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LANGUAGE IN THE NATURAL SCIENCES[i]

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Abstract:
Language is an important tool for acquiring knowledge, and its development depends on the social environment, particularly on parents and teachers. The main purpose of this paper is to systematically analyze language in the context of natural sciences. Natural sciences emerged from human practical activity and, as they evolved, were systematically organized into a field of cognitive activity. Natural Sciences are a method and knowledge. They are the way in which we explore the natural world to reveal the what, how, why, when, and where of things. The following teaching models are mainly used for teaching Natural Sciences: the traditional model, the discovery model, and the constructive teaching model. The constructive approach to teaching has an advantage over other approaches because it combines understanding of physical concepts with the development of skills in scientific processes and, at the same, the acquisition of a scientific mindset by students.

Keywords: Natural Sciences, language, teaching models

Περίληψη:
Η γλώσσα είναι ένα σπουδαίο εργαλείο για την απόκτηση της γνώσης και η ανάπτυξή της εξαρτάται από το κοινωνικό περιβάλλον και ειδικότερα από τους γονείς και από τους δασκάλους. Ο κύριος σκοπός της εργασίας είναι να γίνει συστηματική ανάλυση της γλώσσας στην έννοια των Φυσικών Επιστημών. Οι Φυσικές Επιστήμες αναδύθηκαν από την ανθρώπινη πρακτική δραστηριότητα και στην εξέλιξή τους οργανώθηκαν συστηματικά σε πεδίο γνωστικής δραστηριότητας. Οι Φυσικές Επιστήμες, είναι μέθοδος και γνώση. Είναι ο τρόπος με τον οποίο εξερευνούμε το φυσικό κόσμο για να αποκαλύψουμε το τι, πώς, γιατί, πότε, και πού των πραγμάτων. Για τη διδασκαλία των Φυσικών Επιστημών χρησιμοποιούνται κυρίως τα εξής μοντέλα διδασκαλίας: το παραδοσιακό μοντέλο, το μοντέλο της ανακαλυπτικής και της εποικοδομητικής διδασκαλίας. Η εποικοδομητική προσέγγιση της διδασκαλίας πλεονεκτεί έναντι των άλλων προσεγγίσεων, διότι

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συνδυάζει την κατανόηση των φυσικών εννοιών με την ανάπτυξη δεξιοτήτων στις επιστημονικές διαδικασίες και παράλληλα την απόκτηση επιστημονικής νοοτροπίας από τους μαθητές.

Λέξεις-κλειδιά: Φυσικές Επιστήμες, γλώσσα, μοντέλα διδασκαλίας

1. Introduction

Language is an important tool for acquiring knowledge, and its development depends on the social environment, particularly parents and teachers. However, other factors, such as the influence of the media, peers, books, etc., also affect children's language development. Research conducted in many parts of the world has shown that, regardless of the socio-economic environment in which they grew up, when students come to school, they have formed their own personal views on the explanation of natural phenomena. These personal views, which we could call pre-existing ideas or alternative ideas or misconceptions of students, play an important role in learning. Learning outcomes depend on the environment, prior knowledge, attitudes, and values of the student.

The main purpose of this work is to conduct a systematic analysis of language in the context of natural sciences. Natural sciences emerged from human practical activity and, as they evolved, were systematically organized into a field of cognitive activity. Solving practical problems required the creation and use of concepts of quality and quantity through combinations of linguistically expressed concepts and relationships, measuring and design instruments, measurement and calculation techniques, drawings, diagrams, and images, and even gestures. Knowledge of the natural sciences is not only knowledge of concepts, methods, and conclusions, but also the ability to create meanings through the combination of verbally expressed concepts, visual representations, and manual-technical actions (Lemke, 2004).

2. Natural Sciences

2.1 The concept of Natural Sciences

Natural sciences are a method and knowledge. They are the way in which we explore the natural world to reveal the what, how, why, when, and where of things (Kokotas, 1998). In order to explore the natural world, scientists use various scientific procedures, such as observing, recording, testing, comparing, hypothesising, predicting, researching, drawing conclusions, etc. Scientists are characterised by their determination and persistence in their efforts, reaching conclusions after systematic research.

2.2 The objectives of Natural Sciences

The objectives of natural sciences are also included in the objectives of education. The main reasons why natural sciences are taught in education are as follows:

a) Students need to understand the world in which they live and have a better understanding of the world around them. This allows them to see a subject from a broader, more satisfying perspective and to recognize many scientific ideas that are socially useful.
b) They should acquire the scientific mindset and methodology used by scientists so that they become capable of discovering and learning on their own.
c) To realize that knowledge is the product of collaborative effort built in the classroom through dialogue and discussion.

