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COGNITIVE SCIENCE - EPISTEMOLOGICAL CONSTRUCT CONFIGURATION

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Abstract: The development of Cognitive Science configures a strange scenario. In just over 40 years of official existence, it has a huge spread. While always emphasizing its interdisciplinary project, this new Science was always marked by an oscillation between the study of the brain as opposed to the study of the mind. An oscillation generated the corollary of the predominance of a discipline or of a specific perspective in the way it architected its investigation and its proposal of interdisciplinarity. In the first decades of its history, Cognitive Science bet on the analogy between minds and computers, between thought and symbols. The mind would be the brain's software and the bet on the possibility of simulating it through computer programs made Computing occupy a privileged place in this initial scenario. However, it is necessary to elaborate a concept for this discipline.
Keywords: Cognitive Science. epistemological status.

INTRODUCTION

A new discipline with an old history, Cognitive Science is finding new ways to tackle old problems, notably by employing scientific techniques to explore questions about the nature of minds as special types of data, information and knowledge processing systems.

The notion that Cognitive Science and the explanation of human behavior are closely linked has been skillfully expressed by Jerry Fodor, according to which cognitive approaches attempt to relate the intentional properties of mental states to their causal capacities to affect behavior.

Although it may take some time to recognize the significance of this position, it hints at a close link between cognitive epistemology and the explanation of behavior (FETZER, 2000).

The first challenge encountered when considering the perspectives of a science of cognition seems to be to determine whether this activity is indeed necessary. The term Science of Cognition designates a multidisciplinary approach to the study of cognitive processes.

Among the subjects involved in this project are cognitive psychology, neurosciences, linguistics, logic and computer science. It is not difficult, therefore, to conclude that this area is permeated by a diversity of approaches and methods.

It is possible, however, to establish a common point in the midst of all this diversity: the interest in the study of intelligence.

Science, the true cognitive domain, is no exception to this form of constitution, and it is called the criterion of acceptability, which defines and constitutes the science of acceptability.

Furthermore, it defines and constitutes science as a cognitive domain and that simultaneously constitutes as a scientist the person who applies it, of criteria for validating scientific explanations, it is this criterion of acceptability that constitutes science as a cognitive domain (MATURANA, 2001).

The peculiarities of Science as a cognitive domain arise from its form of constitution by applying the criterion of validation of scientific explanations.

Developing simulations of human mental activities is the primary task of cognitive science. In this sense, it is basically a science of the artificial, that is, of the behavior of simulations understood as great mental experiments.

Nothing hampered the development of Sciences more than the hesitation in treating the human as a heuristic object.

Those who wanted to preserve the human being from a scientific approach made the Human Sciences sterile. Initially, Cognitive Science appears as an intermediate alternative between introspectionist tendencies and behaviorism.

DEVELOPMENT

If there is life between inputs and outputs received by an organism, this life can be modeled in the form of a computer program. This was the initial motivation of Cognitive Science, which soon realized that it would have to establish itself as an interdisciplinary science, making use of the resources of Psychology, Linguistics, Computing and Neuroscience.

The beginnings of this new Science were marked by the mystifying discourse about electronic brains and puerile philosophical debates about what computers can and cannot do.

Cognitive science itself had its internal paradigmatic disputes or different schools that proposed to model mental life either through the simulation of the mind or through the simulation of the brain.

In recent years, Cognitive Science increasingly recovers robotics, as the perception grows that the replication of embodied minds, that is, intelligences endowed with a body that acts in a real environment.

If understood as a science of simulation, they have, as a starting point, the construction of computational systems that instantiate the conditions of possibility of some kind of mental life that resembles that of human beings.

In this sense, cognitive science is an a priori investigation, but it is, at the same time, an enormous engineering task that presupposes and establishes the testability of its models, thus approaching the empirical-formal disciplines (TEIXEIRA, 2004).

The great difficulty faced by Cognitive Science is to identify the organizational invariants of what is called mind.

Such Science, still, can be devoted to the construction of androids simulating the human mental life; androids which, while not yet reproducing organizational invariants of the mind, are essentially possible models of mental functioning.

The end of artificial intelligence or the so-called symbolic paradigm requires that Cognitive Science make new heuristic alliances.

On the other hand, if one assesses the development of Cognitive Science in recent decades, with Philosophy, one will possibly arrive at a strange scenario: if, on the one hand, Cognitive Science tried to consolidate itself based on the notion of representation, Philosophy took the opposite route. The latter tried, for its part, to dismantle the notion of representation and avoid mentalism in its conceptions of knowledge.

