Revista Ibero-Americana Multidisciplinary Scientific Journal of Knowledge.
ISSN: 2675-9128. São Paulo-SP.

Year V, v.1 2025. | submission: 25/07/2025 | accepted: 27/07/2025 | publication: 29/07/2025

The Role of Social Interaction in Scientific Learning: A Reading Vygotskian

Thinking the construction of scientific knowledge from the historical-cultural perspective

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SUMMARY

The article aimed to reflect on the construction of scientific knowledge based on historical-cultural perspective focusing, in particular, on the concept of epistemic practices for teaching and learning science in the school context. They were
Some of Vygotsky's main assumptions regarding the sociocultural origins of higher psychological functions, the process of mediation, language and thought, meaning, and sense are presented, as it is understood that these can contribute to the construction of scientific knowledge through the development of epistemic practices. It was noted that epistemic practices, from a historical-cultural perspective, can be considered a social practice constituted through interactions and dialogues established between students. Vygotsky's studies, in addition to allowing for many other interpretations of the relationship between teaching and learning, due to the extreme breadth of his thought, contribute to elucidating how certain sociocultural practices manifest themselves in contexts of school interaction. It is hoped that the reflections presented in this article will contribute to students' process of constructing scientific knowledge.

Keywords: Scientific Knowledge. Historical-cultural. Epistemic practices.

ABSTRACT

the paper aimed to consider the construction of scientific knowledge from the historical-cultural perspective, focusing particularly on the concept of epistemic practices for teaching and learning science in the school context. Some of Vygotski's main ideas
were presented regarding the sociocultural origin of higher psychological functions, the process of mediation, language and thought, meaning and sense, insofar as it is understood that they can collaborate for the construction of scientific knowledge, through the development of epistemic practices. It is known that epistemic practices, from a historical-cultural perspective, could be considered as a social practice established by the interactions and the dialogues between students. The Vygotsky's
studies allow many other interpretations about the relationship between teaching and learning, due to the extreme breadth of his thinking. However, it is expected that the reflections made in this paper could contribute to the process of scientific knowledge construction for students.

Keywords: Scientific knowledge. Historical-cultural. Epistemic practices.

Introduction

The objective of this article is to discuss the contributions of the Historical-Vygotsky's Cultural1 (1896-1934) to the process of knowledge construction scientific, based on the emphasis that some researchers (KELLY, DUSCHL, 2002; CACHAPUZ *et al,* 2004; WICKMAN, 2002; SILVA, 2015; SASSERON, DUSCHL, 2016; KELLY, LICONA, 2018) have been attributing the role of social interaction to the teaching and learning of science in the school context, based on the foundations Vygotskians. Regarding this aspect, Silva (2015, p.71) says that:

> [...] social interaction, according to the Vygotskian tradition, assumes a relevant role in research within this line, since it constitutes a central aspect in the appropriation of semiotic social resource systems and the socially significant ways of using them, which constitute the culture of any community [...].

In this sense, according to Vygotsky (1994), it is in the foundations of historical and dialectical materialism that the epistemological foundations are found necessary to address the relationships between man/nature, individual/society. In which refers to the relationship between man and nature, Vygotsky found in the propositions of Engels, the key element for understanding human history and for the development of higher psychological functions. For Engels, nature does not affect man in a unidirectional way, but man also acts on nature and creates new natural conditions for its existence, because by transforming it (nature) transforms itself.

According to the author, it is through work, through the use of instruments, that man, by transforming nature, transforms himself. This is where the historicity. Thus, human time is both social and individual history. In development of society, work is the mediating element between man and nature, which is of fundamental importance to understanding the phenomenon psychic, insofar as historical-social changes produce changes in the behavior and consciousness.

[1] In this article, the spelling *Vygotski* was chosen to refer to the author, whose name appears spelled in various ways in the literature consulted, maintaining the original spelling in the case of references and citations.

Vygotsky (2012, p.26) tells us that “the instruments that man uses to mastering their environment and their own behavior have not fully emerged developed”, but “were invented and perfected throughout the social history of man”, a process in which language plays an essential role in organization and development of thought, bringing “with it the concepts generalized, which are the source of human knowledge.”

To explain the origin of higher psychological functions Vygotsky (1994) expands this concept of mediation of human activity, work, through the use of instruments, to the use of signs. Culturally produced and internalized signs by the individual would exercise a mediating function between the lower and higher psychological functions2 of individual development and between these and society.