3. Teaching models in Natural Sciences

The following teaching models are mainly used for teaching natural sciences:

1) The traditional model
2) The discovery learning model and
3) The constructivist learning model (Kokotas, 1998).

3.1 The traditional model

This model was used in the teaching of natural sciences until the early 1960s and is still used in many countries today. According to this model, the child's mind is considered a "blank slate" on which the teacher can write anything. In this way, the teacher's knowledge is transmitted to the child. A variation of this model is that the student, while coming to class with certain opinions about a specific concept, under the influence of teaching, discards their ideas and adopts the scientific approach offered by the teacher. Another variation is one that accepts that the student has ideas and comes to school with formed opinions about physical concepts.

These views can be modified through teaching. Then, when the student's own ideas and the teacher's science coexist in the student's mind, the student becomes confused. The traditional behaviorist view of learning has dominated for more than half a century. The reasons why some teachers, while aware of the existence of students' ideas, do not use them are:

a) they consider representations to be a parasitic phenomenon, in which the student expresses whatever comes to mind,
b) representations are often complex,
c) they are numerous and therefore difficult to take into account in practice,
d) a student's misconceptions may cause confusion among their classmates.

Most educators support the view that the teacher "teaches" the lesson, thus conveying the idea, and the students store it in their minds. Sometimes, teaching may include several experiments so that students have specific examples of the phenomena. Barnes (1976) argues that even when teachers ask questions, their aim is to check whether students have actually acquired the knowledge they have imparted.

It is considered that learning takes place when knowledge is accumulated through practical exercise. In fact, research has shown that most of the time, students apply rules or memorize facts. The discrepancy between what the student thinks and what the

teacher believes the student thinks stems from the teacher's lack of awareness of the student's pre-existing ideas or from the teacher's rejection of the student's pre-existing ideas. Thus, underestimating the importance of the student's ideas leads to their rejection by the teacher.

To conclude the reference to the traditional model, it is worth mentioning the reasons why many teachers adopt the traditional teaching model: a) the class is quiet and usually pays attention, b) it is believed that "a lot of work" is done during the lesson, c) the curriculum is covered to a satisfactory degree, d) students demonstrate their knowledge in written exams. This model allows the teacher to maintain their role as the expert and be in control of the class, monitoring everything that happens (Kokotas, 1998).

3.2 The discovery learning model

Discovery learning is based on the assumption that if children are given the necessary tools and asked open-ended questions, they will be guided in the right direction and will be able to discover knowledge. However, the assumption that by carefully observing and searching for regularities, students would discover the laws of nature does not seem to have worked effectively. Thus, while discovery learning seemed to influence all traditional teaching methods, the disregard of students' ideas and their non-didactic use did not allow for its stable establishment in the teaching of natural sciences.

The prevailing new perception is that both scientists and students are called upon to view the world through a new lens, and in this sense, there is a good parallel between scientists and students. Both are active in constructing new ways of interpreting the world in which they live. This shift is best achieved through the use of the discovery or inquiry-based teaching method. According to this model, concepts are defined and classified, ideas are differentiated, positions are clarified, relevant material is gathered, the position (version) supported is evaluated using this material, a logical conclusion is formulated, the truth is generalized, and the logical consequences of the positions are explored (Petroulakis, 1981).

The teacher presents the problem in the form of a spring. The purpose of teaching is to clarify the problem and suggest various hypotheses about it. The general role of the teacher is to create conditions in which a problem can be developed: to have materials and resources available to students to explore the topic and to encourage students with questions to point out additional topics, formulate hypotheses, and then clarify, explore, and resolve conflicting ideas and positions.

According to Massialas, the activities of the teacher during teaching are (Massialas): the teacher as planner, presenter, guide of disciplined research, educator, and evaluator. Students practice logical and scientific processing of answers, confirmation, and the use of knowledge. They are encouraged to form their own opinions through free discussion and exchange of views. At the same time, they practice methods and techniques related to the subject of science. These methods and techniques belong to procedural knowledge, i.e., knowledge that defines the "how" of things (Salvaras, 1996).

