



The learning schemes: Kant y Piaget. Philosophical-Psychological introduction

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ABSTRACT

Deficiencies in the structuring, development, and functioning of *mental schemes* affect the daily lives of social agents. The main consequence of these failures is reflected in learning problems (in the broad sense), from merely technical problems to errors in logical-mathematical thinking, in social-critical thinking, and in the natural and artificial language skills: oral expression, written expression, reading comprehension and grammar).

Studying human learning schemes shows that *man and reality are dynamic and complex*. Therefore, it can be said that human action and learning are constructed from an individual or collective poly-symbiotic social context that is in the discourse and allows explicitly structured learning schemes from four subschemas of action: *conceptual-factual, linguistic, sociocultural and technical-procedural*, that work in unison, although in different order when they come into contact with practical or theoretical learning situations.

The current origin of schema theory comes with Kant, who, in his conceptual system, develops a theoretical vision on these. Thus, part of the need to understand how it is possible

for an object to be conceptualized by the mind and creates the concept of the original schema as a category that makes possible non-empirical representation, but the intelligent and sensible representation of objects in concepts. This term, doubly homogeneous, implies the category of time, the relations among representations and representations, in other words, is a microsystem that allows the categorization of phenomena as concepts objects of knowledge. The method which follows the understanding of this scheme, it is called *schematism* of the correct understanding

Based on the ideas of Kant and the contributions of a French specialist, Piaget, he places the concept of the schema as a central and evolutionary term, which allows describing the subject's action during a specific learning situation, therefore, to explain the cognitive functioning of the subject. For this reason, it can be observed, throughout the Piagetian work, two fundamental theses to explain the subject-object interaction that uses the concept schema directly related to the action, which allowed him to make it explicit.

1. Introduction

From the dawn of humanity - in the ancient civilizations of the Hittites, Mayans, Egyptians, Aztecs, Inca, Europeans (Greek and Roman), until today - knowledge has been constituted from a powerful instrument: social interaction. This is the primary mediator, in a broad and strict sense, between teaching and learning in *formal and informal situations* of action in which an agent who teaches and another who learns are presented.

Thus, from everyday situations to academic-scientific, nowadays, it is required the efficient development of *people's learning schemes* through a recursive process that requires mental actions such as structuring, restructuring, and fixation. However, not all human beings reach expert schemes for different evolutionary reasons: historical-cultural, social, the uncertainty of human habitats or a mixture of them.

Deficiencies in the structuring, development, and functioning of *mental schemes* affect the daily lives of social agents. The main consequence of these failures is reflected in learning problems (in the broad sense), from merely technical problems to errors in logical-mathematical thinking, in social-critical thinking, and in the natural and artificial language skills: (speaking and listening, writing), and its inappropriate use in the different professional fields: poor performance in social interaction, severe contradictions in problem solving and decision making, flaws in technology management, unsatisfactory results in the field of research and clear evidence of misuse of language skills (oral expression, written expression, reading comprehension and grammar).

Studying human learning schemes shows that *man and reality are dynamic and complex*. Therefore, it is necessary to consider two fundamental aspects of the systemic scaffolding of

the mind that allow them to be analyzed: 1) the psychobiological and social complexity of the human mind is a kind of mediating interface between being (conscious or subconscious) and the polyontexturas of reality which are revealed; 2) taking into account the philosophical foundations of the polyontextural logic can be stated that human action and learning are constructed from an individual or collective polisimbiótico-social context that manifests itself in the discourse and allows explicitly structured learning schemes from four subschemas of action: *conceptual-factual, linguistic, sociocultural and technical-procedural*, that work in unison although in different order when they come in contact with the situations of practical or theoretical learning.

The second aspect, enumerated in the previous paragraph, takes as a reference not only the definition of policontextural¹ but its main contributions on self-referential systems. According to Salatino (2009), the theory of subjectivity is based on these systems that allow observing the possible interaction between volition and cognition:

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- Elimination of ambiguity in the representation of the S / O ratio.
- Identity as the possibility of having various forms of expression.
- The concept of parallelism justifies the contemporary manifestation of the forms of expression of identity.
- A new inductive process that is configured by considering not only the system but the reality outside the system.
- New identities: Subject (S), Object (O) and Subject Objective (OS) as logical values.
- The heterarchy, as opposed to the hierarchy, represents the cyclical causality of the hierarchical processes distributed in different contexts.