In fruitful alliance with Philosophy, Cognitive Science demanded to find its foundations and conceptual tools: definitions of knowledge, representation, inference, among others.

Cognitive Science, by ignoring the evolution of Philosophy itself that would serve as the foundation, seems to have fallen into the naive illusion that the consolidation of a discipline as scientific implies a positivist refusal to discuss its philosophical foundations.

The price of this deliberate deafness and the refusal to dissociate itself from assumptions assumed even today in an uncritical way can be so high that Cognitive Science compromises its future as a research program.

The resumption of connectionism and research on neural networks in recent decades constituted a crucial moment for cognitive science to reassess its philosophical partnerships.

Cognitive Science cannot do without one or some notion of representation, but in order to incorporate the results of contemporary philosophical reflection, it would have to go beyond the traditional notion of representation.

Rethinking the status of representation in cognitive science means not only seeking new philosophical partnerships for this discipline, but also rethinking its object and scientific project based on these new alliances.

From the point of view of the epistemological constitution, this new perspective places individuals in an advantageous position: representation can be developed as a cognitive phenomenon.

In line with Teixeira's (2004) magisterium, if Cognitive Science aspires to break with the classical view of representation, it must study not only the representational system of the various organisms, but also the environment where representations develop and condition them.

The main motivation of contemporary Neuroscience lies in the possibility of reducing mental phenomena to a neurological substrate, and thus, in an interdisciplinary way with Cognitive Science and Philosophy, generating a holistic view of the brain.

In the 1970s, the conception of mental functioning prevailed, where it was defined as a sequential set of computations performed on symbolic representations.

Cognitive Science is guided by the combative relationship between its two main paradigms: representationalism, which sees the mind as a manipulator of symbols, and connectionism, which sees the mind as an associate of patterns.

Despite the uncourteous words they both speak about each other, the two schools are not as divergent as their advocates claim, and each has serious problems with precisely the characteristics that supposedly make it attractive over its rival.

Similar to the rich doctrine of Cognitive Science, the growing investigation of Vygotsky's work offers many useful elements (FRAWLEY, 2000). His work is based on mutations and growth, a guiding principle that he openly exposes in thought and language.

Although Vygotsky stresses mutability and development, he never falls into radical relativism or self-defeating nihilism.

This is because he accepts the historical and cultural foundation of development and the classical view that development is teleological – progress towards a better end state. This doubly links development to the world.

Those who aspire to understand how thinking changes throughout life study cognitive development, the investigation of how mental abilities are created and change with increasing physiological maturity.

Cognitive development researchers study the discrepancies and similarities between people of different ages, seeking to discover how and why people think and behave differently at different times in their lives.

Cognitive development involves qualitative mutations in thinking as well as quantitative changes, such as increasing knowledge and ability.

Most cognitive psychologists agree that developmental changes occur as a result of interaction, timing, and learning (STERNBERG, 2000).

However, some of them place much greater emphasis on maturation, which refers to any relatively permanent change in thinking or behavior that occurs simply as a result of maturation, regardless of particular experiences.

Others, however, emphasize the importance of learning, which refers to any relatively permanent change in thinking as a result of experience.

The cognitive development hypothesis generally considered to be more comprehensive lies in Genetic Epistemology, codified mainly by Jean Piaget.

While certain aspects of this doctrine have been questioned and, in some cases, refuted, its influence is immense. In fact, its most relevant contribution consists more in its influence on further research than in its maximum accuracy (STERNBERG, 2000).

Thus, in order to understand intelligence, Piaget reasoned, the investigation must be twofold: observing a person's performance and also considering why that person performed that way, including the types of thinking underlying that person's actions.

Although Piaget used the observational research technique, much of his research was also a logical and philosophical exploration of how knowledge develops, from primitive to sophisticated forms, he believed that development occurs in stages that evolve through equilibration, in which Children seek a balance between what they encounter in their environments and the cognitive structures and processes that lead to that encounter, as well as between their own cognitive capacities.

Equilibration involves three processes. In some situations, the child's way of thinking and existing mental structures are adequate to face and adapt to the challenges of the environment; it is thus in a state of equilibrium.

