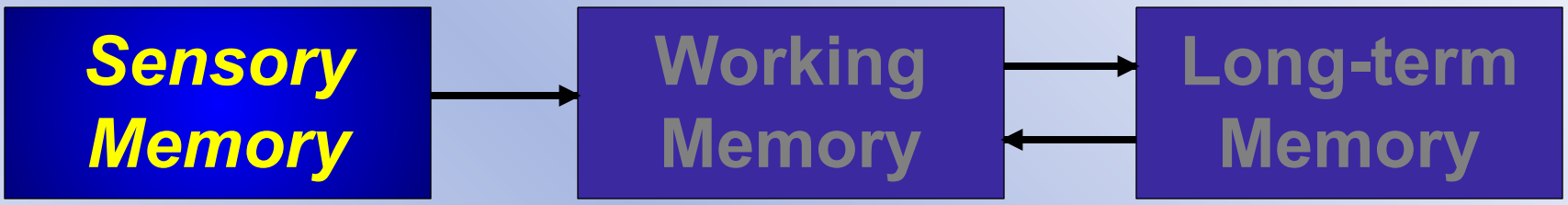
How Do We Form Memories?



Each of the three memory stages encodes and stores memories in a different way, but they work together to transform sensory experience into a lasting record that has a pattern of meaning

The Three Stages of Memory

The Three Stages of Memory

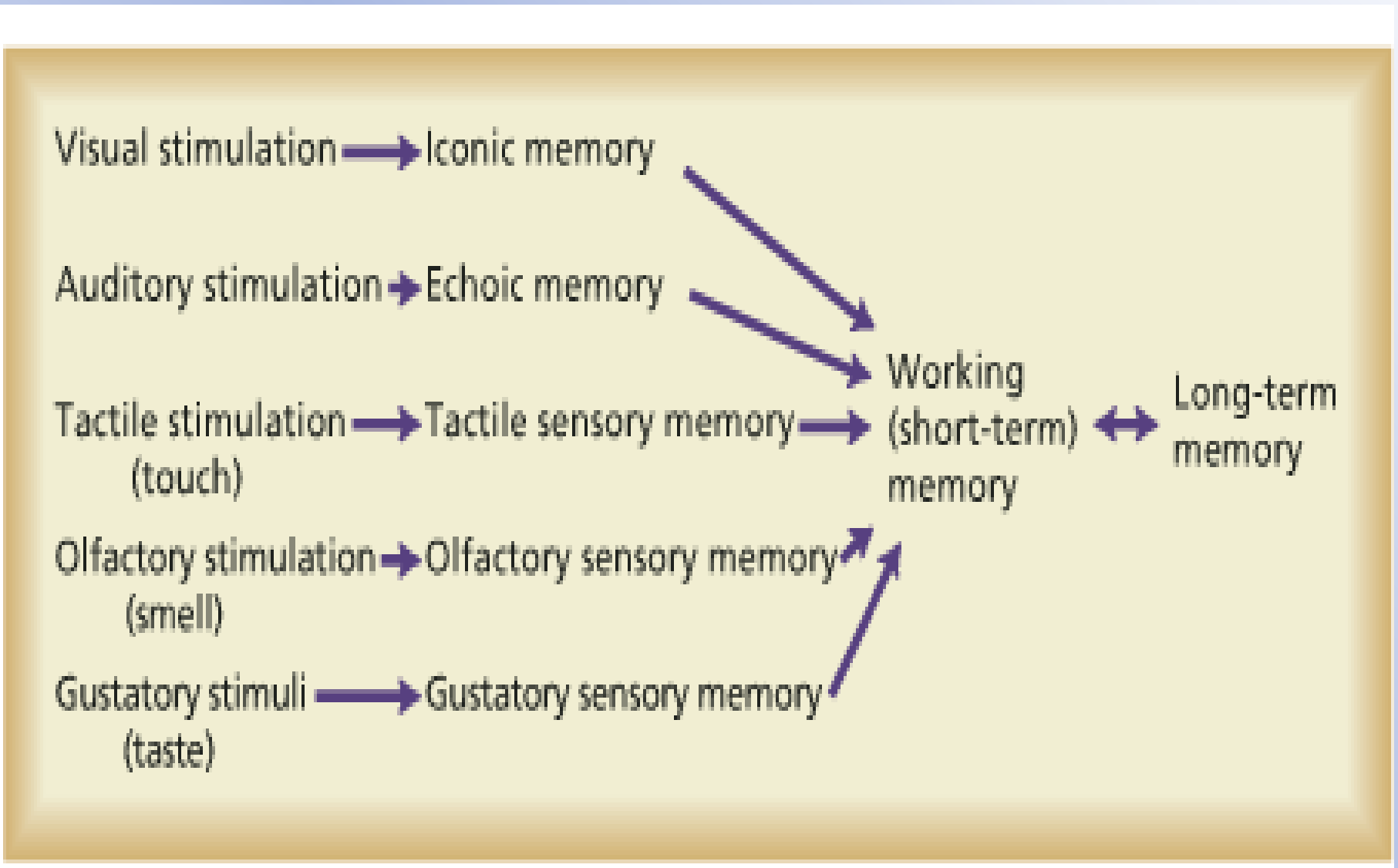


Preserves brief sensory impressions of stimuli

The First Stage: Sensory Memory

- The actual capacity of sensory memory can be twelve or more items
- All but three or four items disappear before they can enter consciousness
- There is a separate *sensory register* for each sense