1. Günther (1979) in Salatino (2009, pp. 33-34) defined *contexture* "as the domain in which there are two logic rates (logical binary domain). In this one, the classic logical postulates are respected (the principle of identity, the principle of no contradiction, the principle of the excluded third), these rates have the role of true and false (...) it is a domain where *the subject* (S) exists. Which is different from its *objects* (O), this assumes a cognitive process, when two rates are not enough (as the ones available in the mono-contextual domain) to face other real aspects of the habitual phenomenon related to the perception or the behavior or the ones related to the daily language that shows an ostensible and complex gradation".

2. The autoreferential systems in the operatory level have the opportunity to establish a difference between its action and others in their context. In this way, the system is reinforced with the information from its context taking into account the varied dispositions and theory concepts relate it to it. From this situations, the operations of the system appear. However, a continuous state of adaptation is needed to face the complicated information process. Thus, a flexible knowledge facilitates the adaptation of daily situations. Because of that, the external complexity is thereby increasing the internal complexity (Luhmann, 2002). It is also related to autopsies definition that emphasizes the autonomy of human being (Maturana y Varela, 2003).

Therefore, investigating the *human being* system starts from considering it with the reality in which it lives and how it learns from it. Thus, to study *human action schemes* is to orient oneself on and under a line of postulates of the cognitive sciences (cognitive psychology, neuroscience), related to philosophy, anthropology, linguistics, sociology, the theory of culture and learning. It is, therefore, necessary to start from a general and unified philosophical-scientific conception, as a basis for understanding the origin of the ideas that have shaped them since antiquity.

In the following, a series of ideas are presented which allow understanding theoretically what the mental schemes are - from philosophy to genetic psychology - and their application to the study of learning. These form the basis of the theory on the subschemas that make up the learning schemes.

2. Materials and Method

To base a fieldwork, especially the one done in the classroom to explore, observe and characterize the grammar learning schemes of the II year students (course 2015) of the Hispanic Language and Literature of the Faculty of Education and Languages at UNAN-Managua, it was first necessary to carry out a documental investigation. With this, an approach was made to a nucleus of scientists and to the main theories on which the doctoral thesis “Schemes of learning of the grammar” was based.

Consequently, the documentary research was based on methodology. The primary method used was the search and tracking of information, which is called the bibliographic method. Hence, de la Torre and Navarro (1982) express: “The acquisition or obtaining of knowledge, fixation, organization, and expansion of it, as well as its transmission, require special rules, a methodology that needs and educates in thinking and expression, which stimulates and strengthens them. Thus, a method is a logical process, arising from reasoning and induction” (p.3).

It is considered that the acquisition of information occurs directly or indirectly, and the latter procedure is standard in current research practice (Sierra, 1986), the development of the theme: “**Learning by Schemes: a Philosophical-psychological introduction. Human Action Schemes: Kant and Piaget**”, focused his selection focus on those authors whose interest, initially, was to put into perspective a vision about how the human being learns.

Another method used was *thematic analysis*, which served to extract from the texts and articles consulted, those aspects that were explicitly related to the concept of interest: an *action scheme*.

The **conceptualization and definition as strategies that confirm the interpretive method prevailed in the investigation as the method of analysis**. It was focused the central approaches of the two leading theorists that originated the concept scheme as a category of analysis of human knowledge and learning. Kant, from rationalist philosophy and Piaget, from the empirical observation of psychological-genetic cut.

