Learning schemes: dimensions that contribute to its formation

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SUMMARY

In order to study human learning schemes, it is important to understand what is meant by reality. These schemes are mental procedures, whose functioning depends on the cultural conception of reality that an individual has in a society, but at the same time is also in contact with other societies. Therefore, space and time are important and essential aspects to be addressed in order to understand them. Finally, the action, a concept loaded with a wide range of possibilities of use in the different fields of knowledge, presents a series of valid theoretical considerations to understand the theory of learning schemes, which are formed from the deliberate action of a subject-agent that apprehends the reality that surrounds it in a specific space-time.

1. INTRODUCTION

From the point of view of learning schemes, the reality in which any human being is born, develops and dies, is shaped by the interaction of four dimensions: reality, space, time and action. Together they make up what is known as culture for some, and for others, the ecological niche of survival.

The learning of each individual or group of individuals is formed by the apprehension of the first dimension -which is so variable with the man himself-, in a space-time that goes

from home to the company where he works. However, to be able to perform competently it is necessary to act according to a series of rules of action that are acquired throughout life.

In the educational field, these dimensions help to train people with certain skills, which will lead them to face professional and daily life from certain social, educational and scientific perspectives. However, the learning process they live is mediated and organized by their learning schemes, which ultimately are those that favor a certain response in situations in which they must act.

2. MATERIALS AND METHOD

This article is part of the theory that supports the doctoral thesis: "Grammar learning schemes". The main method used was the search and tracking of information also called bibliographic method. Hence, De la Torre and Navarro (1982) express: "The acquisition or obtainment of knowledge, the fixation, organization and expansion of it, as well as its transmission require special rules, a methodology that requires and educates in thought and the expression that stimulate and strengthen them. Thus, the method is a logical process arising from reasoning and induction" (p.3).

Considering that the obtaining of information occurs directly or indirectly, and this last procedure is common in current research practice (Sierra, 1986), the development of the theme: **"Learning schemes: dimensions that contribute to their formation"**, centered its selection focus on those theoretical aspects that allowed to insert the learning schemes in four areas that are present in every learning process: reality, space-time and the rules of action that allow human functioning in those niches of coexistence.

Conceptualization and definition predominated in the investigation as strategies that make up the interpretive method. With this, we arrived systematically at the structuring of theoretical approaches, which brought reality and learning closer with the tools that the human being uses to carry it out.

3. FOUR DIMENSIONS THAT CONTRIBUTE TO THE CONFORMATION OF LEARNING SCHEMES.

3.1. Reality and learning

Reality is complex because it is based on the fact that it is incommensurable and the human being cannot grasp it in its entirety. It is diffuse because each person captures fragments of this and generates different action and processing schemes.

Then, reality is related to the concept of perception considered as a construct:

(...) a bio cultural construct [that] depends on the ordering, classification and elaboration of systems of categories with which the stimuli that the subject receives are compared, since they conform the perceptual referents through which the new sensory experiences are identified, transforming them into events recognizable and understandable within the collective conception of reality. (...) This process of formation of perceptual structures is carried out through learning, through the socialization of the individual in the group of which he is a part, in an implicit and symbolic way where the ideological and cultural patterns of society mediate (Vargas, 1994, p. 47-48).

The previous definition considers perception as a mental process that transduces the real world. From there, it relates directly to the concept of action schemes because these function as a filter of physical reality data, which is diverse through a continuous organizational process of learning that has adaptive purposes for each individual and its social group.

The sectioned perception of variable reality refers to a constant unifying process of analysis and synthesis, which updates itself in a space and time determined by the same living organism - the human body. Therefore, reality is diffuse and complex for the human senses because it is changing. But, at the same time, it is tangible because of the production of information -exclusive for every human being since they are born- that is not totalizing, but fragmented and redundant.

As a product of the analysis-synthesis process, human actions are oriented to the knowledge, *prima facie* of reality in a direct relationship with the world and with himself. This is what Laín (19891) states when he expresses that of the radical and previous unity of all the senses:

(...) the impression of reality depends on feeling-to feel the world through my body, to feel myself in my own body-it carries with it essentially (...) the primary impression of reality that in a man produces the relationship with the world and with himself (p.135).

Therefore, the unification of feelings is the primary physical unit through which the human being apprehends reality, using the process of analysis and synthesis for it, which is also embodied in the *logos* as a single structure and a single act of learning.

