CHAPTER 8

CHAPTER OUTLINE

Cognition and Language

Module 8.1: Attention and Categorization

1) Research in Cognitive Psychology: Cognition refers to thinking, gaining, managing and applying knowledge. Research into thought processes is challenging. People have difficulty describing their mental processes accurately. Visual and auditory imagery studies pose special challenges to the psychological researcher.

2) Attention: Response to and selectively memory for stimuli. At any given time, one responds to and remembers more about some stimuli. Attention is guided by a number of factors; some are automatic and others are deliberate.
   a) Preattentive and Attentive Processes: Much mental processing occurs via preattentive processes. These happen automatically and simultaneously across a large portion of the visual field. More investment of mental effort characterizes attentive processing—procedures involving attention to only one part of the visual field at a time.

3) Limitations of attention:
   a) Though some tasks require a limited amount of attention, at times attending to more than one stimulus at once taxes attentional resources. We experience an “attention bottleneck” as items compete for our attention and some piece of information may be missed. Attention research is central in the fields of ergonomics and human factors psychology.
   b) The Stroop Effect: During a task, while looking at the names of assorted colors that are printed in different-colored ink, we are asked to say the color of the ink and not read the word, people find that they must fight the tendency to read the word. The strong, automatic urge to read the word is an example of preattentive processing.
   c) Change Blindness: The failure to detect changes in our environment due to limitations of attention. It allows, for example, movie makers to shoot different parts of the same scene over the course of several days. Only rarely are slowly-occurring changes detected in sight, sound, or other sense channels.
   d) A “bottleneck” in processing is also apparent in the attentional blink. The moment after we perceive one stimulus, we find it difficult to attend to another.

4) Attention-Deficit Disorder (ADD): People vary in ability to control and shift attention. ADD is characterized by easy distraction, impulsiveness, moodiness, and inability to follow through on plans. When the symptoms include noticeable fidgetiness, the condition is called Attention-Deficit Hyperactivity Disorder (ADHD). These disorders are thought to occur in 3-10 percent of all children, and boys make up 70 percent of those afflicted. There are ongoing disputes about the true nature of the disorder. A positive response to drugs used to treat it is not considered to be a true indicator of its presence. Some cognitive tasks which are more sensitive to the presence of ADD/ADHD are the Choice-Delay and Stop Signal.

5) Categorization: Research on categorization examines how people classify objects into
different groups.

a) Ways to Describe a Category: Most categories are not clearly defined with simple lists of features. Categories are often defined by *prototypes*, the most familiar or typical examples of its members. We categorize objects by determining how closely they match prototypes.

b) Conceptual Networks and Priming: Reaction time research reveals that we organize items in networks of related ideas, not in isolation. Thinking about a concept brings to mind other related concepts. *Priming* occurs when a small reminder of a concept makes it easier to think about related ones. This is *spreading activation*.

**Module 8.2: Solving Problems, Making Decisions, and Thinking**

1) Algorithm: A technique for solving problems or testing hypotheses, these are step-by-step routines or mechanical procedures. Algorithms are not appropriate strategies in cases where the problem is not well defined or has more than one possible solution.

2) Heuristics: Some problems don’t have a “correct” answer. Or we don’t have the time to carry out the steps. In these cases, *heuristics* are employed. Heuristics are “rule-of-thumb” strategies for solving problems or guiding investigations. We tend to use heuristics when we can; but computers rely almost exclusively on algorithms, even for problems that do have a specific correct answer.

3) Maximizing and Satisfying: To thoroughly consider every possibility in order to find the best one is to *maximize* in making a choice. Maximizing tends to depend on algorithms. To stop at the choice that is good enough is to *satisfy*. This process depends on application of heuristics.

4) Representativeness Heuristic and Base-Rate Information: The *representativeness heuristic* refers to the (usually correct) assumption that items similar to those in a particular category are probably members of it as well. It can lead us astray when faced with the rare or unusual case. When considering whether a case is a member of a certain category, we should consider *base-rate information*. It provides us with the probability that an item, person, or situation would be encountered or might occur. People overlook this information and rely on the representativeness heuristic.

5) The Availability Heuristic: Judging the likelihood of an event based on the vividness of our memories of it. Sometimes this leads to illusory correlations - we believe that two unrelated events are connected.

6) Other Common Errors in Human Cognition: Awareness of flaws in thought can help us improve our ability to engage in *critical thinking*, and evaluate carefully the evidence for or against a conclusion before deciding or taking a position.
a) Overconfidence: People are overconfident in estimating answers to questions, predicting uncertain events, and in their understanding of complex physical processes. We prefer a “long-shot” chance at a valuable outcome over a small but sure gain. The low probability of winning makes the bet more appealing. We are not sensitive to differences between extremely low probabilities.
b) Confirmation Bias: We seek evidence that fits with a given idea or hypothesis, and overlook evidence that does not fit expectations. This general tendency is called confirmation bias. A special case is functional fixedness - persistence in a single approach to a problem.
c) Framing Questions: We tend to choose or answer questions differently, depending on wording of questions or alternatives. For example we avoid taking risks when considering gains, but will accept risks when considering losses.
d) The Sunk Cost Effect: A special case of the framing effect, it’s our tendency to do something because we’ve already invested money, time, or effort and not because we want to do it.

