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# The obscured structure of the number in preschool education (pre-symbolic stage). Prime part

# La estructura oscurecida del número en la educación preescolar (etapa pre-simbólica). Primera parte

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**Abstract**

The article highlights certain aspects of the obscured structure of the number, which occur irregularly in the teaching of numeracy in Preschool Education. Its absence, as an effect, leads to the child's misunderstanding of the concept of number. In the pre-symbolic stage, the number is taught through the word. Structural particularities are found in the semantics and phonetics of the number word and are substantial in the processes of speech and listening. The objectives are to make known the obscured structure of the number and its elements and to analyze the nature of the name of the number. It is justified that the basis of the word "ONE" are the first sound manifestations of the infant. It states that there is the same and equal relationship between the acquisition of knowledge of language and speech with the acquisition of knowledge of number through the development of tonal auditory balance. Methodology: the theoretical analysis of the structural parts (semantics and phonosemantics) of the number and the identification of reciprocal correlation between the constructions of the knowledge of spoken numeral word in Preschool Education through the implemented technology. Contribution: the development of the method for learning the concept of number.

**Number, Darkened structure, Word**

**Resumen**

El artículo destaca ciertos aspectos de la estructura oscurecida del número, que se presentan irregularmente en la enseñanza de aritmética en Educación Preescolar. Su ausencia, como efecto, conduce a la incomprensión del concepto de número por parte del niño. En la etapa pre-simbólica el número se enseña a través de la palabra. Las particularidades estructurales se encuentran en la semántica y fonética de la palabra del número y son sustanciales en los procesos del habla y la escucha. Los objetivos son: dar a conocer la estructura oscurecida del número y sus elementos y analizar la naturaleza del nombre del número. Se justifica, que la base de la palabra “UNO” son las primeras manifestaciones sonoras del infante. Hace constar, que existe la relación idéntica e igual entre la adquisición de los conocimientos del lenguaje y del habla con la adquisición de los conocimientos del número mediante del desarrollo del equilibrio auditivo tonal. Metodología: el análisis teórico de las partes estructurales del número y de la identificación de correlación reciproca entre la construcción del conocimiento de nombre de número y su expresión verbal en la Educación Preescolar. Contribución: el desarrollo del método para aprender el concepto del número en la etapa pre-simbolica.

**Número, Estructura oscurecida, Palabra**

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## Introduccion

Pointing out something mysterious in the title of the article, for example, an obscured structure of a number may immediately cause rejection as unrelated to the academic field, or perhaps even help to look at the reasons that led the authors to state the problem.

A review of the academic content and processes that are developed in initial teacher training (SEP, Plan de Estudios. Licenciatura en Educación Preescolar., 2022) in the field of preschool education makes it possible to make a diagnosis and determine the object and medium of study on the subject analysed in this article. At the same time, from this process the problem in relation to the topic of analysis of the "Concept of number" is glimpsed, since despite its study over a long period of time in the training of pre-school students, the way in which its learning is gestated has not been clear. One of the factors is the lack of understanding of the meaning of the notion of number. The subject of numbers, their relations and characteristics is studied in arithmetic, which is a division of mathematics. The object of number is a notion. The notion of number is presented by means of the word. The word spoken by the teacher (transmitter) and perceived by the pupil (receiver) manifests itself as an idea and is registered in the child's mind. In other words, numbers, which appear in the form of ideas in the classroom subjects, need to be expressed verbally.

Then, with the help of oral expression, the number is conveyed, its verbal meaning is remembered and people consistently arrive at real arithmetic, real in the sense that the word-number becomes a sound-idea-image. Now it can be said, that the obscured structure of number, which is fragmentarily studied by different sciences, in our understanding, is the word.

The academic process in Pre-school Education (SEP, Plan de Estudios de Educación Preescolar, Primaria y Secundaria., 2022) from the initial teacher training is to teach to understand the number through its name. In this sense, it is worth mentioning an agreement and then disagreement with Polanyi's theory of tacit knowledge. Tacit knowledge is a type of knowledge that includes knowledge that cannot be easily transferred to others.