If reality is captured by the perception and sensations of the body as a system of continuous learning, then:

Only words can distinguish and coordinate impressions, separate and link bodies, psyches, sexes, evaluate their identity and their difference, tracing the plane of their interactions. The reality principle is not the representation of a physical exteriority (...) but the representation of a semantic space in which words take charge of the world, draw forces in it, fix their nuclei, through a game of analysis and synthesis. (Enaudeau, 1998, p.83).

This game recreates reality in space-time. It is like a bridge - understood as a problem of logic that deals with the passage of the sensory world to the physical world - between reality and the inner world of the body in terms of the three fundamental physical entities: space points, instants and material particles according to Russell (1914, cited by Moulines, 1973). However, reality becomes such in the human mind, only if before it is nourished by the senses and reflexively processed by language, which results in intelligence.

Perceiving reality is the product of different schemes of action which operationalize the consciousness of the human being. This is so, because once the process of analysis and synthesis is totalized, reflection takes place on the different situations with which it is confronted in the daily life. In the words of Merleau-Ponty (1993):

> The reflexive analysis replaces the absolute existence of the object with the thought of an absolute object (...) all perception occurs in an atmosphere of generality (...). My perception, even seen from the inside, expresses a given situation, whereas, on the contrary, personal acts create the situation. Undoubtedly, knowledge teaches me that the sensation would not occur without an adaptation of my body (...). By means of sensation I grasp, on the margin of my personal life and of my own actions, a life of given consciousness (own cursive) (pp. 220 and 230-231).

That is to say, the process of learning reality, through a principle of organization, has no other purpose than that of the adaptation of the human being to the dynamic reality in which he lives. Therefore, the action of the sensory components of a perceived entity or object, requires an internal learning effort, a training to achieve the unconscious and automatic process of organizing.

Therefore, learning must be understood (Brust, 2007) in relation to its way of occurrence and its significance as a process that takes place through the mediation and influence of others. Hence, that is considered the product of a process of reconstruction of the knowledge of a culture. For this reason, formal learning (communication and interpersonal contact with both teachers and classmates) favors the enrichment of scientific-technical knowledge, the broadening of perspectives and the personal development of the student.

If this process is real, effective and functional for students' lives, it can be said that learning is significant or relevant, because it goes beyond memorization, it forces understanding, application, synthesis and evaluation of what is apprehended in real situations. In other words, learning must have a sense of usefulness, consolidating processes of appropriation in practice, that is, the student learns to learn, learns to do and learns to be.

Salas, Silva, Santos and Parra (2004), following Entwistle (1988), consider learning by the way students do different tasks. Each person has their way of learning, a schematic system to appropriate knowledge in relation to a context or situation, therefore:

> The *learning approach* is a way of approaching a content of learning, which responds to a particular *intention* of the subject and assumes a *relational* character between the subject and the context in which it develops. The learning approach therefore depends on the previous learning experiences of the subject as well as on the perceptions of the characteristics of the current context. Hence, (...) the term "learning approach" would also mean certain *predispositions* to adopt particular processes (p.5).

Therefore, it is necessary to think about an apprenticeship of reality from the native reality in which one is born, develops, lives and dies. This space of knowledge is impregnated by the psychobiological-socio-cultural system that crosses it, which is concretized in the learning schemes of that reality that is not only present, but also a potential future. In this sense, reality is seen as a reason to build knowledge as subjects responsible of themselves and of others. This approach is reinforced by Zemelman (2011) when he states:

> A sense of reality means thinking about the present from a desire for the future that cannot be written in any program, from projects of society that are not in any program, nor can any technique solve it to me, unless there is a subject that allows me to reason through the techniques to answer the problem and from which project I am building my most analytical knowledge. It supposes a subject *capable of recovering his subjectivity*, capable of valuing himself as a person (p.22).

3.2. Space-time and learning

By expressing that the human being inhabits a space, he also refers unequivocally to what he does in time as well. These magnitudes pressure the organism to make a continuous learning of reality. Therefore, it is a temporary object which occurs because of the attention given to the phenomena that need to be learned. That is to say, a decursive, experiential process that takes place in succession and intentionally over time, so that they have a beginning and a point-source that are always expanding (Husserl, 2002).

The individual acquires knowledge in a subjective time and space (Damasio, 2010)[1]. That is, it processes the experience of the stimulus present in an immediate past and towards a space outside the mind. This does not happen in real space-time, but rather a certain interval is necessary for the lived experience to be assimilated by the individual, which has consequences for learning.

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1. Learning is a fact of printing it in the neuronal brain systems, not a metaphysical concept. The processing is a real and radical filter, which hiperformalizes body and consequently hyper automates, when trading reality into signals and gives them back with a plus of adaptive responds made by intellection.

