

### Topic 1: Theories of the Mind - Cognitivism<sup>1</sup>

#### 1) Beginnings of attempts to understand the mind:

- Plato - one of the first early philosophers to consider the nature of human thinking:
  - saw the mind as a block of wax, upon which perceptions and ideas make an impression
  - felt that the most important knowledge comes from concepts such as virtue that people know innately, independently of sense experience.
- Aristotle – said that all learning is determined by association.
- Rationalism – knowledge can be gained just by thinking and reasoning (Descartes and Leibnitz).
- Empiricism – all knowledge is derived from experience; *tabula rasa* (Locke, Hume).
- Kant's philosophy – bridged the gap between empiricism and rationalism.
  - what we know depends on the interaction of who we are along with what we experience
  - knowledge is the product of new information interacting with previous information.
- Experimental psychology – the study of mind remained the province of philosophy until 19th century:
  - Wilhelm Wundt and his students initiated laboratory methods for studying mental operations more systemically (1879)
  - goal was to identify the simplest essential units of mind, like the periodic table did for chemistry.
  - used introspection to determine how the mind works
- Behaviorism – mind as a black box
  - dominated psychology from the '20's to '50's

- virtually denied the existence of mind
- S-R psychology (stimulus-response) was the strict study of behavior – only objective and observable phenomena were 'proper' for study.
- according to J.B. Watson (1913), psychology should restrict itself to examining the relation between observable stimuli and observable responses.
- emphasis shifted to the extreme of operational definitions of behaviors, tied to highly specific operations or observations
- Skinner maintained that all behavior is nothing less than a series of responses to reinforcers (rewards or punishments) in the external environment
  - Learning is regular, expected responses.
  - Instruction is repetition and reinforcement.
  - Practice makes perfect.

#### 2) Downfall of behaviorism:

- 1927: Kohler shows problem-solving often involves "insight"
- 1932: Tolman demonstrates learning without reinforcement
- 1953: computers and communication technology emerge
- 1956: George Miller summarized numerous studies that showed that the capacity of human thinking is limited, with short-term memory, for example, limited to around seven items (this is why it is so hard to remember long phone or social security numbers)
- 1957: Chomsky shows language acquisition is too complex for a simple S-R explanation
- 1962: Piaget shows cognitive development occurs in sudden, qualitative shifts
- Behaviorism, because of its extreme position, was also fated to fall into disfavor, although, there are elements which remain useful.
- By ignoring the inner environment, strict behaviorism lead to its own demise: simple introspection will lead to the inevitable

conclusion that we are thinking, feeling beings without requiring any outside stimulation to set our thoughts and feelings in motion.

### 3) Cognitivism – how it began?

- Several independent, co-occurring events around the early '50's led to the decreased popularity of behaviorism and subsequent rise of cognitive psychology, especially information processing:
- dissatisfaction with and inability of behaviorism to explain higher cognitive functions
- the rise of technology which influenced several young sciences, especially communication engineering and verbal learning
- the young science of computer science - analogy between human mind and computer - limited working memory and theoretically infinite memory storage system
- seen to interact to solve problems, make decisions, recognize and respond to external (environmental) stimuli.
- focused on the mind as a symbol operating system

### 4) Founders of cognitive science:

- George Miller
- John McCarthy
- Marvin Minsky
- Allen Newell
- Herbert Simon
- Noam Chomsky

### 5) Cognitivism – main assumptions:

- Cognitivism focuses on mental processes, which involve how people think, remember, learn, solve problems.
- It influenced education system as its most effective.
- It compares and contrasts with behaviorism mainly focuses on observable behavior.

- Cognition is over linked by contemporary researchers works to the view that people process information as computer do.

### 6) Cognitive science – mind as a computer:

- Mind should be understood in terms of mental representations and procedures operating on those structures.
- CRUM (Computational-Representational Understanding of Mind) – mind has mental representations analogous to data structures, and computational structures similar to algorithms.
- Schematically: Program

Data structures + algorithms = running programs

Mind

Mental representations + computational procedures = thinking

Thinking is a product of a more complicated process.

### 7) Cognitive science – measurable?

- Cognitive science is the sum of the following fields:
- Psychology
- Artificial intelligence
- Linguistics
- Neuroscience
- Anthropology
- Philosophy

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<sup>1</sup> „Mind: Introduction to Cognitive Science“ P. Thagard, 2005, Massachusetts Institute of Technology