UNIT 7 GUIDE – 12/16/2019
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MODULE 31 – Studying and Building Memories

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| Studying Memory | – **Memory** is learning that has persisted over time, information that has been acquired, stored and can be retrieved<br>– *Information=processing models* are analogies that compare human memory to a computer's operations. To remember an event, we:<br>– get info to our brain (**encoding**)<br>– retain that info (**storage**)<br>– get the info back out (**retrieval**)<br>– Our brain processes things simultaneously through **parallel processing**<br>– One info-processing model, *connectionism*, views memories as products of interconnected neural networks, which are accessed through particular activation patterns<br>– Richard Atkinson and Richard Shiffrin proposed another model:<br>– we record to-be-remembered info as a **sensory memory**<br>– we process info into **short-term memory**, encoding it through *rehearsal*<br>– info moves into **long term memory** for later retrieval<br>– Alan Baddeley challenged this view of short-term memory, saying that it's not just a temporary storage space, but an active place where you process new info and link it with long-term memory<br>– **Working memory** describes what happens during the middle stage<br>– Without focused attention, info often fades |
| Building Memories: Encoding | – Atkinson and Shiffrin's model focused on processing **explicit memories** – memories/facts we consciously know, which are encoded through conscious **effortful processing**<br>– Other info goes directly into storage, through **automatic processing**, which produces **implicit memories**<br>– Implicit memories include *procedural memory* for automatic skills. They also include:<br>– information about *space/location*<br>– information about *time/sequences of events*<br>– information about *frequency* (how much things happen)<br>– It's hard to shut off automatic processing – like reading (which becomes automatic through a lot of practice)<br>– Sensory memory feeds active working memory<br>– Sperling's experiments show **iconic memory**, fleeting sensory memory of visual stimuli, which is cleared quickly<br>– we also have good fleeting memory for audio stimuli (**echoic memory**)<br>– We can recall about seven information bits, plus/minus two<br>– Working-memory capacity varies with age and other factors<br>– **Chunking** information is organizing items into familiar, manageable units which enables us to recall it more easily (usually occurs naturally)<br>– To encode lengthy passages and speeches, we use **mnemonics**<br>– The *peg-word system* uses our visual imagery skill – we associate peg words (for example in a rhyme) with to-be-remembered items, allowing us |

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| | to recall them in any order<br>- When people develop expertise in an area, they process it in chunks and *hierarchies*: broad concepts divided into narrower concepts and facts<br>- We retain info better when encoding is distributed over time, in the **spacing effect**<br>  - a good way to do this is through *repeated self-testing*, also called the **testing effect**<br>- We process verbal info at different levels, the deeper the better<br>  - **shallow processing** encodes on a basic level like letters or sound<br>  - **deep processing** encodes semantically, based on the meaning of words<br>- We have trouble processing info that's not meaningful or related to our experience<br>- The amount remembered depends both on the time spent learning and on your making it meaningful for deep processing |

MODULE 32 – Memory Storage and Retrieval

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| Memory Storage | - Memories don't reside in single specific spots – no matter what parts of their brain are removed, rats can at least retain a partial memory of a maze<br>- The network that processes and stores your explicit memories includes your frontal lobes and hippocampus<br>- The **hippocampus**, the temporal-lobe neural center in the limbic system, is a "save" button for explicit memories – damage to this structure disrupts their recall<br>  - left hippocampus damage: trouble remembering verbal info<br>  - right hippocampus damage: trouble remembering visual designs and locations<br>  - one part of the hippocampus works with associating names and faces<br>  - another is for spatial mnemonics, another for spatial memory (near the rear)<br>  - acts as a loading dock where elements of a memory are registered and temporarily held<br>- The **cerebellum** plays a key role in forming and storing the implicit memories created by classical conditioning<br>- The *basal ganglia***,** which are involved in motor movement, facilitate formation of procedural memories for skills<br>- Infantile amnesia is contributed to by: indexing explicit memory using words that babies don't know, and because the hippocampus matures late in life<br>- Emotions can trigger stress hormones which influence memory formation<br>  - they provoke the *amygdala* to boost memory-forming activity<br>- Emotions can persist even if we don't know what caused them<br>- Perceived clarity of memories of surprising, significant events leads some psychologists to call them **flashbulb memories**<br>- Eric Kandel and James Schwartz observed synaptic changes during learning of a California sea slug, *Aplysia*<br>  - when learning occurs, more *serotonin* is released into certain synapses, which then become more efficient at transmitting signals<br>- When certain memory-circuit connections were stimulated, people had increased sensitivity for hours or even weeks<br>  - this increased efficiency of potential neural firing called **long-term** |

