Cognition and Language Ch. 8 (Bernstein)

(Connections to sensation, perception, memory, and Bio-psychology)

Humans can reason logically
Solve complex problems
Use language (Animals don't have these capacities)

Frontal Lobe= Reasoning + decision making and impulse control

Language- located left side of brain, processing Weirneky's and Broca's Area production

Cognitive Psychology: = the study of mental processes by which the information humans receive from their environmental is modified, made meaningful, stored, retrieved, used and communicated to others.

Cognitive Neuroscience = study of mental processes and brain activity

Basic questions:
What is thought?
Function of thought?
What are the ingredients of thought? (Components: reasoning, problem solving, decision making…)
How is language acquired and used? (language has similar mental processes to cognition)

Pg. 283 What are the basic functions of thought?

Model: Circle of Thought= 5 core functions of thought:

- Describe- the information or problem
- Elaborate- use existing knowledge to consider issues and actions
- Decide- on a course of action
- Plan- method of steps
- Guide Action- act on plan
- Sensory system continues to process information
    - Our perceptual system describes and elaborates on this information whish is represented in the brain in ways that allow
        - Decisions
        - Formulating plans
        - Guide our actions

We use information processing system:
Similar to a computer
We receive information represent the info with symbols manipulate those symbols

Thinking (defined):

The manipulation of mental representations

Info Processing Model:

1. Information= sensations via receptors (auditory, kinesthetic, visual, olfactory, gustation)
2. Information is perceived and recognized (perceptual processing)
    a. Info is elaborated (connected to stored knowledge (LTM)
3. Decide what to do with info
    a. Store it or take action –(make a plan)
4. Act on the plan

Measuring Information Processing:

How does information processing normally work?
What interferes with it?

Pg. 283 Mental Chronometry: (measuring the timing of mental processes, how fast)

Looks at **reaction time-**
Time between stimulus and response
Found delay in reaction time – is
Due to complexity of decision making

More options to respond the longer the reaction time

Expectancy is also a factor in response time
Faster response to things we expect
Slower response to surprises

Speed and Accuracy trade off
Faster response = more errors

Evoked Brain Potentials:

Use **EEG** to measure brain activity
*key in measuring speed of information processing
Nerve Imaging= PET Scan and FMRI visualizes brain functioning between and during info processing

Frontal Lobes:

Active during decision making and problem solving

Active with New and difficult tasks
When a new task was learned- the hippocampus was very active (memory)

Mental Representations: Ingredients of thought
How do we mentally represent information?

- Concepts
- Propositions
- Schemas
- Scripts
- Mental Models
- Images
- Cognitive Maps

Pg. 285 Concepts:

Categories of objects, events or ideas with **common properties** or **features** that are shared by members of the category

Type of Concepts:

Formal concept: clearly defined by properties members vs. non-members

Natural Concepts

Concepts have no fixed or set defining features- but have typical (prototypical) characteristics
Resembles but not exact
Prototype- a natural concept that possesses all or most characteristic features
A combination of properties
Most thinking uses natural concepts
Can be:

Concrete object categories house-bird
Abstract concepts honesty-justice

Temporary goal oriented concepts
"Stuff for a trip"

Pg. 287 **Propositions (type of concept)**

A mental representation that expresses a **relationship between concepts**
Can be true or false
Reflect- **networks of associations**

Schemas:

- Complex mental representation
- Close associations=Schema: Networks
- They are generalizations we develop about categories of objects, places or events
- Builds on expectations

Mental Models

Are representations of particular situations or arrangements of objects
Mental representations can be 3 dimensional
3 dimensional models

Pg. 290 Images + Cognitive Maps:

We think in mental representations
Can be manipulated- similar to real objects

Cognitive map:

Mental Image of scenes- locations

Pg. 289 Thinking Strategies:

Information processing systems that "Combine, Transform, Elaborate Mental Representations

Allow Reasoning, Problem Solving, and Decision Making

Reasoning is the process through which we generate and evaluate arguments and reach conclusions"

Pg. 290 Formal Reasoning:

Pg. 290 Formal Reasoning: **Deductive Reasoning, Algorithms, Logic**
AKA Deductive Reasoning-

- the process of following a set of rigorous procedures to reach valid or correct conclusions.
- It takes a general rule and applies it to deduce conclusions about specific cases.