Sensory Memory



The Three Stages of Memory

Preserves recently perceived events or experiences for less than a minute without rehearsal, also called short-term memory or STM

The Second Stage: Working Memory

Working memory consists of

- A central executive
- A phonological loop
- The sketchpad

Encoding and Storage in Working Memory

Chunking –

Organizing pieces of information into a smaller number of meaningful units

Maintenance rehearsal –

Process in which information is repeated or reviewed to keep it from fading while in working memory

Encoding and Storage in Working Memory

Elaborative rehearsal –
Process in which information is actively reviewed and related to information already in LTM

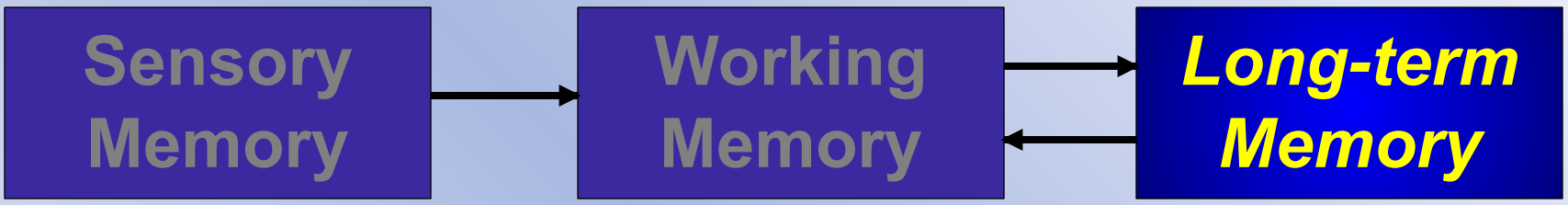
Acoustic encoding –
Conversion of information to sound patterns in working memory

Encoding and Storage in Working Memory

Levels-of-processing theory –

Explanation for the fact that information that is more thoroughly connected to meaningful terms in LTM will be better remembered