This activates the internal functions and processes that take place during learning, such as attention, selective perception, internal repetition, semantic coding, reaction

organization, feedback, and executive control processes. With these, the student "learns how to learn." With the discovery or inquiry-based teaching method, students climb the steps of the learning hierarchy, achieving understanding, as well as discrimination and generalization. At the same time, the development of these cognitive processes is pursued by activating analytical and critical thinking.

In short, when we refer to the discovery or inquiry-based teaching method, we mean teaching at the level of "simple abstraction" (relationships between things) that aims to discover knowledge, using comparison, the organization of relationships through grouping, arrangement and coupling, analysis of the parts of a whole, verification of relationships, verification of versions, and explanation (causal or teleological). The essence of the method can be defined as a way of organizing students' creative activity to solve problems that are new to them.

3.3 The model of constructive teaching

The key difference that distinguishes constructivism from other teaching approaches is the fact that it uses and exploits students' ideas for teaching purposes. With the constructivist approach, learning in the natural sciences becomes a natural and logical process. It combines understanding of natural concepts with the development of skills in scientific processes and, at the same time, the acquisition of a scientific mindset by students.

Students' ideas are often so deeply rooted that they do not change with teaching. However, after teaching, it is possible for students to use more specialized and accurate vocabulary. It is important to enable students to solve problems. Students' ideas influence the process of acquiring new knowledge because they act as a host structure. They resist the changes we want to bring about through teaching, and if we ignore them, they remain unchanged. Driver and Oldham (1985) propose a model of a constructive approach to learning and teaching that includes the following phases:

a) orientation,
b) highlighting students' ideas,
c) restructuring ideas,
d) applying new ideas,
e) review.

The constructive approach to teaching has advantages over other approaches in the following respects:

a) It combines scientific methodology with our knowledge of how knowledge and understanding develop.
b) Learning becomes a natural and logical process directly linked to scientific processes.
c) Children quickly acquire the relevant skills so that they can carry out their own initiatives.
d) There is a significant improvement in children's attitude towards the subject,
e) Children with social or behavioural problems improve significantly with the constructive approach and become better as they do not depend on their teacher.

The teacher gives them the opportunity to take the initiative and at the same time use the instruments and devices they need, and

f) Frequent dialogue between children and the teacher creates a sense of security in children and develops their self-esteem, combined with the fact that the teacher shows a genuine interest in what his students think and takes their opinions seriously (Oldershaw & Ritchie, 1993).

However, the constructive approach also has some weaknesses, which can be summarized as follows:

a) Teaching a subject requires more time than with the traditional approach, which leads to a reduction in the amount of material taught,
b) It requires students and teachers to have experience in conducting discussions and to be aware of the need for group work.
c) Many teachers today are unfamiliar with the theoretical framework of this approach and, in fact, have no experience in applying it.
d) There is no supporting material for this method, i.e., detailed programs, textbooks, visual aids, etc. (Kokotas, 1998).

4. Children's ideas and characteristics

In recent years, there has been particular interest in how students who have been educated in the field of natural sciences understand scientific concepts. Both in the context of Cognitive Psychology and Science Education, systematic research shows that students' prior ideas about physical phenomena play a dominant role in learning. Even at a very young age, children have ideas about things, so their minds are not a "blank slate" that can accept teaching in a neutral way. Many people, such as Ausubel, Piaget, and Wallon, have incorporated this concept as an integral part of their theories (Driver, Gufsne & Tiberghien, 1993).

Specifically, as a result of his research, Piaget emphasizes the process and logical structures of thinking in order to describe and interpret children's mental acts. However, a second direction, equally important to the first, explores the content of children's ideas and provides an insight into how young people construct new knowledge. This direction is known as "constructivism." This term translates the English term "constructivism" into Greek and covers a set of theories and methods that share the common element of accepting the fact that knowledge cannot be passively accepted but is actively constructed by its bearer.

Students' perceptions of the natural world are based on how they interpret everyday experiences and construct interpretive models that are described in various terms with slightly different meanings. Some terms, such as "intuitive idea" or "intuition," indicate the origin of ideas, while others, such as "frames" or "children's models," emphasize the organization of ideas and their interrelationships. Finally, the terms "alternative framework" and "alternative conception" emphasize the difference between children's ideas and accepted scientific theory. This pluralism of terms reflects the

multidimensional nature and variability of children's ideas (Driver, Gufsne & Tiberghien, 1993).