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| | **potentiation (LTP)** provides a neural basis for learning and association<br>- LTP-blocking drugs interfere with learning<br>- Mutant mice which can't perform LTP can't learn to leave mazes<br>- Rats with enhanced LTP learn a maze twice as quickly<br>- Injecting a chemical that blocks LTP preservation erases recent learning<br>- Passing electricity though the brain can wipe out recent memories |
| Retrieval: Getting Information Out | - Evidence of memory includes three *measures of retention*<br>- **recall** - retrieving unconscious information learned at an earlier time<br>- **recognition** - identifying items previously learned<br>- **relearning** - learning something more quickly a second time<br>- Additional rehearsal (*overlearning*) of verbal information increases retention (as rehearsal increases, relearning time decreases)<br>- Tests of recognition and time spent relearning demonstrate that we remember more than we can recall<br>- Memories associated with each other can serve as *retrieval cues* that you can later use to access information<br>- Our associations are activated without our awareness through **priming** (if you see the word rabbit, you'll think hare and not hair)<br>- priming can also influence behavior<br>- Putting yourself in the context where you experienced something can prime your memory retrieval<br>- *State dependent memory*: what we learn in one state (ex: drunk) is more easily recalled when again in that state<br>- mood is a good example of this: our memories are somewhat **mood congruent**<br>- We attribute to reality our own changing judgements, memories and interpretations<br>- The **serial position effect** demonstrates that we have a tendency to recall best the last (recency effect) and first (primacy effect) items in a list |

MODULE 33 - Forgetting, Memory Construction and Memory Improvement

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| Forgetting | - Good memory is helpful, but so is the ability to forget<br>- **Anterograde amnesia** - recalling the past but not forming new memories<br>- **Retrograde amnesia** - not recalling the past, but forming new memories<br>- Those with anterograde amnesia can still learn nonverbal tasks without being aware of learning them (implicit memories)<br>- Much of what we sense we never notice, and what we fail to encode, we will never remember<br>- The course of forgetting is initially rapid, then levels off with time (stored memories decay)<br>- Sometimes important events defy our attempts to access them - given retrieval cues was can easily retrieve them<br>- **Proactive interference** happens when prior learning disrupts recall of new information<br>- **Retroactive interference** happens when new learning disrupts recall of old information<br>- information presented in the hours is protected from this b/c the opportunity for interfering events is minimized (this is a good time |

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| | to commit info to memory)<br>- *Positive transfer* is when previously learned info facilitates learning of new information<br>- Sigmund Freud proposed that we **repress** painful or unacceptable memories to protect our sense of self and minimize anxiety (but these memories can be retrieved by some later cue)<br>  - increasing numbers of people doubt the existence of repression – it's hard to forget emotional events |
| Memory Construction Errors | - Elizabeth Loftus demonstrated how eyewitnesses reconstruct their memories after a crime or accident<br>- The **misinformation effect:** exposed to misleading information, we tend to misremember<br>  - a vivid retelling of an event can implant false memories<br>  - repeatedly *imagining* nonexistent actions and events can create false memories<br>  - digitally altered photos can also produce *imagination inflation*<br>- **Source amnesia** is attributing the wrong source to an event we've experienced, heard, read or imagined (at the heart of many false memories)<br>  - helps explain **déjá vu** – cues from the current situation may unconsciously trigger retrieval of an earlier experience<br>- False memories can be very persistent<br>- Stephen Ceci and Maggie Bruck demonstrate how easily children's memories can be molded, and the effect of suggestive interviewing techniques<br>  - over half the children produced false, vivid stories regarding made up events<br>  - doesn't mean children can never be accurate – given less suggestive, more effective interviewing techniques, even 4 or 5 year olds can produce accurate recall<br>- Some therapists, when giving a patient hypnosis or drugs, can expose them to techniques which form an image of a threatening person who never actually existed<br>  - however, some clinicians argue that this theory adds to abused people's trauma<br>  - memories of things before age 3, or recovered under hypnosis/drugs, are unreliable, **but** still emotionally upsetting |
| Improving Memory | - Rehearse repeatedly<br>- Make the material meaningful<br>- Activate retrieval cues<br>- Use mnemonic devices<br>- Minimize interference<br>- Sleep more<br>- Test your own knowledge, to rehearse it and find out what you don't yet know |