Finally, theoretical analysis and discussion are presented evolutionarily, that is, as a historical-theoretical reconstruction from the field of philosophy to the genetic psychology

3. From Kant to Piaget: Human Action Schemes

Kant in his conceptual system develops an idealized vision on the schemes. In his *Critique of Pure Reason*, there is a brief chapter on the schematics of simple concepts of understanding. Part of the need to understand in what way it is possible for an object to be conceptualized by the mind, if the only way is: “the representation of the first one must be homogeneous to that of the second, in other words, the concept must enclose what is represented in the object. In effect, is expressed that an object is contained under a concept” (Kant, 2010, p.175). However, pure concepts are heterogeneous, therefore, when they are processed by the mind, their categorical representation indicates that they are not equivalent to the object.

Kant seeks a result for this contradiction and postulates the existence, between categorization and phenomena, of a third term that makes non-empirical representation possible, but the intelligent and sensible representation of objects in concepts. To this term, it denominated *transcendental scheme*, which implies the category time that allows the relationship between the formal representations of the various thing. In this way, the category is doubly homogeneous, on the one hand, it is a universal manifestation a priori, and on the other hand, by allowing the relationship between the representations of the diverse, this is a consubstantial part of each representation, and therefore, homogeneous each other. Thus the time, the relations between representations and representations, form the original scheme, which is a microsystem that allows the categorization of phenomena as concepts objects of knowledge:

[...] the only way by which objects are given to us is a modification of our sensibility ... pure concepts a priori, in addition to the function performed by the understanding in the category, must still contain the formal conditions of the sensibility (especially the inner sense) that contains the condition that allows only the category to be applied to no matter what object is. This formal and pure condition of the sensibility, we will call it schema of this concept of the understanding, and to the method that follows the understanding concerning this scheme, the schematism of the pure understanding (Kant, 2010, p 176).

An important aspect pointed out by Kant is that a scheme can have two origins: reality and imagination. This favors the distinction between the image and the scheme. When this

differentiation is possible, the scheme is the representation of a procedure, which encloses in a concept its image. From this, it is understood that, in reality, concepts constituted as mental objects are not based on representational images, but rather schematics:

When I have five points one after the other, [...] I give the number five image. On the other hand, when I only think of a number in general, which may be five or a hundred, this thought is the representation of a method intended to represent a multitude (eg, thousand) in an image, according to a given concept, rather than this image itself, that it would be difficult, in the last case to go through it with the eyes and compare it with the concept (Kant, 2010, p 177).

This principle is in the intellect, is an act hidden in the depths of the human being, whose natural mechanism is difficult to determine. Therefore, it is only the imagination and its empirical power that produces the schema of sensible concepts and figures in space. The scheme, from this conception, is a product, a monogram through which mental images are possible, and only through it are linked to the concept that represents them, though not in an adequate way:

(...) the scheme of a pure concept of understanding is something that cannot be brought to any image, it is pure synthesis, made according to a rule of unity by concepts in general, rule that expresses the category, and is a transcendental product of the imagination which concerns the determination of the internal sense in general, according to the conditions of its form (time) in relation to all representations, whereas these must be linked a priori in a concept, according to the unity of apperception (Kant, 2010, p 178).

Following the logic of presentation, Kant proposes a classification of transcendental schemas by following the order - but not the quantity, that is why the implicit schemas of the transcendental categories (quantity, quality, relation, and modality) and the relationship with them. Thus, the first scheme calls it a *pure scheme of quantity*, because it considers the *number* as a concept that represents the successive addition to the unit (unit schema), that is to say, the synthesis of the manifold (plurality scheme) by intuition made by the totalizing homogeneous intuition (scheme of the totality), which operates in time. In this sense (the schema of reality) corresponds to the sensation in general, with a particular *degree* or quantity, which occupies time, and tends to quantitative reduction (negation scheme) until reaching the *quantum* and *schematization* of this in time (limitation scheme).

Reality tends to persist through time. The *outline of the substance* is the representation of reality as a substratum that remains over time. This mental attribute is what remains as a substrate, while the substance changes, i.e., time as an immutable entity does not transform, but the existence of the substance mutates.

According to Kant, the causality of a thing is what is real, but once it arbitrarily stabilizes, it becomes the effect of another, by a rule of the succession of diversity. This process is called the *schema of cause and the causality*.