Algorithms:

Systematic methods that always produce a correct solution to a problem (if a solution exists)

Pg. 291 Logic:

- A formula for drawing valid conclusions
- "If Then" structure...
- Aristotle
- Drawing conclusions from a set of statements known as premises
- False premises can lead to faulty logic
- We use logic to discover new facts and draw inferences

Confirmation Bias:

A tendency to seek evidence and reach conclusions that are constant with existing beliefs.'

Pg. 292 Informal Reasoning
Inductive Reasoning
Induce a general conclusion to appear on the basis of specific facts or examples

Psychologists use inductive reason --> experiments
Jurors use informal reasoning- inductive reasoning

Heuristic (inductive Reasoning)

- Mental shortcut to reach a conclusion that is probably but not necessarily correct.

Pg 293 Anchoring Heuristic-

- Estimating the probability of an event not starting from scratch but by adjusting an earlier estimate
- Being anchored by earlier/original judgement
- Example-Not able to change much about first impressions

Representative Heuristics

- Rejecting probability
- Making a choice or decision based on belief or representation of a category... Kind of like a ?

Availability Heuristic-

- Judging the likelihood of an event or the correctness of a hypothesis based on how easily the hypothesis or examples of the event come to mind...
- We tend to associate things that are most present in our mind
- Results from biased judgement

Pg. 295 Problem Solving Strategies:

IDEAL Problem Solving:

Best heuristic = have a general thinking strategy
5 steps

1. Identify-
2. Define- problem clearly (Solving by Understanding)
3. Explore- Possible solutions + relevant knowledge
4. Act- try a possible solution or hypothesis
5. Look (at results) and learn- learn from results

Solving by Understanding- (process)

- Deeper comprehension of a problem
- Discover general prosperities of a solution
- General solution identifies the requirements for success
- Proposes a series of Functional (workable) Solutions
  - Then choose the best one

Means Analysis:

- Ask yourself "Where am I in relation to my goal?"
- Identify sub-goal- that progresses toward a goal.
- Successive Sub-goals get closer to the end goal
- Step by step process

Working Backward:

- Start at the end
- To understand what needs to happen in each phase of reaching a goal

Using Analogies:

- Similarities between todays problem and others you have encountered before.

Pg. 298 Obstacles to Problem solving:

1. **Faulty diagnosis of a problem**
2. **Limited hypotheses, not considering enough of the alternatives**
3. **Mental Sets:**
    a. Old patterns of problem solving persist
    b. Restricting perception of the problem or even approaches to solve the problem

Fixations

- Barriers to problem solving
- Becoming blind to alternatives
- Tendency to get hung up on wrong solutions
- Caused by unnecessary restrictions on our thinking

Functional Fixedness:

- A tendency to use familiar objects in familiar rather than creative ways
- Lack of creative thinking
- (incubation alleviates = more time in thought)

Ignoring Negative Evidence:

Confirmation Bias

Creativity Defined:

Creativity: Personality Characteristics of Creative People:

- **Expertise**- in the field of endeavor, tied to what a person has learned
- A set of **Creative Skills**- hard work, persistence, divergent thinking, ability to take risks
- Motivation- internal motivation (seems not external example $)

Creativity Killers:

- Working under surveillance
- Having choices restricted by rules
- Working only for a good evaluation (to avoid a bad one)
- Working to get more money
- Time pressure kills creativity

Chomsky and Language:

all languages share a common universal grammar, and children innately have a mental program to learn it