Time can be considered as a necessary tool to appropriate the surrounding reality. Therefore, we must think of the linguistic synthesis of knowledge that relates the dynamic positions and periods between two or more factual processes in which the individual is involved or perceived. In this sense, time regulates socially the functions of the human being in each situation he lives and learns. To do this, it creates and operationalizes two types of temporal concepts: those that indicate the sequence of known transformations, but are not assimilated by the schemes as part of those changes (before, during, after) and those that introduce the basis of conceptual formation of those processes experienced (yesterday, now, tomorrow) (Elías, 1989).

Thus, the teaching-learning process must consider this double conceptual articulation that is within the learning schemes of each student and the group of students that they inhabit-they learn in a certain classroom. In it, learning is individual and plural, therefore, time as a synthesis of knowledge is managed in different ways and rhythms. However, following Wilber (2005) the space-time that surrounds the subject is a continuum and not a division. This is so because their perception is organized in a linear and enveloping way, but it fragments the reality in events to be able to understand it. That is to say, it captures both the space and its objects (people, things, situations, among others) as well as the time to turn them into learning and store them in memory.

Memory stores information in the form of data and representational symbols, which are organized into action schemes that carry: particular present data, immediate memories, certain results of introspection and their fundamental logical notions. The first three are sensorial data immediate to the senses, including psychological and logical relationships: temporal, mutually exclusive, in between events (simultaneous and prior) and those of similarity and dissimilarity, which are real functions whose values are taken from the present reality.

The storage of information occurs by the action of individuals in space-time, for this reason, what is saved are events whose duration covers the full time of perception, (Moulines, 1973). If the above is related to what happens in a classroom, each individual and collective perception simultaneously captures one and multiple events according to each situation in that space. Therefore, the perception of each event of the teaching-learning process is not the same for each subject.

The previous ideas project two aspects in relation to space-time considered as learning synthesis. On the one hand, the psychic time, and, on the other hand, the sociocultural determinants that affect it. Salatino (2009) calls the first one a qualitative time, which occurs by the functioning of the brain and its electrical properties: oscillation, coherence, rhythmicity and resonance.

According to Salatino (2009), it has been found that several classes of neurons have a cyclic intrinsic electrical activity, that is, nonlinear dynamic patterns that have different temporal behaviors and favor neuronal adaptation to the multiple functional demands. Each action potential is evidence of the *oscillation and rhythmicity* of some neurons, which can influence others to form neuronal groupings that also oscillate in phase *coherently and simultaneously*.

In other words, neuronal and interneuronal groupings communicate through an intrinsic oscillator, which favors functional synchronization through *resonance* in different parts of the system. Gray and Singer (1989) and Gray et. al (1989) state that it correlates with oscillatory activity at 40 Hz between related cortical columns, in the same time and direction. This property is not continuous, but varies according to the situations that occur in the outside world, which suggests the occurrence of learning.

When performing cognitive tasks (elaboration and use of strategies necessary for life), a coherent neuronal activity is produced, sufficiently intense that reflects the resonant properties of the thalamus-cortical[2] system detectable on the surface of the skin of the skull (Llinás et. al, 1991, Pedroarena and Llinás, 1998; Whittington et al, 1995; Molotchnickoff and Shumikhina, 1996; Llinás, 1990, Steriade and Amzica, 1996, in Llinás 2002).

This resonance or oscillations is attributed to the representation of the perceived world. This is only possible, by the unification of sensory information in a single state of cognition, temporarily coherent (Llinás 2002). These coincidences, in the electrical brain oscillations, form the unified basis of their intrinsic temporal action, therefore they are the substratum of mental acts -schemes of learning- formed by the simultaneous cooperation of several regions of the central nervous system, functionally different, topographically distributed and embodied in a body (Varela, 2000).

The action of the subjects changes or repeats again if successful, so it is improved. To do this, he performs different cognitive functions: he reasons, plans, rationalizes, learns, memorizes, creates, analyzes and communicates (Dispenza, 2010). But he does it considering the experience in which he finds himself, in a real space-time determined by different socio-cultural aspects.

The social and cultural determinants condition the action of the individuals in the different contexts of action. Levine (2006) in his transcultural investigations, considers that the temporal rhythm can be different, according to the individual, the time, the place, and what he does. Divide the time of each person's experience into five categories: urgency of time, the speed they perceive at their place of study or work, the speed outside of this, level of activity they

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2. The thalamus (midbrain subsystem) works as the station, which splices all sensory information (excluding smelling) stored in different areas of brain. Cortex (neo cortex) is the core conscious perception and it is in charge of learning, remembering, creativity, invention, and conscious behavior (Dispenza, 2010).

want for their lives and the preferred time for their surrounding environment. However, this is relative, because what can be fast in one moment may not be fast in another.