Each substance is determined by other qualities by its accidents. Substances coincide in reality and are reciprocal to the accidents is a rule-governed event. This determination that distinguishes or makes them similar occurs by the structuring of the *scheme of the community (reciprocity) or reciprocal causality of the substances* concerning their accidents.

The *schema of possibility* synthesizes the arrangement of time and condition in its different images; i.e., the representation of a thing takes place at one time, and according to where and how the representational synthesis is structured.

Finally, Kant proposes two other schemes: *scheme of reality* as existing in a particular time and the *scheme of the need* for the existence of an object at all times.

All these schemes are for Kant the real conditions facing the concepts a relationship with objects, and therefore, its significance. The categories themselves, just yield to the perceived reality, and may not have any empirical use unless through microsystems that return and make them operational and dynamic for the human being. Also, it is necessary to underline that, these schemes work considering the order of the categories, the time and its rules: the time series, the content of the time, the order of time, all the time with all possible objects, whether they are physical or abstract. These schemes bring up the categories by restricting or expanding them inside and outside the limits of our sense, which is understanding itself; Hence:

The assortment of all possible experience which is inherent in all our knowledge, and is in generally related to one experience that comprises a transcendental truth that precedes all empirical truth and makes it possible (...). The scheme is not but the phenomenon or the sensitive concept of an object, as it matches a category (...) Categories, without the scheme, they are not, therefore, but functions of the understanding concerning to the concepts, but they do not represent any object (Kant, 2010, pp. 180-181).

From the Kantian transcendental scheme, one may realize that the schemes are dynamic microsystems, units of action, which, in turn, are rules of construction of images from the mental sensitivity and determination of time, an intellectual processing. I.e., the scheme is a procedure (method), whose core composes of categories, procedures, and action. That is; they are the product of the experience; therefore, mediators between self and reality.

Below is an extension of the Kantian scheme, based on Duke's schematization (2002). This has considered completing and comparing the *logical* and schematic categories. In doing so, the schemes of unity, plurality, totality, reality, denial, and limitation, implicitly addressed by Kant, become evident. However, they are not considered yet as manifestations of the mind - which Nietzsche (2000) studied as active segments of the body - expressed that in shape there is no other causation than the will itself:

Title	Measurements	Logical Category	Schematic category	Scheme
Quantity	Time series	Unity	Successive addition, synthesis of the diverse, homogeneous totalizing intuition	Number
		plurality whole		
Quality	Time content	Reality	general feeling, quantum schematization	Degree
		Negation Imitation		
Relation	Time order	Inherence/subsistence	substance/accident	Permanence
		Basis/ Consequence	Cause/effect	Succession of the diverse
		Community	Reciprocal action	Simultaneity
		Possibility/ Impossibility	Occurrence of representation	Concurrence of the synthesis with time in general
Modality	Time complexion	Be there/not to be	Effective reality/ non-existence Existence	be-there at a certain time
		Necessity/ contingency		be-there at all times

Taken from Duque (2002, pp. 60-62).

According to Carvalho and Parrat-Dayán (2015), Kant’s ideas - above developed - and the contributions of the psychiatrist Revault d’Allonnes influenced the concept of a scheme proposed by Piaget. Thus, to analyze the Piagetian work, as a central and evolving term, Carvalho and Parrat-Dayán investigated how Piaget used these ideas to explain the action of the subject during a specific learning period. For example, they wonder how Piaget used throughout his studies the concept of the diagram to explain the cognitive functioning of the subject.

Because of the inquiry, two theses arise: (1) to explain the interaction of subject-object, Piaget needed a concept that directly linked to action, and which allowed him to make it explicit. (2) It is possible to recognize elements that indicate the underlying use of the concept in the work of Piaget.

To document both theses, Carvalho and Parrat-Dayán followed the author’s evolutionary phases signaled by Parrat-Dayán (1998): egocentric, functionalist, structuralist and phase of synthesis. In this last phase, Piaget validates and rescues the functional aspects of his theory and concepts as the scheme. He places the scheme at a broader level and in direct coordination with other cognitive structures of the subject and makes it a more related object to study. Below is a summary of the four phases that the scheme concept took in its evolution.