In general, agreeing with his view on the pedagogical process as a learning process, acting in three ways, such as action teaching methods, teaching signs and latent learning, and on the important role and operating principles of language, expressed in linguistic representation and in the operation of symbols to ensure the thinking process, at the same time, it is noted that "every time, as Polanyi says, when we use a word to refer to something, we are performing an act of communication and at the same time certifying (verbally or mentally-verbally) that we have performed this act. It follows that the use of this word makes it possible to give a name to a class or thing" (Polanyi, 1962). In our case, this provision is made concrete later, the word "UNO" in English does not correspond to any thing or phenomenon, so nothing allows its use, but it is used. For example:

**Figure 1** One watermelon plus one watermelon plus one watermelon
*Source: Own elaboration*

There is a situation in which there is a word, but there is no thing. However, Polanyi states affirmatively, and it is true, that "we acquire our knowledge of things denoted by words mainly from experience" (Polanyi, 1962). Continuing to expose the disagreement and take into account Polanyi's assertion, the argument is complemented by the following expression: "If there is nothing denoted by the word "ONE", then there is no experience. Therefore, if there is no experience, then there is no knowledge. In other words, if there is knowledge that there is no experience, then there is knowledge that there is no knowledge. And this is a complete absurdity.

As many historians of mathematics point out, the reason for the emergence of arithmetic, which is one of the oldest sciences, was the practical necessity of counting, with which, perhaps, it would not be difficult to agree.

The world of man, represented by the exchange, buying and selling of essential commodities, needed to count and calculate, demonstrating the equality and identity of the results of labour. The first thing that was expressed in this act and pronounced as a magic word, was the name of the number, which equalised the ownership of people.

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Life was determined by the word and the world became the word. The world becomes word. The world is word.

*Development*

According to Bellustin (Bellustin, 1909), it cannot be known who laid the foundations for arithmetic, and who was the first to say the word "ONE" in "inventing" the odyssey of number. The ability to count, at least in small predestines, as well as the need to count, is inherent to all thinking beings. Just as a living human being breathes and eats without fail, so a person living a conscious life thinks, speaks and, by the way, counts. Therefore, one cannot speak of any special invention of counting, for this need is peculiar to all people. Therefore, the beginning of arithmetic is drowning in the same unforeseen depths of distant centuries, as well as the beginning of humanity. Meanwhile, the naive authors of ancient textbooks sought, at all costs, to indicate the person or persons to whom the account owes its origin. This honour is attributed to the ancient sage Pythagoras or "Cyrus, son of Asidor", who wrote this numerical philosophy, i.e. this philosophy of arithmetic in the Final Letters". The Byzantine historians of the Middle Ages were still far away and did not hesitate to admit directly the miraculous origin of Arithmeticians: it was promulgated on earth by the Phoenix, the grandson of the god Neptune. The Phoenicians are also credited with the invention of the letters of the alphabet.

*The early stages of the numbering system*

As our ancestors, who lived in ancient times, long before the birth of Christ, believed, it is impossible to estimate, let alone judge this directly and clearly. From the point of view of mathematical archaeology, the written scrolls have not been preserved, and could not have been, because the development of written accounts depends on the general development of education, and our earliest predecessors were certainly at the lowest levels of education. But broadly speaking, and this is historically and understandably attested, the great figures of science and education, such as Pythagoras, Plato and Aristotle, are still at a place of unattainable knowledge. In other words, humanity as a whole has not yet mastered the science of mathematics and its fundamental object, arithmetic: the number.

We can assess the first steps of arithmetic only by conjecture, comparatively; the means of comparison are those peoples who are lost in the remote corners of the interior of some continents, who, having the traditions of antiquity of number and counting, are at present just coming out to enjoy and use the modern intellectual treasures of technology, science and education. We present some assertions from Bellustin's examples (Bellustin, 1909). The Tamanaca Indians use fingers and toes in counting. Incidentally, the Eskimos, the inhabitants of the cold countries of North America, say "20" and "100" five persons. The Carais in the West Indies and along the Orinoco River give the first four numbers special names, but 5 is replaced by the words "four and one", 6 - "hand and one", 7 - "hand and two", 20 - "as many as arms and legs", 30 - "as many as arms and legs, and 2 more superfluous hands". The Zulus in South Africa use a very similar custom. They do it without legs and do calculations with one hand. They start counting with the little finger of their left hand.

In this way, fingers for those people who can hardly count are an invaluable and convenient aid. We can see this in all countries of the world and in all people. To count, they need a visual aid, and what kind of manual is closer to a person, if not their own fingers? They are especially loved by young children. Almost all civilised peoples of the ancient and modern world introduced the decimal system of counting. Where did such an amazing agreement of all people come from? Why does everyone have the same counting system? It is inconceivable to suppose that the inhabitants of different parts of the world have arranged something like a conscience, upon which they have settled down to adopt a common system. The key, obviously, lies in the following.