The Three Stages of Memory

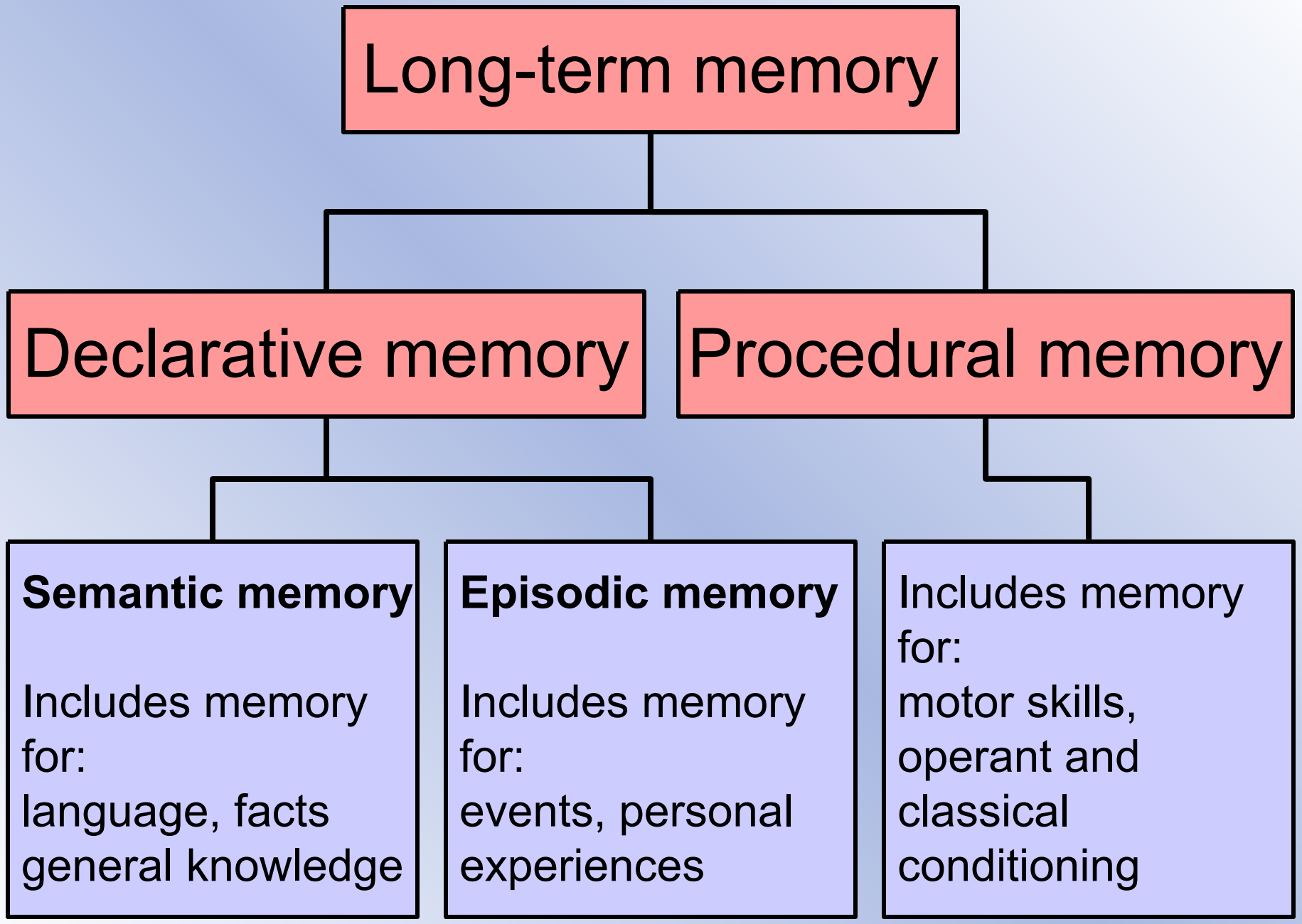


Stores material organized according to meaning, also called LTM

The Third Stage: Long-Term Memory

Procedural memory –
Division of LTM that stores memories for how things are done

Declarative memory –
Division of LTM that stores explicit information
(also known as fact memory)


Long-term memory
Declarative memory
Procedural memory
Semantic memory
Includes memory for:
language, facts
general knowledge
Episodic memory
Includes memory for:
events, personal experiences
Includes memory for:
motor skills, operant and classical conditioning

The Biological Basis of Long-Term Memory

Engram –
The physical trace of memory

Anterograde amnesia (forget the new)
Inability to form memories for new information (example: 50 First Dates)

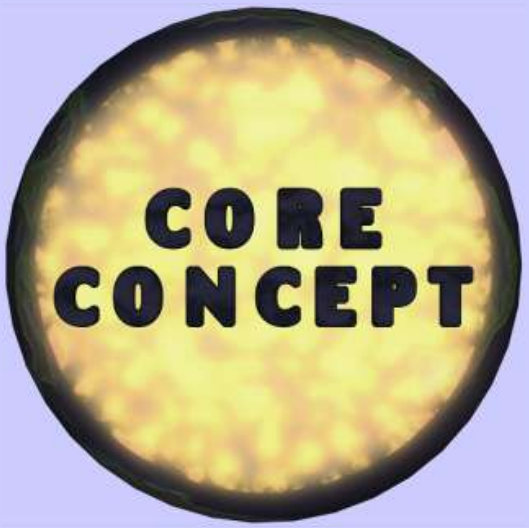
Retrograde amnesia (forget the past)
Inability to remember information previously stored in memory (example: Samantha Who?)

The Biological Basis of Long-Term Memory

Consolidation –

The process by which short-term memories are changed to long-term memories

How Do We Retrieve Memories?



Whether memories are implicit or explicit, successful retrieval depends on how they were encoded and how they are cued

How Do We Retrieve Memories?

Implicit memory –

Memory that was not deliberately learned or of which you have no conscious awareness

Explicit memory –

Memory that has been processed with attention and can be consciously recalled

Retrieval Cues

Retrieval cues –

Stimuli that are used to bring a memory to consciousness or into behavior

Retrieval Cues

Priming –

Technique for retrieving implicit memories by providing cues that stimulate a memory without awareness of the connection between the cue and the retrieved memory

Priming

If you are presented with the following words:

assassin, octopus, avocado, mystery, sheriff, climate

Priming

An hour later, you would easily be able to identify which of the following words you had previously seen:

twilight, assassin, dinosaur, mystery

Priming

However, an hour later, you would also have a much easier time filling in the blanks of some of these words than others:

ch_ _ _ _ nk

o _ t _ _ _ us

_ og _ y _ _ _

_ l _ m _ te

Priming

While you did not actively try to remember "octopus" and "climate" from the first list, they were *primed* in the reading, which made them easier to identify in this task

chipmunk

octopus

bogeyman

climate

Retrieving Explicit Memories

Anything stored in LTM must be “filed” according to its pattern or meaning

Recall and Recognition

Recall –

Technique for retrieving explicit memories in which one must reproduce previously presented information

Recognition –

Technique for retrieving explicit memories in which one must identify present stimuli as having been previously presented