Although children's ideas are personal, i.e. they relate to their personal approach to phenomena, there are certain general patterns in the types of ideas that children of different ages tend to use. Completely independent research projects conducted in various parts of the world with children whose experiences differ significantly from the teaching of natural sciences report similar patterns of ideas. For example, studies conducted in countries on children's perceptions of dynamics and heat show that their early experiences of phenomena dominate the way they think. Research shows that teachers should take into account general trends in children's thinking when designing teaching activities and improving communication in the classroom.

However, it is often found that even after teaching, students do not change their ideas, despite the teacher's efforts to use counterexamples (Matsaggouras, 1995). This can be explained as follows: when students are not aware of the elements of their perceptions, from which they derive their predictions about situations, they may not be able to see the fact as contradictory. But even if a conceptual conflict is generated in a student, this alone does not produce an alternative schema. Thus, although some children can apply scientific ideas to exam problems, they fail to apply them outside of school to interpret some phenomena (Driver, Gufsne & Tiberghien, 1993).

When we refer to children's ideas, we do not consider them to be mere misconceptions due to misinformation, but rather as creations of mechanisms through which they perceive what is happening around them. Ideas develop as children strive to explain the world they live in based on their experiences (Vosniadou, 1992). The language used by adults plays an important role in shaping ideas. Expressions such as "close the door so the heat doesn't escape" or "so the cold doesn't come in" lead children to misconceptions. Similar misconceptions can be formed by the media, as well as by inadequate teacher-student communication.

Research conducted by experts such as Driver shows that students' ideas, regardless of their origin, share certain characteristics, which can be distinguished as follows (Driver, Gufsne, & Tiberghien, 1993):

a) Thinking dominated by sensory perception. When faced with a problem, students tend to base their thinking on immediately observable characteristics. Thus, the earth is a flat surface with the sky above it, while light is considered to exist only when it is so intense that it causes noticeable effects. Through the process of natural sciences, we seek to guide students in constructing mental models for entities that are not immediately perceptible, such as light, heat, and temperature, etc. This is a complex process that requires significant effort on the part of the student, as well as considerable time.
b) Limited focus. Children focus their attention on certain prominent features of a given situation. They tend not to think about the problem in terms of the interaction between the elements of a system. For example, to explain how a syringe works, many students attributed the movement of the liquid to the power

of suction rather than to the difference in pressure inside and outside the syringe (Driver, Gufsne & Tiberghien, 1993).

c) Focusing more on changes than on stable situations. Students focus on transient situations in a system much more than on situations of equilibrium. Thus, they recognize the existence of force when there is movement, while there is much less hope of this happening in systems of static equilibrium (Kokotas, 1998).
d) Linear causal reasoning. Students believe that every change needs an explanation. They always link an effect to a cause, without, however, being able to understand the interaction of bodies.
e) Non-separation of concepts. Children cannot distinguish between basic concepts, resulting in their use of "umbrella" concepts such as "weight" and "electricity." They jump from one concept to another without realizing it, which is evidenced by the fact that their ideas are more global than those of scientists.
f) Εξάρτηση από το πλαίσιο. Οι μαθητές έχουν την τάση να εξηγούν τα φαινόμενα με όρους απόλυτων ιδιοτήτων ή ποιοτήτων που αποδίδονται σε αντικείμενα, παρά με όρους αλληλεπίδρασης μεταξύ των στοιχείων ενός συστήματος. Για παράδειγμα, πολλά παιδιά πιστεύουν πως ένα δοχείο αλουμινίου είναι κατάλληλο για να διατηρήσει το νερό ζεστό, εξαιτίας της ιδιότητας που έχει το αλουμίνιο να είναι καλός αγωγός της θερμότητας (Driver, Gufsne & Tiberghien, 1993).
g) Εγωκεντρική και ανθρωποκεντρική άποψη. Αν και μέχρι την ηλικία των δέκα χρόνων τα παιδιά έχουν μια εγωκεντρική αντίληψη για τον κόσμο, στη συνέχεια υιοθετούν έναν ανθρωποκεντρισμό. Ερμηνεύουν δηλαδή, τα γεγονότα με βάση την ανθρώπινη εμπειρία. Έτσι, αν ρωτήσουμε ένα παιδί ποια είναι η διαφορά ανάμεσα στο παγωμένο νερό και το νερό θερμοκρασίας περιβάλλοντος, απαντούν, ότι το πρώτο δεν πίνεται εύκολα.
h) Attributing human or animal characteristics to objects. Many students attribute human characteristics, such as will and feelings, to objects. This may be due to the extensive use of metaphors even in the teaching of natural sciences, which often leads to misunderstandings.
i) Attributing a certain amount of physical entity to objects. Many students attribute a certain amount of physical entity to an object. For example, children believe that cold has a physical entity (Kokotas, 1998).