Levine suggests five influences of the psychological time and eight lessons on what should be taught and learned about it according to society or culture:

No.	Influences of the psychological time	Lessons to be taught about the time
1.	The pleasant: successful experiences are judged shorter than those of failure.	1. Learn to interpret schedules in relation to punctuality.
2.	Degree of urgency: the more urgent, the slower the time passes.	2. Understand the line that separates working time, study time and social time.
3.	The amount of activity: a single task, the absorbing, exciting task, the one that demands mental effort, or several at the same time.	3. Study the rules of the game of waiting. 4. Learn to reinterpret the "doing-nothing". 5. Find out the acceptable sequence of events and procedures.
4.	Variety: the greater variety of activities, the faster time elapses	6. Analyze whether people or institutions are guided by clock time or by time of events.
5.	Timeless tasks: the type of tasks and the skills required affect the perception of duration.	7. Perform practices or simulations on time management. 8. Criticize only what is understood in a given temporal culture.

Source: created from Levine (2006, pp. 229-239)

The previous observations are interesting to understand the space-time-learning relationship, especially in the classroom where the formal standardization of knowledge is sought, in the synthesis psychological time - sociocultural time that do not always coincide. In this sense, the student must consider himself a being in transformation in different dimensions (intellectual, personal, social, corporal, spiritual), whose knowledge of the world constantly changes in a process of stabilization that does not end, because the density of human time is not homogeneous and offers different possibilities of knowledge (Echeverría, 2008 a, b).

3.3. The norms of action and learning

The action contains all the movements or patterns of movements with which the consciousness of the individual's own activity is correlated (Warren (1982). When those

movements occur as a function of the change or progressive transformation of the subject, the action is connected with a change of social status (Pratt, 1997), that is, learning.

On the other hand, it manifests itself objectively among other functions in language. For that reason, it can be identified with factual linguistic action, that is, with the actual use of it in concrete situations in which the agent thinks or verbalizes his actions (Lewandowski, 1992). Therefore, the agent as the observer synthesizes and analyzes the performance in the discourse: "The action is, therefore, the transforming and dynamic element that allows to pass logically and temporarily from one situation to another. It is the logical-temporal illation of different situations" (Pavis, 1996, p.5). In this sense, language is a vital and relevant symbol, it carries the actions -conduct- of the subject and its social group, therefore, it must appropriately express the situations it represents (Parson, Bales and Shils, 1953).

The action, from the perspectives expressed, emphasizes the interrelation of three aspects: each subject structures and executes it from their own perceptions, the latter transform the schemes developed in their brain and are conventional. The individual is immediately responsible for the changes he suffers due to the different and changing local situations in which he is immersed. That is why it is the individual or group cognitive structure that: "(…) determines the possible modes of action of the perceiver and how it can be shaped by environmental events" (Varela, 1996, p.19).

Hahn (1985) states that actions are not carried out in an abstract and isolated way, even though they are individual. That is to say, the society and culture offer a variety of alternatives of orientation, or modes of action among which the individual has to choose before the options are closed. These modes of action are related to those that Ferrater (1998) calls standards of the cultural level, these are not actions in themselves, but rules[3] created and adopted conventionally or not by individuals who act and interact with each other. In addition, he considers that when a human being acts, he performs a task in which several levels of reality intervene: physical, organic, social, cultural, spiritual, and others; and meets five criteria:

- When a task is executed: acting is synonymous with executing it.

- A task can be executed in more than one way.

- The tasks are carried out according to a set of rules, norms or instructions.

- The actions of a task can break or contravene a set of rules, norms or instructions, or part of them.

- Rules, norms or instructions can be changed by others, which may also be contravened.

3. Ferrater considers rules, regulations, duties and instructions as synonyms, a task that is studied in this theoretical discussion.

These criteria make clear the conventional character of human actions since they are interactions associated by the effects of the coexistence and communication among people. Therefore, interactions can occur in two ways: as part of a series of actions or integrated into a set of actions circumscribed by a real and historical situation that determines them. The tasks covered by one or several situations can be of different levels of importance: insignificant, more or less important, decisive, routine and others, exceptional. As a whole, rules of action and interaction and situations occur against the backdrop of society and culture, responding to the following premises: they are the result of activities carried out by the human being, they belong to the practical productions, and they are patterns that guide the action that requires knowledge to function.