Other Factors Affecting Retrieval

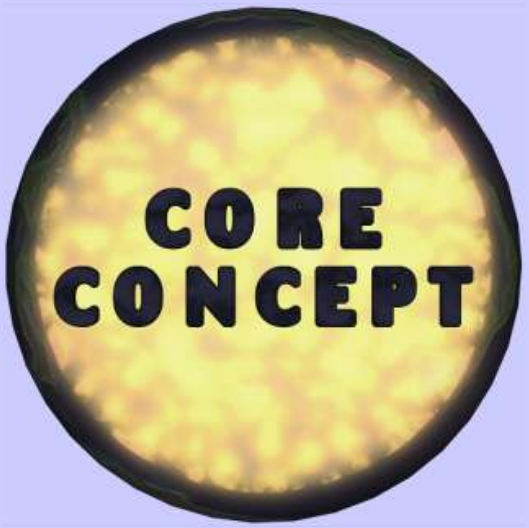
Encoding specificity principle –
The more closely the retrieval clues match the form in which the information was encoded, the better the information will be remembered

Other Factors Affecting Retrieval

Mood congruent memory –
A memory process that selectively retrieves memories that match one's mood

TOT (tip of the tongue) phenomenon –
The inability to recall a word, while knowing that it is in memory

Why Does Memory Sometimes Fail Us?



Most of our memory problems arise from memory's "seven sins" – which are really by-products of otherwise adaptive features of human memory

Memory's "Seven Sins"

- Transience
- Absent-Mindedness
- Blocking
- Misattribution
- Suggestibility
- Bias
- Persistence

Can't remember those 7 sins of memory? Use this mnemonic device!

Try (*transience)*

Asking *(absent-mindedness)*

Bappleby *(blocking)*

Maybe *(misattribution)*

She's *(suggestibility)*

Brilliant in *(bias)*

Psychology *(persistence)*

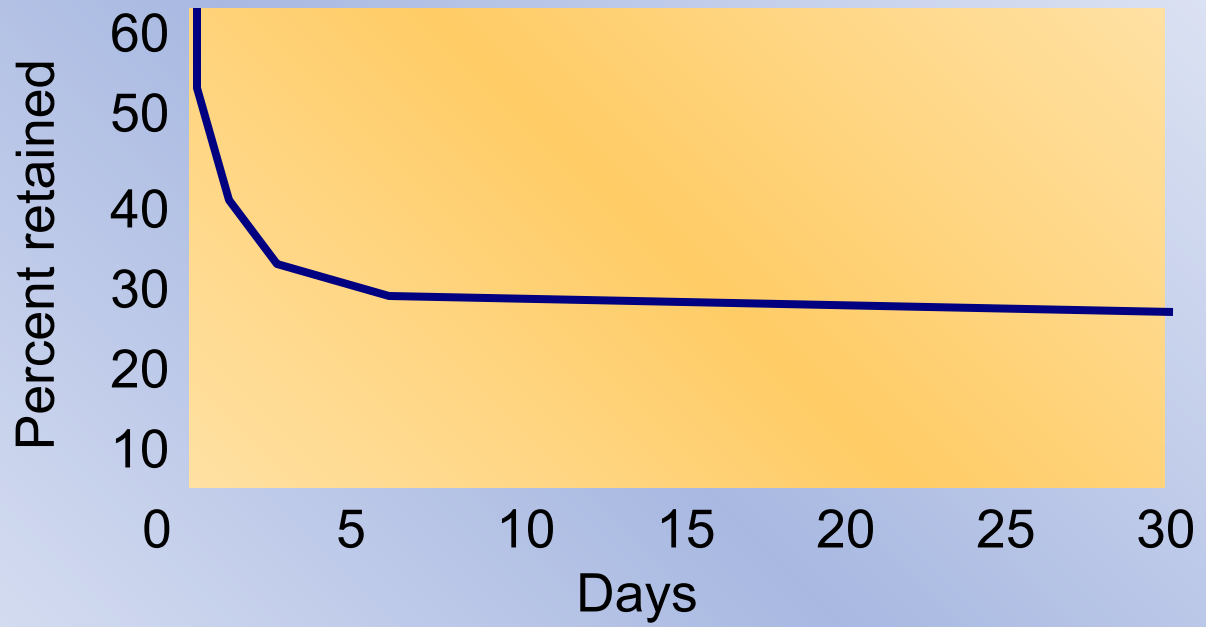
Transience

The impermanence of a long-term memory; based on the idea that long-term memories gradually fade in strength over time

Forgetting curve –

A graph plotting the amount of retention and forgetting over time for a certain batch of material

Ebbinghaus's Forgetting Curve



Recall decreases rapidly, then reaches a plateau, after which little more is forgotten