The author's analysis of the development of the human psyche begins the assumption that it is realized in the interrelation of biological phenomena and psychological, through a process of dialectical synthesis, in order to establish a link between the simplest and most complex forms of human behavior or between the elementary or lower psychological functions and higher psychological functions, the which do not arise directly from the lower ones, that is, the lower level does not end when the new emerges, but is overcome by it, it is dialectically negated by the new, becoming exist in the new, which is not configured as juxtaposition, but as an interaction that gives rise to something new.

The psychological phenomenon only occurs through mediations, “which means to say that man builds his forms of action, carries out his activities with the use of social tools of thought, that is, with the use of signs” (CONSTANTINO, et. al., 2014, p.49). Considering that psychological functions superior are indirect operations, which need a mediating sign, it is from the mediation that the encounter with the sign takes place, without which there is no contact with the culture, because it only constitutes a sign if it makes sense to others and if it is shared.

By understanding that the development of the human psyche results from a process of social construction in its dialectical relationship with the cultural and the historical,

[2] The lower psychological functions are essentially biological in nature and consist of reflexive, involuntary and autonomous actions of the individual in his relations with the outside world, while the psychological functions refer to more complex mental operations, such as attention, language, thought, memory, planning, etc. that require the mediation of signs for contact with the culture.

RCMOS – Multidisciplinary Scientific Journal of Knowledge.
ISSN: 2675-9128. São Paulo-SP.

Vygotsky highlights the relevance of the mediation process, through which all the cultural development. In this way, the learning process goes through necessarily through the mediation of another, who may be an adult, a partner or more experienced companion, a teacher or educator. This means that the learning plays an important role in the formation of psychological functions superiors, which involves interfering in what Vygotsky (1994, p. 97) called the Zone Proximal Development (ZPD), which is defined as:

> [...] the distance between the level of actual development, which is usually determined through independent problem-solving, and the level of potential development, determined through problem-solving under adult guidance or in collaboration with more capable peers [...].

In other words, Vygotsky points out the need for the teacher to identify not only the student's actual level of development, what he already knows how to do independent and autonomous, but also the level of proximal development, that that he can accomplish with your help, that is, act as a mediator in the process of student learning, according to their level of potential development.

It can be stated, in this way, the relevance of social interaction for the process of formation of higher psychological functions, which as Rego indicates (1995, p.39) represents a:

> [...] typically human mode of psychological functioning, such as the capacity for planning, voluntary memory, imagination, etc. [...] these processes are not innate. They originate in relationships between human individuals and develop through the process of internalizing cultural forms of behavior [...].

It is necessary to consider here Vygotsky's formulations regarding the process of internalization. It is noted that instruments and signs perform mediating functions in human activity. While work is the mediating element between man and control of nature, signs act as mediators of psychological activity. What The difference between them lies in the fact that the signs are oriented internally (subjective field) and the instruments are externally oriented by the activity of the work (objective field). Thus, as Oliveira (2003, p. 34) explains, in the the individual's development process occurs:

> [...] two fundamental qualitative changes in the use of signs. On the one hand, the use of external marks will be transformed into internal processes of mediation; this mechanism is called, by Vygotsky, the **process of internalization.3** On the other hand, symbolic systems are developed, which organize signs into complex and articulated structures [...].

As the author further explains, during the process of development, the individual no longer needs external marks and begins to use **internal signs4,** which are configured as mental operations that replace objects of the real world, which will allow you to establish mental relationships, such as planning, compare, remember, in the absence of the objects themselves. Thus:

> [...] These possibilities of mental operation do not constitute a direct relationship with the physically present real world; the relationship is mediated by the internalized signs that represent the elements of the world, freeing man from the need for concrete interaction with the objects of his thought [...] (p.35).

The process of internalizing cultural forms of behavior does not carried out passively, but rather through a process of transformation and synthesis dialectic, as we have already pointed out. Throughout his development, the individual inserts himself in certain groups that already have culturally established meanings. In this case, external social activities and interpersonal functions become internal intrapsychic activities, mediated by internalized signs.

The elements that mediate the relations between the individual and society, the instruments and signs, imbued with cultural meaning, indicate that “the systems symbolic, and particularly language, play a fundamental role in communication between individuals and in establishing shared meanings that allow interpretations of real-world objects, events, and situations” (OLIVEIRA, 2003, p. 40).