Finally, Ferrater (1998) considers that practical productions are governed by technical standards (guidelines and instructions) and social standards (courtesy and treatment). These rules are interrelated and do not have a clear application frontier. This is so, because in a society the action requires as much of some as of others to function properly.

Considering the previous ideas and transferring them to the field of learning, a considerable number of realization models of the teaching-learning process have been created. Out of these and without going into details, the didactic principle of learning by action is extracted. Picardo, Escobar and Balmore (2005) consider that this didactic-methodological principle favors the identification of needs, interests and problems related to the contents and the possibility of tackling them through a logical process of work and autonomous learning that allows to:

- Learn about the need or problem and define the objective to be achieved.

- Prepare a work plan as intellectual anticipation of the execution.

- Decide a procedure determining the sequence of the tasks to be performed, the instances of work, the sharing with others.

- Determine the tools and materials you will use.

- Define and control their own activity, using quality criteria.

- Execute the tasks, paying attention to the divergences between the control measures, what is planned and the characteristics of the product that is being achieved.

- Analyze and evaluate the work process, identifying the mistakes made and devising how to avoid them in the future.

Human action is built on the laws of repetition and association that work together in the brain to create memories, that is to say, learning. One of the most plausible models to
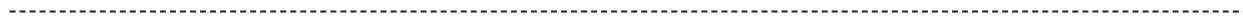
understand how it happens is the one proposed by Hebb (1989)[4] in Dispenza (2008), which explains the transformations that occur in the brain when repetition actions are carried out:

> [...] when two neurons connected in a synaptic junction repeatedly trigger at the same time in several occasions (both in the learning of new knowledge and through experience), the cells and synapses that exist between them change chemically, so that when it is activated, it serves as a powerful stimulus so that the others are also activated. The neurons that at first remained inactive become companions and, in the future, they will activate together much more easily (p.294).

The learning of Hebb is the best evidence that the accomplishment of tasks is mediated not only by human action, but by the whole composed by the experience, the context and the information processing that occurs in the neural network -interface between the real world and the subject-agent. Metaphorically, it is a processor that gives coherence to life from learning, seen as past action, updated in the present and ready to continue learning (Lakoff and Johnson, 2004).

From the communicative action, learning, in terms of Habermas (1999), is mediated by the Piagetian mechanisms of adaptation and accommodation that operate according to two modes of action related, without contradiction, to Hebbian learning:

> If the interaction between subject and object modifies both, it is a fortiori evident that all interaction between individual subjects modifies each other. Every social relation is, therefore, a totality in itself that creates new properties by transforming the individual into his mental structure (pp. 102-103).

Each one of the aspects -about learning- mentioned can be interpreted as rules, parts of a process, a prescription or rule to be followed, which validates the statements about the action exposed. In addition, they can be considered as components of higher mental tools (skills) that prepare and dispose for the action of learning in society (Wertch, 1993, Varela, 1996, Schneuwly and Bronckart, 2008), useful not only for classroom tasks, but for different contexts of life.

4. CONCLUSIONS

The process of apprehending, in a broad sense, involves everything that surrounds the man. Thus, in the school -it does not matter the level- it is imperative to bring subjects (teachers and students) closer to the real development of their capacities for life, in a world that is contributing rapidly to create structural changes in technology, science, in social relationships, ways of knowing, thinking and speaking. Hence, the mental schemes seen from a real learning

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4. "From a neurophysiologic perspective, the rule presented by Hebb would be a temporal-variant rule, with a high interactive mechanism that increases the synaptic efficacy as a function of the pre and post synaptic activity (...) it is a type of unsupervised learning (...) in which the connections between two neurons increases if both activate at the same time" (Serrano, Soria y Martín, 2009-2010, p. 9).

condition favor the understanding of how this phenomenon occurs in individuals who are part of a social reality that is individual, but also plural.

On the other hand, the rhythms of learning and the planning of teaching must consider the space-time correlate in their individual, group and socio-cultural reality (the latter brings with it the burden of family, fraternal and community culture), as generating processes of continuous stabilization in students, given that the heterogeneous density of human time offers different possibilities of knowledge.

Finally, the learning and its rules of action respond to a prescription or rule to be followed, which validates the expositions on the action exposed. In addition, they can be considered components of higher mental tools (skills) that prepare and dispose for the action of learning in society (Wertch, 1993, Varela, 1996, Schneuwly and Bronckart, 2008), useful not only for classroom tasks , but for different contexts of life.

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