MODULE 34 – Thinking, Concepts and Creativity

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| Thinking and Concepts | - **Cognition** – the mental activities associated with thinking, knowing, remembering and communicating information |

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| | - **Concepts** - mental groupings of similar objects, events, ideas and people<br>  - simplify our thinking<br>  - often formed by developing **prototypes** - mental images/examples of a category<br>- Once we place an item in a category, our memory of it later shifts toward the category prototype<br>- Concepts speed and guided our thinking, but they don't always make us wise |
| Creativity | - **Creativity** is the ability to produce ideas that are both novel and valuable<br>  - a certain level of aptitude supports creativity, but there's more to creativity than what intelligence tests reveal<br>- Intelligence tests, which demand a single correct answer, require **convergent thinking**<br>- Creativity tests require **divergent thinking**<br>- Five components of creativity (Sternberg)<br>  - **Expertise** - a well developed base of knowledge<br>  - **Imaginative thinking skills** - the ability to see things in new ways<br>  - **A venturesome personality**<br>  - **Intrinsic motivation**<br>  - **A creative environment**<br>- To boost the creative process:<br>  - develop your expertise<br>  - allow time for incubation (sleeping on it allows unconscious processing to form associations)<br>  - set aside time for the mind to roam freely<br>  - experience other cultures and ways of thinking |

MODULE 35 - Solving Problems and Making Decisions

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| Problem Solving: Strategies and Obstacles | - For some problems we use *trial and error*, for others we use **algorithms**, step-by-step procedures that guarantee a solution, or **heuristics**, simpler thinking strategies<br>- When no problem-solving strategy works, we use **insight**<br>  - when insight occurs, during the Aha! moment, the frontal lobes were active (focusing attention) and there was a burst of activity in the right temporal lobe<br>- We more eagerly seek out evidence that verifies and favors our ideas (**confirmation bias**)<br>- Ordinary people evade facts, become inconsistent, or systematically defend themselves against the threat of new information relevant to the issue<br>- Once we incorrectly represent a problem it's hard to restructure our approach<br>  - *fixation* - the inability to see a problem from a fresh perspective<br>- The **mental set** is our tendency to approach a problem with the mind-set of what has worked for us previously<br>  - just like the perceptual set predisposes what we perceive, this predisposes how we think |
| Forming Good and Bad Decisions and | - We seldom take time to reason systematically - we follow **intuition**, our fast, automatic unreasoned feelings and thoughts |

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| Judgements | - The mental shortcuts we call heuristics enable snap judgements – intuitive judgements are instantaneous and usually effective<br>- Research by Tversky and Kahneman showed how those helpful shortcuts can lead smart people to dumb decision<br>- The **representativeness heuristic** is judging the likelihood of things in terms of how well they represent particular prototypes (may lead us to ignore relevant information)<br>  - e.g, we think somebody reading a book is more likely to be a writer<br>- The **availability heuristic** is when we estimate the likelihood of events based on how mentally available they are<br>  - e.g, we think a casino win is more likely because they lead to attention-catching commotion, while losses go unnoticed<br>  - can lead to a fear of extremely rare events b/c of how much attention they attract<br>- **Overconfidence** is the tendency to overestimate the accuracy of our knowledge and judgements<br>  - projects usually take twice the number of days expected<br>  - can have adaptive value – those who err on the side of overconfidence live more happily, make tough decisions more easily and seem more credible<br>- **Belief perseverance** – clinging to one's initial conceptions after the basis on which they were formed has been discredited<br>  - to rein in this phenomenon, one should consider the opposite<br>- **Framing**, the way we present an issue, sways our decisions and judgements<br>- Those who understand the power of framing can use it to influence our decisions<br>- Irrational thinking can prevent us from seeing problems clearly, making wise decisions, forming valid judgements and reasoning logically. It can also feed gut fears and prejudices<br>- Summary of intuition's powers<br>  - Intuition is large<br>  - Intuition is usually adaptive<br>  - Intuition is recognition born of experience |