5. Language and Natural Sciences

In a classroom, teachers use the full range of available and appropriate means of communication for each situation. They talk to the students, use body movements, gestures, and facial expressions to present or explain concepts and information, write words, symbols, graphs, and drawings on the blackboard, refer to specific pages of the textbook open in front of the students, and ask the students to take notes in their notebooks, who must combine all of these simultaneously or sequentially. Therefore, learning in a school environment requires the ability to synthesise a multitude of different

means of expression and to 'translate' data from one mode of expression to another. The synthesis and translation of semiotic modes lead to the creation of meaning (Wells, 2000). Language is a great tool for acquiring knowledge and is the starting point for individual thought. It is the most important means of communication and is the starting point for individual thought. Language evolves gradually. In the first stage, it is limited to naming objects; in the second stage, it progresses to syntactic relationships and connects sentences with conjunctions; in the third stage, the subject has the ability to handle multiple parameters simultaneously, while the fourth stage involves the use of mathematics, which broadens the individual's horizons.

Language development depends on the social environment and, in particular, on parents and teachers. It is difficult and perhaps impossible for a child to develop a concept that they do not encounter in their cultural or social environment. Of course, children do not simply imitate what they hear, but analyze the linguistic message and derive their own rules. At first, their sentences are simple, but gradually they form more complex sentences.

Traditionalists, such as Aristotle and Piaget, argue that thought precedes and is a prerequisite for language development. Specifically, Piaget said that children go from the sensory stage to the pre-conceptual stage and from there to the stage of concrete reasoning and abstract thinking. At each of these stages, their thinking has certain characteristic properties; for example, in the pre-conceptual stage, they do not distinguish that when objects are transformed, some of their properties remain unchanged. In Piaget's theory, the way of thinking changes first and then language changes.

Sapir and Whorf express the opposite view, arguing that language precedes thought and that the type of thoughts a person can have depends on the language they speak.

However, research conducted to prove that the language of the working class in England or of black people in the US reduces their ability to think has not been verified.

5.1 The language of students

According to Bernstein (1983), there are two forms of linguistic communication: restricted language code and elaborated language code. In their early years of schooling, students use a restricted language code that is adequate for communication in the family environment but inadequate and inappropriate for understanding complex concepts. If the teacher and school textbooks use the elaborated communication code while students operate with the restricted code, then there is a problem of comprehension for the student.

The effort to expand education must take into account all the difficulties that students encounter in learning concepts. Usually, teachers underestimate the difficulties that students encounter in understanding newly introduced terms. The main principle is to give children words that are meaningful and related to their experiences. On the contrary, words that are introduced before experience are likely to be forgotten immediately or used inappropriately. As children grow older, they need more words to distinguish phenomena and describe objects more accurately.

Children, of course, like to use technical terms even if they do not understand them. The imprecise, limited or over-extended use of a word in the Natural Sciences is a common thing for children. The teacher should think about when to introduce new terms. If their introduction can be postponed until later without limiting the student's scientific information, this would be a good solution. However, it is necessary that the student has experience with the ideas represented by the new term and can express their meaning in his own words.

5.2 Language and misunderstandings

Because people interpret the meaning of words in different contexts, communication problems arise. There are many words that have an everyday and a scientific meaning, such as "power", "energy", "solution", etc. We say, e.g. for the word energy: This was done with my own actions, or this was a correct action. However, in science, the word is used for transformations, conservation or the production of work.

Another source of misunderstanding is the economy in the written or spoken language that makes the teacher's work very difficult. For example, we say "fish swim, birds fly". The child may conclude that bats are birds or that penguins are fish. The teacher avoids emphasizing exceptions for fear that they will reduce the importance he should give to general principles. However, exceptions must be mentioned so that students understand that laws are approximate laws and that Natural Sciences, as a human creation, provide an imperfect representation of the natural world. An example: while children know from their experience that birds fly, the school must emphasize to them, "that almost all birds fly". Therefore, the short speech, which is appropriate for other cognitive areas, functions as a source of misunderstanding in the teaching of Natural Sciences.