In Vygotsky's studies on the relationship between thought and language, the the question of the meaning of words assumes a prominent place in his writings theorists. For the author, the meaning of the word reflects in the simplest way the unity of thought and language, that is, “it is an indecomposable unity of both processes and we cannot say that it is a phenomenon of language or a

[3] Author's emphasis

[4] Author's emphasis

phenomenon of thought” (VYGOTSKY, 2009, p. 398). Meaning is then a trace indispensable constituent of the word, insofar as a word without meaning it is not a word, it is an empty sound.

Therefore, it can be considered as a phenomenon of discourse, and at the same time time, an act of thought, because, from a psychological point of view, the meaning of word is nothing but a generalization or concept. If the meaning of the word is, at at the same time, a phenomenon of discourse and intellectual, this does not mean its affiliation purely external to two different fields of psychic life. That is:

> [...] The meaning of the word is only a phenomenon of thought insofar as thought is related to the word and materialized in it, and vice versa: it is a phenomenon of discourse only insofar as discourse is linked to thought and focused by its light. It is a phenomenon of discursive thought or of the conscious word, it is the *unity* of the word with thought
> [...] (VYGOTSKY, 2009, p. 398).

The meaning of the word changes both during the process of development of the individual and in different modes of functioning of thought. “It is more a dynamic formation than a static one” (VYGOTSKY, 2009, p. 408).
As the author emphasizes, the main finding of his experimental studies shows that operating with the meaning of words as a unit of discursive thought, indicates the real possibility of the concrete study of discursive development, which means that the meanings of words develop.

For Aguiar and Ozela (2013. 304):

> [...] Meanings are, therefore, historical and social productions. They are what enable communication, the socialization of our experiences. Although they are more stable and "dictionaryized," they also transform in historical movement, a moment in which their inner nature changes, consequently altering their relationship with thought, understood as a process [...].

This idea that the meanings of words transform over time relations of the individual with the physical and social world, takes us to another aspect of question of meaning formulated by Vygotsky (2009, p.465), which refers to the sense of the word, which is configured as much broader than the meaning, since:

[5] Author's emphasis

> [...] the meaning of a word is the sum of all the psychological facts it awakens in our consciousness. Thus, meaning is always a dynamic, fluid, complex formation, with several zones of varying stability. Meaning is just one of these zones of meaning that the word acquires in the context of discourse and, moreover, a more stable, uniform, and precise zone [...].

It is understood, then, that if meaning is one of these zones of senses that the word acquires in the context of some discourse, they (the senses) can change in different contexts, on the other hand, the meaning "is a still and unchanging point which remains stable in all changes of meaning of the word" (VYGOTSKY, 2009, p.465). However, the real meaning of a word, as the author highlights, is inconstant, or that is, in a given situation it appears with one meaning, in another, it acquires another (sense).

Aguiar, Soares and Machado (2015) comment that meanings contain more than that appear and constitute the starting point for us to reach the zones of meaning. It is therefore concluded, according to the authors, that it is possible to carry out the analysis and apprehension of the dialectical movement of the process of signification, through the discourse of the subjects, going from the appearance (meaning) and description of the facts to their essence (meaning), that is, to seek an explanation of its historical-constitutional process. social, indicating that:

> [...] the meaning of the word represents the objective, social dimension of reality, which, although more stable, also changes throughout the historical movement of society, while the meaning concerns a subjective, personal dimension of reality, being the expression of the subject [...] (AGUIAR, SOARES, MACHADO, 2015, p. 61).

In short, it is understood that it is in relations with society that man finds himself appropriates socially produced meanings, which are transformed into movement historical, modifying its inner nature, at which point its connection with the thought also changes, as they acquire a personal meaning when internalized by the individual.

Kelly and Duschl (2002, p. 2) reflect on how issues related to construction, justification and legitimization of knowledge can be analyzed in the school context, suggesting that this construction (of knowledge) must consider the social and cultural perspective and, mainly, the role of language (social basis of knowledge). In this sense, the authors introduce the concept of epistemic practices to refer to the specific paths that certain groups use to construct certain knowledge, indicating that these practices (cultural forms,

already established social and scientific practices of a given scientific community), when internalized, they will be able to produce knowledge.