MODULE 36 – Thinking and Language

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| Language Structure | - **Language** is our spoken, written or signed words and the ways we combine them to communicate meaning<br>- **Phenomes** are the smallest distinctive sound units in a language (*bat* has b, a and t, *chat* has ch, a and t)<br>  - there are 869 different phenomes in human speech but English only uses 40 – most languages use anywhere to 20 to 80<br>  - consonant phenomes carry more info than vowel ones do<br>- **Morphemes** are the smallest units that carry meaning in a given language. Some are also phenomes, but most combine 2+ phenomes<br>  - some, like bat or gentle, are words<br>  - others are prefixes or suffixes like the pre- in preview<br>- **Grammar** is the system of rules than enables us to communicate<br>  - deriving meaning from sounds (*semantics*) and ordering words into sentences (*syntax*) |

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| Language Development | - You use about 150 words for half of what you say, but you'll learn about 60,000 by your high school graduation<br>- We seldom form sentences in our mind before speaking them<br>- We adapt what we say to our social and cultural context<br>- Children's language development moves from simplicity to complexity<br>  - infants start without language, but can recognize differences in speech sounds and read lips by four months (beginning of development of *receptive language*, their ability to understand what is said to/about them)<br>- Babies' *productive language*, their ability to produce words, matures with receptive languages<br>  - recognize noun-verb differences before they utter sentences with nouns and verbs<br>  - the **babbling stage** begins around 4 months of age<br>  - without exposure to other languages, babies lose their ability to hear and produce sounds and tones found outside their native language<br>- Most children enter the **one-word stage** by their first birthday<br>  - first words are often nouns that label objects or people<br>- At around 18 months, learning goes from a word per week to a word per day, and most children enter the **two-word stage** by their second birthday<br>  - they start uttering two-word sentences in **telegraphic speech** - mostly verbs and nouns, in a sensible order (drink juice!)<br>- By early elementary school, children understand complex sentences and humor through double meanings<br>- Noam Chomsky argues that all languages share some basic elements called *universal grammar* (they all have nouns, verbs and adjectives)<br>  - humans are born with a built-in predisposition to learn grammar, but not with a built-in *specific* language<br>- Childhood represents a *critical period* for mastering certain aspects of the language before learning the language<br>  - the window on language learning closes gradually in early childhood<br>  - later-than-usual exposure to language (age 2 or 3) unleashes the idle language capacity of a child's brain, producing a rush of language<br>  - this ability is lost by around age 7<br>  - children will become linguistically stunted if isolated from language during the critical period for its acquisition |
| The Brain and Language | - **Aphasia**, an impairment of language, can result from damage to several cortical areas<br>  - some can read but not speak, others speak but not read, etc… (suggests that language is complex, and that different brain areas must serve different language functions)<br>- Broca reported that damage to **Broca's area** in the left frontal lobe led to struggling with speaking (but not comprehending it)<br>- Wernicke reported that damage to **Wernicke's area** in the left temporal lobe led to struggling with speaking and understanding<br>- Language functions are distributed across other brain areas as well: different neural networks are activated by nouns and verbs, objects and actions, different vowels, etc…<br>- In processing language, the brain operates by dividing its mental functions, |

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| | speaking, perceiving, thinking and remembering, into subfunctions |
| Language and Thought | - Whorf contended that language determines the way we think<br>- His **linguistic determinism** hypothesis is too extreme, but those who speak two dissimilar languages may think differently in different languages<br>- Our words may not determine what we think, but they do influence our thinking<br>  - perceived differences between colors can grow when we assign different names to them<br>- To expand language is to expand the ability to think - young children's thinking develops hand in hand with their language<br>  - the *bilingual advantage*: although their vocabulary in each language is smaller than people speaking a single language, bilingual people are skilled at inhibiting one language while using the other<br>  - this well-practiced "executive control" makes them better at inhibiting their attention to irrelevant information<br>- We often think in images - watching an activity occur will activate the brain's internal simulation or that activity<br>- Mental rehearsal can help you achieve an academic goal<br>- It's better to spend your fantasy time planning how to get somewhere than to dwell on the imagined destination<br>- Thinking affects our language, which then affacts our thought |