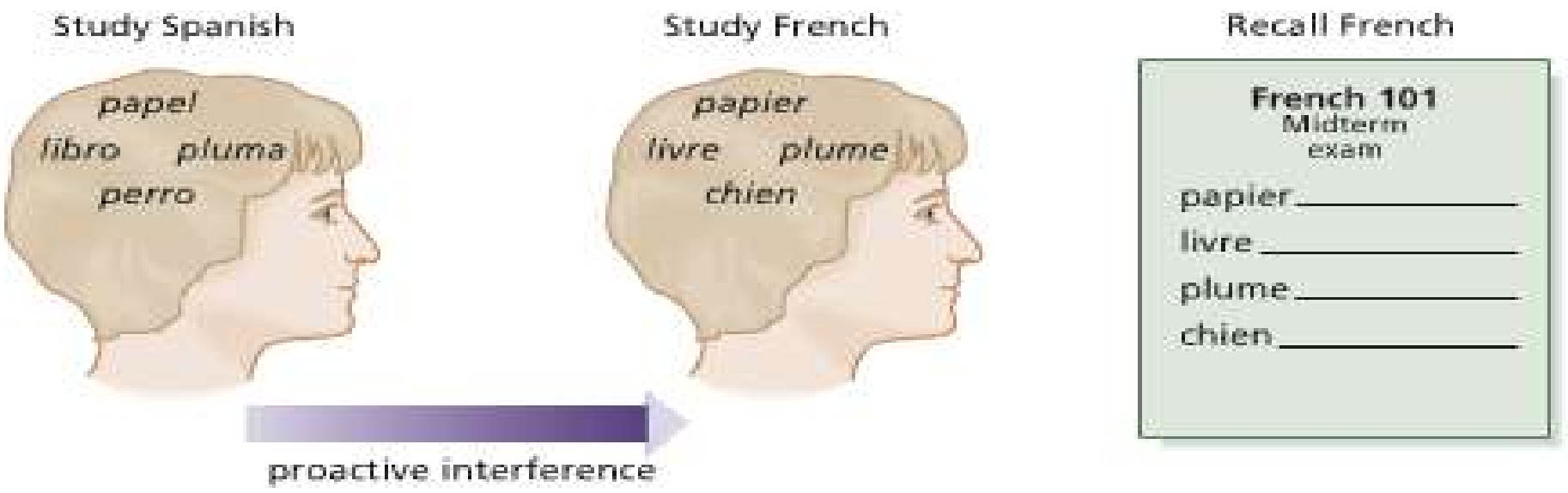
Absent-Mindedness

Forgetting caused by lapses in attention

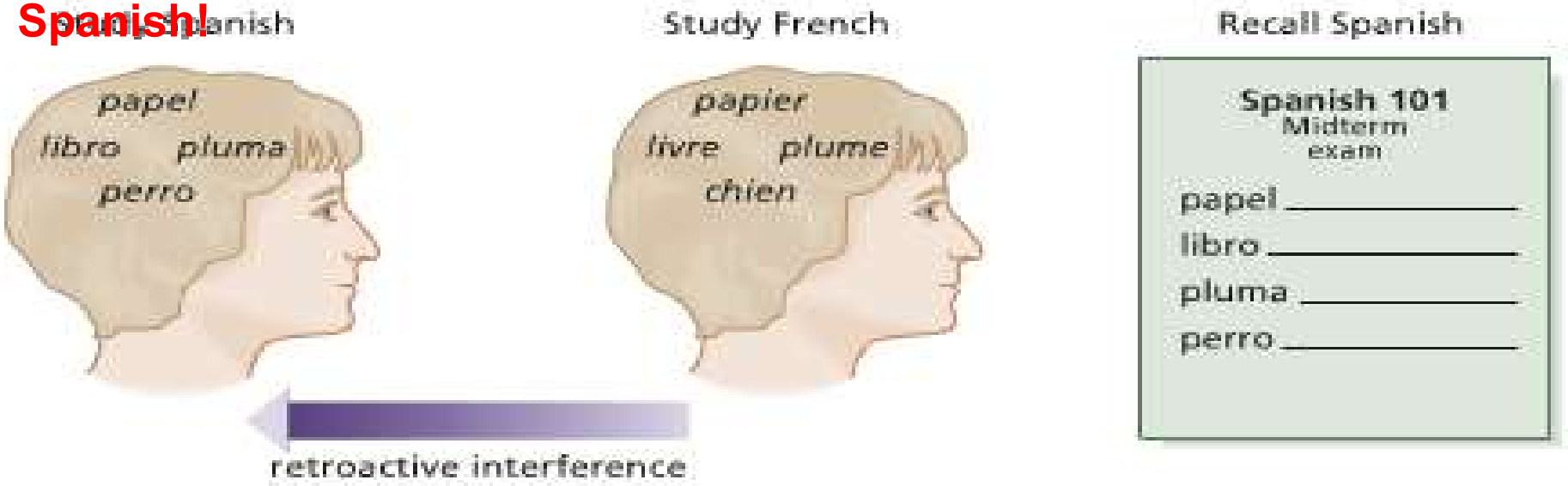
Blocking

Forgetting that occurs when an item in memory cannot be accessed or retrieved

- **Proactive interference** (forward blocking - old information blocks the new)
- **Retroactive interference** (backward blocking - new information blocks the old)
- **Serial position effect** (remember the stuff in the beginning and the end but not in the middle – double dose of interference!)



Old information blocks the new information. All you remember is Spanish!



New information blocks the old information. All you remember is the French!