Finally, another source of misunderstandings is verbs, aggressive and adverbial determiners, as well as conjunctions. The fact that verbs are fewer than nouns makes them less precise compared to the latter, and therefore, the communication of meanings with verbs becomes more difficult. Students usually do not understand the meaning of determiners, e.g. “most”, “generally”, “often”, “many”, “usually”. From conjunctions, children understand the meaning of “and” very early, before they even go to school, but conjunctions – so, therefore, because, therefore – are rarely used by students. However, if they do not understand conjunctions, they construct a meaning different from the one the teacher wanted to convey to them.

From the above, it becomes clear that the teacher is obliged to insist on the students' understanding of the words, because only in this way will they understand the concepts and phenomena. The research conducted to prove the effect of language simplification on learning showed that students improve their performance when they use a simplified language and that this effect is even greater in children who come from a disadvantaged socio-economic environment.

5.3 The use of language in science and teaching

In science, language contributes to the creation of ideas, to the thinking of scientists, as well as to the circulation of scientific ideas among members of the scientific community. In teaching, language is used to recreate ideas in the thinking of students. However, in both areas, language is used to explore or declare something. We thus distinguish between interpretive and declarative or formal language.

In the words that express the concepts of Natural Sciences, we distinguish a main or central meaning and one or more secondary or peripheral meanings. The student, when using in addition to the main and secondary meanings, is helped to make the new words his own. However, if we remove these secondary elements from Natural Sciences, they become a cold text, incomprehensible, impersonal and unfriendly for students.

5.4 The language of the image

Language in the Natural Sciences can be distinguished into physical, symbolic and figurative. Physical language includes elements that make up written or spoken language, symbolic language includes chemical symbols, symbols of quantities, etc., and figurative language includes photographs, e.g. photographs of planets, cells, etc. By using all three forms in the teaching of Natural Sciences, the student is helped to compose a representation that is as complete as possible of that which is required of him.

Ωστόσο, όσο κι αν βελτιώνουμε τα κείμενα και τις εικόνες στα βιβλία, το μυαλό των μαθητών θα επηρεάζεται από παράγοντες όπως: α) Η αρχική τους αναπαράσταση (αρχική γνώση). β) Ο γλωσσικός κώδικας που κατέχουν. γ) Ο γλωσσικός κώδικας που θα χρησιμοποιηθεί στην τάξη. Όσον αφορά τη χρήση εικόνων στο βιβλίο ή άλλων που χρησιμοποιούνται ως οπτικά βοηθήματα, ο εκπαιδευτικός πρέπει να βοηθήσει τα παιδιά μέσω της περιγραφής να κατανοήσουν την εικόνα, να καταστήσει σαφές από τη διδασκαλία ότι πρόκειται για μοντέλα και όχι για τις ίδιες τις οντότητες, και να βοηθήσει τους μαθητές να μην συγχέουν τα σύμβολα της αναπαράστασης και της αναπαράστασης με την αναπαραστατούμενη πραγματικότητα (Κόκκοτας, 1998).

6. Conclusions

The teaching of Natural Sciences in school must integrate as an integral element not only speech and writing, but also the range of expressive elements and visual technologies. This presupposes different approaches to learning from the prevailing ones and different epistemological views of Natural Sciences. The approach to the phenomenon of learning must be free from the dominance of cognitive logic, which, considering concepts as mental objects and their understanding as a purely mental process, reduces their learning to a purely individual psychological function, ignoring its social and cultural characteristics. A different approach based on the socio-cultural theories of Vygotsky (Vygotsky, 1977) or Bruner (Bruner, 1977) for human learning focuses on the processes of giving meaning to the world through participation in specific forms of individual and social activities.

All of the above, of course, implies a different role from the established one of the teacher, who introduces his students to the means and methods of scientific meanings. The adoption of different goals of teaching Natural Sciences in school, different from the prevailing approaches to learning and different epistemological views of Natural Sciences, under the present circumstances, is unfeasible. However, it can be claimed.

In learning and teaching conditions, the creation of meanings in the Natural Sciences cannot be understood only through the use of language in the form of written texts or even oral speech. Language is not independent of the social practices of its use, of writing and speech, of the socio-cultural contexts within which the meanings of writing and speech are determined, of the para-linguistic acts that accompany writing (graphic characters) and speech (facial expressions, gestures, body movements), which modify the meaning of a word or a linguistic expression. Therefore, material and social reality, both at an individual and collective level, is not given meaning only and exclusively by language.

Conflict of Interest Statement
The author declares no conflicts of interest.

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