Abstract counting began among all peoples in the same way, by observing and touching their fingers. What is closer to the fingers and easier to touch? To be fooled by illiterates, small children and old women, when they cannot count even small numbers without fingers: this is in vain, because the need for a visual representation of ideas with the help of objects is inherent in human nature, and every person who is underdeveloped, looking for a visual aid, strives to choose the most convenient one and involuntarily stumbles upon his fingers in our case.

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*Finger systems and figures of men as hieroglyphs are more ancient and common*

In its original form the hieroglyph resembles paintings of strings and bones, which were used in visual counting. Later, the Chinese numbers changed a lot and took on some species. They have different figures: ancient-Chinese, trade, scientific and for governmental acts. The figures of the ancient Chinese are very figurative and intricate, and it is quite possible that it was an alteration of the initial hieroglyphs; it was written on the leaves not in a line, but in a vertical column, located from top to bottom.

Thus, among the Egyptians, Chaldeans and Chinese, we see differences of ancient origin, resembling hieroglyphs, or images of those objects which are found in relation to a given number. Another main root that gave rise to numbers are the names of numbers. These figures are already more than later, since for their representation it was necessary to develop the alphabet, literacy, the need to write and the sufficient art of writing.

Among some peoples, as, for example, among the Phoenicians, the names of numbers were written in their entirety, through letters and words: the Phoenicians wrote the numbers directly, according to their pronunciation, in words, and did not use special icons: numbers.

Sometimes the same method was adopted by the Greeks, but the Arabs were especially fond of it. There is a complete textbook on arithmetic from the Arabic Alcarja (in the 11th century AD), where there is not a single digit, and all calculations, even quite complex ones, are done verbally.

But it is obvious that writing numerical names is extremely inconvenient and tedious. Because of this, the names of numbers began to be abbreviated. And the initial letters of the names of numbers began to be considered numbers. The word became a number.

Let us briefly repeat once again that the numbers of all peoples and times fall into three categories: 1) numbers that originated from hieroglyphs and became conventional signs; 2) numbers formed from the letters of the alphabet and representing the initial letters of numerical names; and 3) numbers in the order of the letters of the alphabet.

The second category of numerals has also changed, like the first, in some cases beyond recognition, so that the conventional signs were formed from the letters. Today, however, it is scabrous to say, that the problem of the "Number" has been solved definitively.

*The initial name of the number*

The formation of the numerical names followed the development of numbers. It is very rare to mention anything reasonable in this matter, after all, a strange tautology is immediately revealed. Therefore, it would be fair to say, that an affirmative answer has to be given to the following questions: what was the first thing, a count, as described in most books on the history of arithmetic, or a number? It is simple and clear to confirm in our deep conviction, that the first thing was neither counting as the basis of number, nor number as the basis of counting. The beginning of number was the "Word".

The language-savvy philologists worked not a little and with great skill on the question: how did the words expressing numbers - "one", "two", etc. - come into being? They recognised that, in fact, the first number of names is taken from those things which are always in a certain quantity, and precisely in a number like the number itself.

Therefore, peoples who were reputed to be educated long ago, from time immemorial, have developed special numerical names which are not similar to the names of any objects. That this happened a long time ago can be seen in the name of the Indo-European family of peoples, and this is demonstrated by this consideration.

It is easy to see, that the first number names are very similar and consonant in all Indo-European languages, and from this we are entitled to deduce that these number names developed in that remote epoch when there was no large settlement of peoples, and when the whole Indo-European family lived in the world and used a common language.

We know, that number exemplifies certain peculiarities of reality and everyday life, such as: counting, magnitude, quantity, measure and order, forming a concept. The concept of number traditionally represents a system of different structures.

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They are structures of name, symbol and meaning. Viewing a system in this way, a view is formed that the core of the article is the nature of the natural number.

Historians of mathematics believe that the history of number originated in prehistoric times, when man learned to count objects, cows and bulls, sheep and lambs, products of his labour such as shoes and bread, learned to bend and unbend his fingers. Arithmetic arose from everyday practice, from man's vital needs.

The formation of mathematical concepts, among which number is given an important place, occupies a considerable period of historical time. Its beginning in some theoretical sources dates back to 30 000 years BC.