Misattribution

Memory fault that occurs when memories are retrieved, but they are associated with the wrong time, place, or person

Suggestibility

Process of memory distortion as a result of deliberate or inadvertent suggestion

Misinformation effect –

The distortion of memory by suggestion or misinformation

Factors Affecting the Accuracy of Eyewitnesses:

- Recollections are less influenced by leading questions if possibility of memory bias is forewarned
- Passage of time leads to increase in misremembering information
- Age of the witness matters
- Confidence in memory is not a sign of accuracy

Bias

An attitude, belief, emotion, or experience that distorts memories

Expectancy bias –

A tendency to distort recalled events to make them fit one's expectations

Self-consistency bias –

Idea that we are more consistent than we actually are

Persistence

Memory problem in which unwanted memories cannot be put out of mind

The Advantages of the "Seven Sins" of Memory

- Despite the grief they cause us, the "seven sins" may actually be by-products of adaptive features of memory
  - For example, absent-mindedness is the by-product of the useful ability to shift our attention
  - Misattributions, biases, and suggestibility result from a memory system built to deal with meaning

Improving Memory with Mnemonics

Mnemonics –

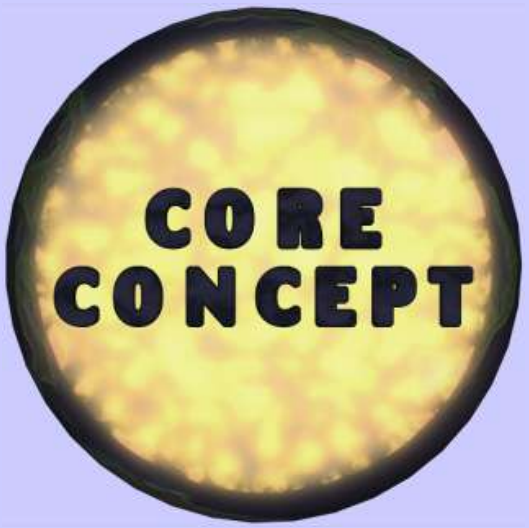
Techniques for improving memory, especially by making connections between new material and information already in long-term memory

Mnemonic strategies include

Method of loci

Natural language mediators

How Do Children Acquire Language?



Infants and children face an especially important developmental task with the acquisition of language

How Children Acquire Language

Innateness theory of language –
Children learn language mainly by following an inborn program for acquiring vocabulary and grammar

Language acquisition device (LAD) –
Structure in the brain innately programmed with some of the fundamental rules of grammar

How Children Acquire Language

Early stages of language acquisition include the following:

- The babbling stage (infancy – varies)
- The one-word stage (6 - 12 mo.)
- The naming explosion (18 mo.)
- The two-word stage (24 mo.)
- Telegraphic speech (short, simple sentences) (24 mo. and up)

The Rules of Grammar

Grammar –
The rules of a language

Phonemes – The smallest units of sounds to form meaningful utterances (a, b, c, d, etc.)

Morphemes –
Meaningful units of language that make up words (put the sounds together to morph into a word – "downtown" is two morphemes – two words with meaning but they morph into one meaningful word). Can also be used to mark tense *("I miss you" vs. "I missed you"*) and possession *("Jessica" vs "Jessica's"*).

Overregularization –
Applying a grammatical rule too widely and thereby creating incorrect forms
(e.g. using "hitted" and "feets")

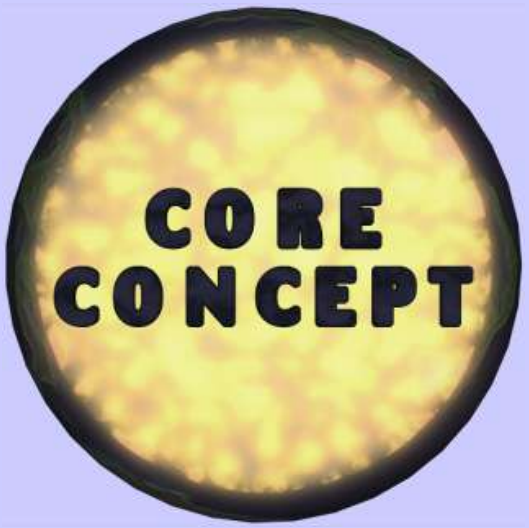
How Children Acquire Language

Other language skills

Social rules of conversation

Abstract words (e.g. hope, truth)

What Are the Components of Thought?



Thinking is a cognitive process in which the brain uses information from the senses, emotions, and memory to create and manipulate mental representations, such as concepts, images, schemas, and scripts