To justify the discursive patterns of certain specific groups, Reveles, Kelly and Durán (2007, p.467) took as a basis the work developed by Kozulin (2003), a scholar of Vygotskian theory, who proposed changing the orientation individualistic approach to learning for sociocultural orientation. In this way, these authors indicated that the principle of mediation (human and symbolic) is a tool fundamental to understanding learning. To this end, they examined the tools psychological (symbolic mediation) and then analyzed the internalization and appropriation of these tools by students, identifying how knowledge was mediated by the teacher (human mediation). These researchers concluded that, as these psychological tools are internalized and become part of one's own students' individual way of doing science, also become part of the way collective way of thinking and doing science within the classroom, since the meanings can be shared by members of certain groups.

Based on this assumption, the construction of knowledge can be considered as a social practice that is constituted through interactions and dialogues between students. Kelly and Licona (2018) explain that meanings are constructed discursively in moment of interaction and “such social processes can become routinized and standardized over time, becoming epistemic practices” (p.140). The researchers also claim that a certain group justifies its knowledge through epistemic practices, which are understood as a set of actions standardized based on common intentions and expectations of individuals who share cultural values and tools.

Considering these explanations, it is assumed that Vygotsky's (2009) propositions regarding the meaning/sense dialectic can contribute to understanding how a a given group constructs knowledge through epistemic practices. In other words, the main finding of the researcher's studies helps us understand that operating with meanings, as units of discursive thought, indicates the possibility real concrete study of discursive development, since they are constructed in moments of social interaction. Furthermore, it is important to remember that the process of construction of scientific knowledge goes through the mediation of the other, presupposed foundation of Vygotsky's theory, according to which all development takes place cultural.

Based on Vygotsky's (2009) ideas on how sociocultural practices manifest themselves in contexts of school interaction, in which language "acts decisively in the structure of thought and is a basic tool for the constitution of knowledge", we found that in an article published in 1997, Kelly and Green agree with Vygotsky, when they elucidate that discursive patterns (taken by them as signs), which manifest themselves in contexts of school interaction and which are resulting from the social practices of that specific group, can be considered as social mediators to produce or construct scientific knowledge. Furthermore, when members of a given community (scientists, students, etc.) interact over time to share and produce specific knowledge, "they create through social interaction particular ways of speaking, thinking, acting and interacting" (KELLY *et al,* 1998, p. 24).

In the words of Knorr-Cetina (1999, p. 321), learning science is a cultural process "therefore, conditioned and conditioning the contexts in which it is develops and is directly related to interpersonal relationships belonging to this". Therefore, the discursive processes (oral and written) mediated by the teacher, or a more experienced companion, in the school environment, play a role fundamental to identify how the construction of knowledge is carried out in the moment of interaction.

It is understood that, according to Knorr-Cetina, this is the concept of Zone of Proximal Development (ZPD), formulated by Vygotsky. Also Kelly and his collaborators (2001, p. 137), suggest that to analyze scientific learning in school environment it is necessary to examine what knowledge students already have (level of proximal development) and how these are shared at the time of interaction. According to the authors, this analysis can be carried out using texts, theoretical references, experiments related to the discipline in question, among others cultural elements.

Likewise, Kelly (1999, p. 885, *apud* BAZERMAN, 1988, p. 307), from a Vygotskian perspective, highlights that, at the moment of interaction, the student becomes socialized into the "semiotic-behavioral-perceptual" system of a given community by using internal signs, which represent a important role in the organization of this system.

Regarding this aspect, Oliveira (2003), also supported by Vygotsky, makes us It is clear that in the process of individual development two changes occur

qualitative changes in the use of signs. Thus, “on the one hand, the use of external marks will transform into internal mediation processes, a mechanism called internalization process” and “on the other hand, symbolic systems are developed, that organize signs into complex and articulated structures.” (p.34).

As Oliveira continues, during the development process, the individual no longer needs external marks and begins to use internal signs, the which are configured as mental operations that replace real world objects, the that will allow you to establish mental relationships, such as planning, to compare, to remember, in the absence of the objects themselves. Such mental operations do not relate directly to the real world, but are mediated by signs internalized, freeing the individual from the need for concrete interaction with others objects of your thought.

It is considered that the studies carried out by Vygotsky allow for many other readings about the relationship between teaching and learning, due to the wide range of your thoughts. However, we hope that the considerations made in this article can contribute to the knowledge construction process.

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