According to Dantzig (Dantzig, 1947), the origin of number is hidden behind an impenetrable veil in the mists of time. Whether this concept was born out of experience or the accumulation of experience contributed to the manifestation of what was implicitly already present in a latent form in the abysmal depths of the ancient mind is a fascinating subject for metaphysical reasoning. Dantzig, continuing his contribution on the belonging of number to metaphysics, discovers in man a gift, which he will call "the sense of number". Thousands of years passed, and Pythagoras' cherished dream, "The world is number", became reality.

Therefore, it would be possible to turn the whole entity in the most ordinary and usual way into a natural number, a concept possessed by 99% of the world's population. To possess is not to know. To have knowledge it is necessary to understand where the notion of number came from.

The concept of number has been investigated from the moment it appeared, but in history its analysis is centred on counting as the basis of all arithmetic systems in the ancient world, such as those of the Egyptians, Babylonians, Mayans, and its appearance emerges from the need for men to exchange their products of production.

The problem arises from the lack of knowledge of a structure that makes up the number: the word, which, therefore, does not provide a basis of understanding for its teaching in pre-school students, presenting a field of linguistics that in this paper is identified as an obscured structure since it has not been addressed in the history of arithmetic. Up to a certain age, different for each child and little dependent on external conditions, occupations, plans and programmes, of teaching and learning, children are not able to understand and cannot learn the concept of number.

There is a factor of great importance related to the topic of number, which affected the higher education of teacher training for Pre-school Education, defined as the creation of constructive mathematics, founder of logicism Gottlob Frege, in response to the problems of justifying science and achieving the goal of distancing arithmetic from the sensible world with a caveat, which, according to Tselishev (Tselishev, 2014), "mathematical objects exist outside and independently of human consciousness, they are timeless, extra-dimensional entities belonging to the sphere of extrasensory reality".

In a great feature, and it is necessary to realise and admire, that mathematization of science is a process of great importance and feasibility. Every thing or phenomenon, when it appears, must have its conclusion. As an example, the introduction in Proclus' "Principles of Physics" of the description of the mathematization of Plato's "Timaeus" can serve as an example.

According to Mesiats (Mesiats, 2001), The extension of mathematics to the whole field of knowledge teaches the soul to see in everything - in nature, in the soul, in politics - incorporeal mathematical entities. The general programme of mathematization of the whole sphere of knowledge, formulated by Proclus in the "Introduction", was implemented in three of his works: "The Principles of Physics", "The Principles of Theology" and "Commentaries on the Timaeus". In support of what has been said, Rényi (Renyi, 1948) is quoted as saying that the meaning of the mathematization of knowledge is to use the mathematical apparatus not only to describe established facts, but also to predict new patterns, the course of phenomena and, therefore, to be able to control them.

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The trend of mathematization of knowledge, which lasted for centuries and millennia, and Frege's logicism is due to the need to determine certain stages of knowledge, but at the same time, it negatively affected the didactics of mathematics, both in LEP and in pre-school education.

Just a newly born data, which can justify a serious problem in Pre-school Education that was detected in professional practices to obtain information for a degree thesis, which to the word is said: "when attending the School Technical Councils (CTE) in a Kindergarten "X" in the months of March, April and May of the year 2023, the titular educators manifest on various occasions that an educational lag is noted in the field of academic training in mathematical thinking, especially in the curricular organiser of number, This is at the institutional level, but when working with the third grade group "F", 85% of the children in the group show that they are still challenged by the numerical series from 1 to 10, counting, the graphic representation of numbers and their uses in everyday life" (Sánchez Salazar, 2023).

The purpose of this article is to make known that element of the obscured structure of number, which is the name of the number represented by "the word". Number is word.

In order to form in the pre-school child the idea of number, on the one hand, the affirmation and agreement with Kant's methodological establishment is considered (Kant, Critique of Pure Reason. Introduction, translation, notes and indices by Pedro Ribas, 2016), which in words is said: that "...there are two main trunks of human cognition, which perhaps arise from a common but unknown root, namely sensuality and reason: by means of sensuality objects are given to us, and by reason they are conceived"; and, on the other hand, following two paths related to the obscured structure of number the word. A word represents a number, for example: one, two, three, etc., and number is taught and learned orally, as: "oral communication", "oral number line", "oral confrontation".