Concepts

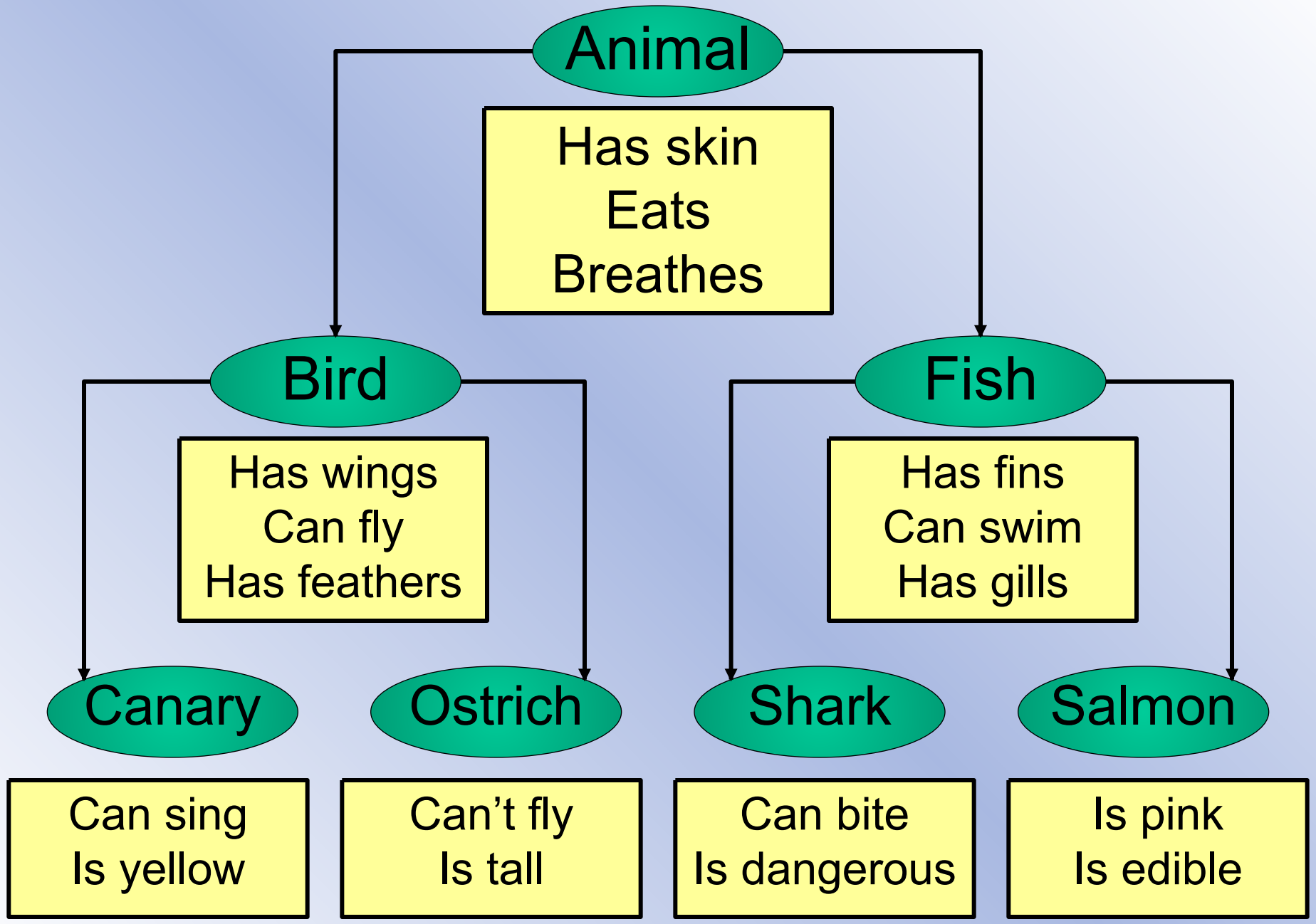
Concepts –

Mental representations of categories of items or ideas, based on experience

Natural concepts represent objects and events – not only are they words, but they evoke images or emotions of the object or event as well. Natural concepts invoke a mental ***prototype*****,** or a generic image that represents an example of a conceptual category (e.g. Bird).

Artificial concepts are defined by rules – dictionary definitions, mathematical formulations. Artificial concepts help to clearly define the natural concept (e.g. Bird is a feathered biped). The concept of the term "concept" is an artificial concept!

We organize much of our declarative memories into ***concept hierarchies***


Animal
Has skin
Eats
Breathes
Bird
Has wings
Can fly
Has feathers
Fish
Has fins
Can swim
Has gills
Canary
Ostrich
Shark
Salmon
Can sing
Is yellow
Can’t fly
Is tall
Can bite
Is dangerous
Is pink
Is edible

Thought and the Brain

Event-related potentials –

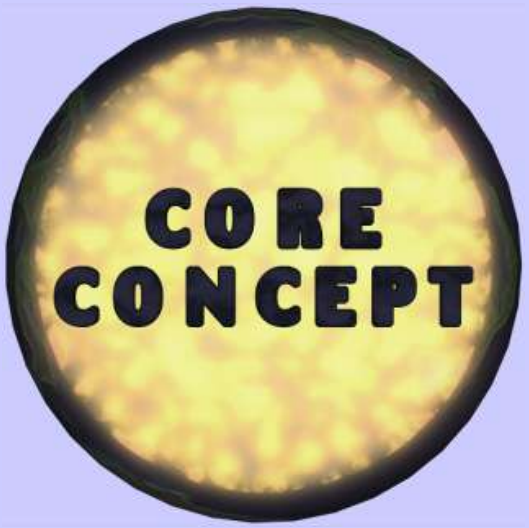
Brain waves shown on an EEG in response to stimulation

Schemas and Scripts Help you Know What to Expect

***Schema* –**
A knowledge cluster or general framework that provides expectations about topics, events, objects, people, and situations in one's life (your schema of telephone is much different than my grandparents' schema of telephone!)