At other times, however, the child is presented with information that does not fit into their existing schemas, so that cognitive imbalance arises. That is, an imbalance occurs when the child's existing schemas are inadequate for the new challenges he or she faces.

She consequently tries to restore balance by assimilation – incorporation of the new information into the child's existing schemas. Together, the assimilation and accommodation processes result in a more sophisticated level of thinking than was previously possible. In addition, these processes result in the restoration of balance, thereby offering the person superior levels of adaptability.

According to Piaget, the balancing processes of assimilation and accommodation are responsible for all the changes associated with cognitive development. In his view, the imbalance is more likely to occur during transition periods between stages (STERNBERG, 2000).

While Piaget postulated that balancing processes continue throughout childhood, as children continually adapt to their environment, he also considered that development involves distinct, discontinuous stages. In particular, Piaget divided cognitive development into four main stages: the sensorimotor, pre-operational, concrete operational and formal operational stages.

The first stage of development, the sensorimotor stage, involves increases in the number and complexity of sensory and motor skills during childhood.

Throughout the early stages of sensorimotor cognitive development, children's cognition seems to focus only on what they can immediately perceive through their senses. In the preoperative stage, the child begins to actively develop internal mental representations, which began at the end of the sensorimotor stage.

The emergence of representative thinking during the preoperative stage opens the way for the subsequent development of logical thinking during the concrete operations stage. With representative thinking comes verbal communication.

However, communication is largely egocentric. A conversation may seem lacking in coherence. The child says what's on his mind, without much consideration of what the other person has said. As children develop, however, they increasingly consider what others have said when creating their own comments and responses.

In the concrete operations stage, children become capable of mentally manipulating the internal representations they formed during the preoperative period.

In other words, they now not only have ideas and memories of objects, but they can also perform mental operations on those ideas and memories. However, they can do so only with regard to concrete objects.

Finally, the formal operational stage involves mental operations on abstractions and symbols that may not have concrete or physical forms. Furthermore, children begin to understand some things that they themselves have not directly experienced. During the concrete operations stage, they begin to be able to see the perspective of others, if the alternative perspective can be manipulated concretely.

Thus, Piaget contributed immensely to the understanding of cognitive development. Piaget's work had and continues to have a great impact on psychology. His main contribution is that he encourages people to consider children from a new perspective and to ponder the way they think (STERNBERG, 2000).

All the preceding perspectives related to cognitive development are influential. They are not mutually exclusive. Some were pursued simultaneously, some evolved as reactions to others, and some are offshoots of others.

Yet another conception of cognitive development considers the physiological development of the brain and neural apparatus. In the light of Genetic Epistemology, cognitive development is centered on progressively complex adaptations to the environment, based mainly on changes resulting from physiological maturation.

More specifically, cognitive development occurs largely through two balancing processes: assimilation and accommodation (STERNBERG, 2000).

As children develop, they become less self-centered, that is, less focused on themselves and more able to perceive things from the perspective of others.

They are also better able to de-center themselves from a perspectively notable aspect of an object or concept to consider multiple aspects. In general, they seem progressively able to consider information, if not that which is immediately apparent through their senses, initially clearly observable in the range of object permanence, but that which is later apparent in other cognitive developments as well.

FINAL CONSIDERATIONS

Science, ultimately, consists of the domain of scientific explanations and claims that scientists determine through the application of the criterion of validation of scientific explanations.

Thus, scientists deal in science with the explanation and understanding of their human experience, and not with the explanation and understanding of nature or reality as if these were objective domains of existence regardless of what is accomplished.

Therefore, like all epistemic rowing, Cognitive Science is, in itself, transdisciplinary, insofar as the understanding of the cognitive phenomenon demands the contribution offered by different disciplines that, when combined, produce a new scientific status.

Cognitive scientists often broaden and deepen their understanding of their subject through research, employing techniques and methods to evidence the study of how human beings acquire and use knowledge. They also benefit from collaboration with other scientists. Furthermore, they engage in the study of a wide range of phenomena, including not only perception, learning, memory, and thinking, but also apparently less cognitively oriented phenomena such as emotion and motivation.

In fact, almost all topics can be studied from a cognitive perspective. Artificial Intelligence involves the attempt to create systems that process information in an intelligent and effective way, without collimating whether these systems simulate human cognition or demonstrate intelligence, through processes that differ from human cognitive processes.

Finally, it is necessary to study the brain and behavior of human beings to explain mental activity through the construction of cognitive simulations.

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