The **Egocentric stage** found in Piaget's first five books (1976/1993; 1923/1924; 2008/1926; 1927; 1932), in which Piaget emphasized the child self-centeredness. However, he barely mentioned the concept in the conclusion of "*Le jugement et le raisonnement chez L'Enfant*" (Piaget, 1993/1924), and refers to the attention schemes proposed by Revaultd' Allones. Though the concept appears in different passages of the text, consider it only as a primary idea, which coexists with other terms that also refer to that psychological function. As a result, the need for a concept that would converge with a child's self-centeredness - without reducing one on the other - to explain the operation of the subject was necessary to identify.

In the **functionalist phase**, Piaget used the concept of the scheme to study the subject functioning based on the study presented in "*La Naissance de l'intelligence chez L'Enfant*" (Piaget, 1977/1936). He considers the schemes as organized processes and bound for specific learning situations. Piaget characterized the formation and functioning process as a tendency to repeat and accumulate knowledge in each developmental stage which favors the subject interaction with the environment. As a consequence, the schemes evolve as differentiations when a type of specialization or coordination occurs, when two schemes are combined, or when one of them assimilates the other. This differentiation results from the subject acting in a specific situation when new objects accommodate and show similar schemes. At this stage, Piaget had explained the concept of a scheme and deepened both in its theoretical sense and how it participates in the subject's cognitive functioning.

During the **structuralist phase**, and in his book "*Le développement of the notion of temps chez L'Enfant*" (Piaget, 1973/1946), Piaget uses the idea of scheme explicitly. Nonetheless, it is a supplement accessory to the concept of structure. Because, when dealing with time notion, it must be related to concepts such as speed.

For this reason, he says, there is an operational time associated with the irregular intervals and the notion of event. Thus, time behaves in a way that is analogous to logical operations, which intimately connect with the idea of speed. For example, this concept of time should be considered a scheme that is forming and differentiating along the individual development. As a result, the idea of a scheme is similar to the notion of structure. This idea happens, because between both concepts there is continuity, and in turn, share several characteristics.

Finally, the **synthesis phase** in Piaget's studies discuss the concepts of possible and necessary (Piaget, 1981 and 1983). Piaget presents and places the concept of a schema as a supportive element of the structure explicitly. Schemes are the structure operational part, which provides the necessary support so that the schemes can assimilate the reality.

Through an operative and schematic system mainly comprised by representative and procedural schemes -they combine to become the essence of the notion of scheme- then the

subject acts accordingly to the situation. Therefore, this system better organizes and adapts to everyday life the circumstances.

Another relevant aspect is that the schemes of the operative system are more flexible and somewhat different for each subject. So, they grant to each an amount of possibilities of actions in every moment. Thus, each subject can face different situations with this system, because their schemes are both qualitative and quantitative differences.

We infer from these studies that the schemes function as a distinctive, but a solidary system. This differentiation turns them into two specific subsystems: the representative schemes focused on to the structure and the procedural schemes toward the integration of the objects. Thus, there is a significant variability in the first, because they stretch learning as a personal trait connected to the action of the subjects, but the latter restricts them.

Piaget, in this phase, clings the concept of scheme oriented to situations, as activators of procedural schemes. That is; these favor operations such as assimilation, compensation, and accommodation, which associate to mechanisms for opening and closing of structures, therefore, related to the possibility and need to forming representative schemes.

4. Conclusions

The theoretical perspective presented to construct the basis to understand what learning schemes are. This concept, which is not new in the conceptual fields of philosophy, psychology, epistemology, among other branches of the human knowledge, has evolved into an influential theoretical originator that proposes, in the field of learning a conceptual system that allows us to analyze this mental function only inherent to humanity.

Therefore, the proposal of four sub-schemes of action: *conceptual-factual, linguistic, socio-cultural and technical-procedural*, becomes an instrument of analysis, conception, generation and evaluation of the learning (in different situations). This proposal which is currently being implemented in real and dynamic learning contexts, promises to be the basis for the development of competencies, therefore, a powerful tool for students and teachers of different levels and fields of language learning and branches of the social sciences.

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