***Script* –**
A cluster of knowledge about sequences of events and actions expected to occur in particular settings (an event schema!)

What Abilities Do Good Thinkers Possess?



Good thinkers not only have a repertoire of effective algorithms and heuristics, they know how to avoid the common impediments to problem solving and decision making

Problem Solving

Good problem solvers are skilled at

- Identifying the problem
- Selecting a strategy

Selecting a Strategy

Algorithms –

Problem-solving procedures or formulas that guarantee a correct outcome if correctly applied

Heuristics –

Cognitive strategies used as shortcuts to solve complex mental tasks; they do not guarantee a correct solution

Heuristics

Useful heuristics include:

- Working backward
- Searching for analogies
- Breaking a big problem into smaller problems

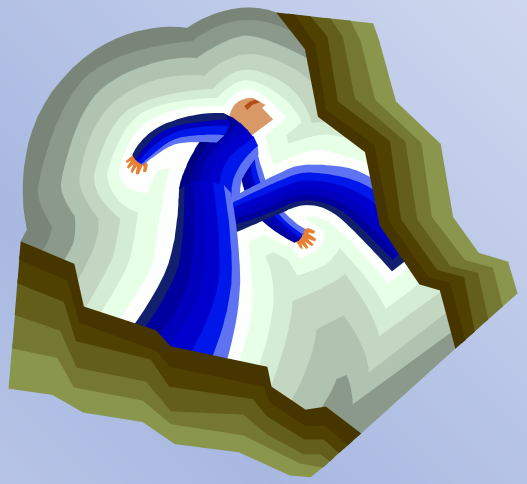
Obstacles to Problem Solving

Mental set –

Tendency to respond to a new problem in the manner used for a previous problem

Functional fixedness –

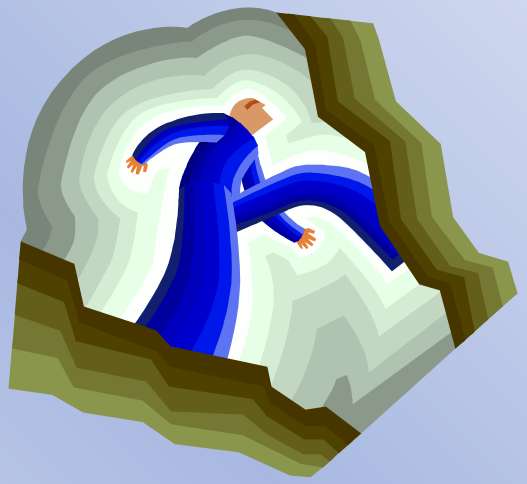
Inability to perceive a new use for an object associated with a different purpose



Obstacles to Problem Solving

Other obstacles include:

- Self-imposed limitations
- Lack of interest
- Fatigue
- Drugs (legal and illegal)



Judging and Making Decisions

Confirmation Bias

Hindsight Bias

Anchoring Bias

Representativeness Bias

Availability Bias

Judging and Making Decisions

Confirmation Bias

Hindsight Bias

Anchoring Bias

Representativeness Bias

Availability Bias

Ignoring or finding fault with information that does not fit our opinions, and seeking information with which we agree

Judging and Making Decisions

- Confirmation Bias
- ***Hindsight Bias***
- Anchoring Bias
- Representativeness Bias
- Availability Bias

Tendency, after learning about an event, to believe that one could have predicted the event in advance

Judging and Making Decisions

- Confirmation Bias
- Hindsight Bias
- ***Anchoring Bias***
- Representativeness Bias
- Availability Bias

Faulty heuristic caused by basing (anchoring) an estimate on a completely unrelated quantity

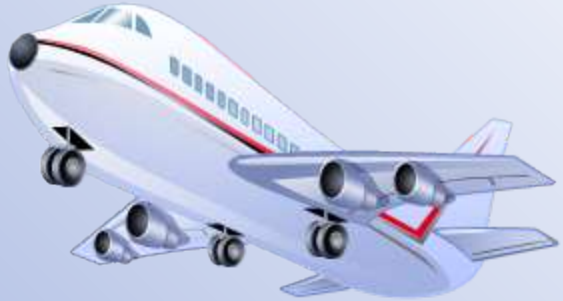
Judging and Making Decisions

- Confirmation Bias
- Hindsight Bias
- Anchoring Bias
- ***Representativeness Bias***
- Availability Bias

Faulty heuristic strategy based on presumption that, once a person or event is categorized, it shares all features of other members in that category

Judging and Making Decisions

- Confirmation Bias
- Hindsight Bias
- Anchoring Bias
- Representativeness Bias
- ***Availability Bias***



Faulty heuristic strategy that estimates probabilities based on information that can be recalled from personal experience

End of Chapter 7
We are halfway through!

Hopefully this chapter will not become "only a memory" now t
are finished with it!