7) Expertise:
   a) Practice Makes (Nearly) Perfect: Expertise mainly develops through extensive experience. It’s probably not completely independent of inborn talents or predispositions however.
   b) Expert Pattern Recognition: An important characteristic of experts is their ability to quickly apprehend the presence of important features or patterns. Expert chess players, for example, are not better at general memory skill, but can more quickly recognize and remember game board patterns.

8) Unconscious Thinking and Problem Solving: Although ultimately reasoning is used to make most decisions, researchers have found unconscious influences on decision-making processes. Research with the Implicit Association Test and other instruments indicates that a short period of distracting, after evidence is presented for two differing choices, usually produces a decision in favor of the one with more positive features. Conscious decisions after a brief period will focus on one aspect that will be defended or explained; unconscious processing produces a satisfactory choice with more advantages.

Module 8.3: Language
1) Only human communication – language - shows the characteristic of productivity, “the ability to find a way to express new ideas.”
   a) We have rules for making and interpreting sentences. Chomsky described these as transformational grammar, a system for converting deep structure (our underlying logic and meaning) into surface structure. When we speak, we transform language’s deep structure into surface structure.
2) Nonhuman Precursors to Language: A number of psychologists have attempted to teach chimpanzees languages and symbol systems. Debate continues as to whether the progress made by animals in learning such systems constitutes language. Of all species bonobos are most accomplished in this realm.
3) Human Specializations for Learning Language:
   a) Language and General Intelligence: These are not inextricably related. People who have Williams syndrome have IQ scores in the mentally retarded range yet
have excellent language skills.

b) Language Learning as a Specialized Capacity: Between birth and 6 years of age we make phenomenal strides in language learning. Children quickly acquire new words and syntactic forms. The process is very similar across languages.

c) Chomsky proposed the existence of a language acquisition device—an innate mechanism for acquiring language. One argument for this is poverty of the stimulus. What children hear can’t provide everything they need to use language; therefore some knowledge must be innate. Most psychologists agree that children are born with a predisposition for language.

d) Language and the Human Brain: Studies of brain-damaged patients have identified two major cortical areas supporting language. Damage to Broca’s area (in the frontal cortex) leads to Broca’s aphasia - inarticulate speech and difficulty using and understanding grammatical devices: prepositions, conjunctions, word endings, complex sentence structures, and so forth. Damage to Wernicke’s area (in the temporal lobe) leads to Wernicke’s aphasia, in which there is difficulty recalling the names of objects and generally impaired language comprehension.

4) Language Development:

a) Language in Early Childhood: There is an orderly series of milestones. The progression is similar in all languages. By age 1, children begin to understand language and can say a word or two. By age 1 ½, most toddlers can use several dozen words. By age 2, toddlers link words together “telegraphically”; by age 3, children generate full sentences. At this age, children overregularize and overgeneralize rules for case and tense. Children in this age range sometimes make up rules for forming negatives. Research and observation suggest that early childhood is the optimal time for language learning.

b) Children Exposed to No Language or Two Languages: Deaf children who do not experience signing still develop their own sign language. Although each deaf child invents a different system, these systems show interesting similarities. Children growing up in bilingual environments learn two languages fluently. Representation of language in the brain is the same in bilingual individuals as it is in those who speak only one language. Bilingualism offers two major advantages: better elaborated communicative and comprehension ability, and greater cognitive flexibility.

5) Understanding Language:

a) Word Comprehension: Letters in a word influence the sound of the other letters; speech sounds are not heard in isolation.

b) Understanding Sentences: Words mean different things, depending on context. The context depends on knowledge of the world and the assumptions you share with the speaker/writer. Although only the immediate context affects what you hear, a delayed one can influence your interpretation of what a sentence means.

c) Limits to Language Understanding: Embedded sentences can be hard to comprehend. We also have trouble interpreting communications that include negatives. Compound (double and triple) negatives are especially difficult.

6) Reading:

a) Word Recognition: Reading experience enhances the ability to recognize words. The word superiority effect - letters are identified more accurately when included
as part of whole words than when presented by themselves. The word context aids recognition of individual letters.

b) Reading and Eye Movements: In an alphabetic language, units include *phonemes*, which make up sounds, and *morphemes*, the smallest bits with meaning. Readers’ eyes move in a non-steady, “jerky” fashion. Readers alternate between *fixations* (stationary eyes) and *saccades*, quick eye movements from one fixation point to another. Reading occurs during fixations; during saccades, a reader is functionally “blind.” Readers of alphabetical languages, reading left to right, generally take in a “window” of roughly 11 characters at a time. When a language is made of characters that convey more information (such as some East Asian languages) or read from right to left (as with some Middle Eastern/Semitic languages) the windows are different.

c) The context of a sentence clarifies ambiguity. Ambiguous words receive longer fixations in reading. Poor readers are less efficient at selecting appropriate meanings of ambiguous words.