

1. Write briefly 3 major contributions of any 3 cognitive science researchers shown in slides 4 & 5.

Ans: Jean Piaget:

Jean Piaget is one of the most influential developmental psychologists, with a number of contributions especially towards theories of education. He believed that children progressed through 4 stages of development: a sensorimotor period (coordination of senses with motions and object permanence), a preoperational period (development of symbolic thought), a concrete operational period (applying mental operations concretely, hierarchical classification), and a formal operational period. His work was used as a tool in the 60s and 70s for the early childhood classroom.

B.F. Skinner

Skinner introduced the concept of Behaviourism. The science assumes behaviour as either a reflex to stimuli in the environment, or as a consequence of learned history (through reinforcement, for example). He referred to it as "radical behaviourism". His book "Verbal behaviour" attempted to extend the theory to human verbal behaviour, but was not received as well.

Noam Chomsky:-

Though primarily a linguist, Noam Chomsky has also made contributions to the field of cognitive science. He proposed that the process of converting ideas to language was a cognitive one, and made immense contribution to the sub-field of Language Acquisition in children, with theories such as the Innateness hypothesis. He was also critical of Skinner's "Verbal Behaviour".

2. Nominate 3 more researchers (in their time) who have NOT been included in slides 4 & 5 (in Lecture 2: History)? Please mention their main contributions justifying why they should be included in this list.

Ans: Kurt Gödel:

Primarily a logician, Gödel deserves to be included in the list due to his famous incompleteness theorem, that can be applied to any Turing-complete computational system (possibly including the brain) which demonstrates, (1) the inherent incompleteness of a

consistent formal system, and (2) the non-provability of axioms within their own system.

Warren McCulloch

McCulloch was an American neurophysiologist who, along with Walter Pitts, developed models of computation inspired by the structure of biological neural networks - now known as artificial neural networks. The models were based on mathematical algorithms called threshold logic.

Cristopher Longuet-Higgins

Cristopher Longuet-Higgins moved from Chemistry to Artificial Intelligence and Cognitive Science. He is the one who coined the term "Cognitive Science" in his commentary on the Lighthill report. He introduced the "essential matrix" to the cognitive science community.

3. What are "situated cognition" and "embodied cognition"? How do these differ from representational and computational views of cognitive science?

Ans. Situated cognition: posits that knowing is inseparable from doing, arguing that all knowledge is situated in activity bound to context. Learning is seen in terms of increasing performance rather than in terms of accumulation of knowledge. It rejects mind-body dualism.

Embodied cognition: posits that many features of cognition (human or otherwise) are shaped by aspects of the entire body of the organism. It emphasizes the formative role played by the environment in the development of cognitive processes.

Representational and computational views of cognitive science propose that thinking is performed by computations operating on mental representations of data, drawing on analogy to algorithms operating on data structures. Unlike situated and embodied cognition, which put emphasis on environment, surrounding context, and doing - "thinking as the fly as a reflex" - they emphasize on clear representations gathered by human cognition and sensory systems.