The pre-symbolic stage of number is a period when teaching and learning is organised and based on the process of oral communication, without the demonstration of the number, i.e. without the graphic display of the symbol. Here it is appropriate to quote Piaget's words on the acquisition of mathematical terms by a child. According to Piaget (Piaget, 2001), "it is a great mistake to think that the child acquires the concept of number and other mathematical concepts directly in learning. On the contrary, to a large extent he develops them independently, independently and spontaneously. When adults try to impose mathematical concepts on a child prematurely, he learns them only verbally, the real understanding coming only with his mental growth".

This process appropriates the following characteristics of oral communication: speaking-saying and hearing-listening. Oral communication, and this is the subject of the LEP courses, is established in the pre-school classroom between teacher and pupil, where one speaks and the other listens and vice versa, developing the presentation and imagination of the number in its phonetic-phonological quality. In other words, in the oral communicative process the sound idea of number is developed in auditory perception with its next phase of transformation into presentation and imagination. We need to clarify the connection of the above-mentioned.

The teaching of the concept of number in the number system is organised verbally between teacher and pupils through the process of speaking-saying and hearing-listening. Teacher says-student listens. Through the auditory perception in the mind of the pupil the processes of presentation and imagination of the word or number name take place.

Let us briefly follow this communicative process and consider it in parts, starting with the reception of a sound signal at the input of the peripheral part of the auditory system of a 3-6 year old child and ending at the output with the result of thinking. Special attention should be paid to the act of misunderstanding the subject of the concept of the number "ONE" for students in pre-school education.

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As already mentioned, the object of the number is the concept represented by the word "ONE". If in the plane "P" we take the point "M" (name) with the coordinates x, y, where "x" is notion, "y" is things. Wherever the point M (N = 0, 1, 2, 3) is, it is impossible to say with certainty what place it occupies, since the word "ONE" does not correspond to anything. This is the first call of semantic uncertainty that leads to misunderstandings. Semantic field of the word "ONE".

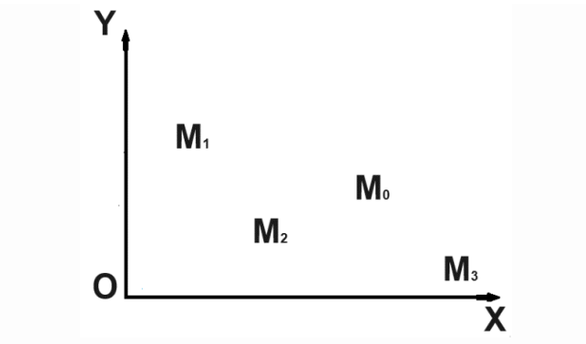


**Figure 2** Plane P
*Source: Own elaboration*

Now it is worth considering the student's perception of the sound side of the word "ONE" and the appearance of sensation and representation. The graph of the tones with which the teacher "speaks" in the Q-plane is shown. It establishes a relationship between the pronounced name of the number (physical value) and the thought name of the number (mental value). The ideal situation is when the two values are equal. That is to say that f(StG5) is equal to f(RSG5), otherwise, when the two values are not equal, an alteration of the thought is determined, which produces an uncertainty and in the end an incomprehension on the part of the pupil. So, on the OX-axis, the pitch (f Hz) is plotted, on the OY-axis - energy E (dB), on the OZ-axis - time (t´). OA is sensation, OB is representation.

The reception of a sound signal f(StG5) at the input of the peripheral part of the auditory system.

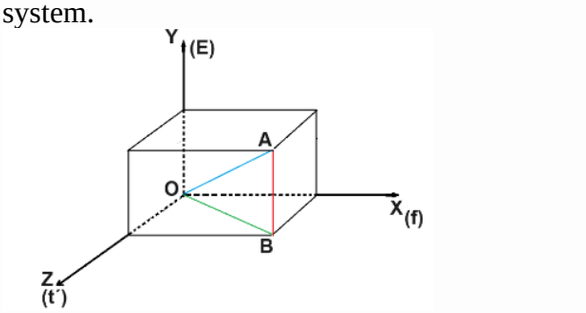


**Figure 3** Plane Q
*Source: Own elaboration*

The synthetic signal representation of the "meaning" (P) and sound f(StG5) (Q) of the word "UNO".

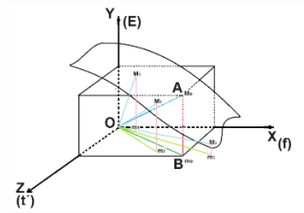


**Figure 4** P and Q Plans, Own Elaboration

The mental process of thinking the tone of the word "ONE" with f(RSG5) (Q). The situation is: f(StG5) is equal to f(RSG5)

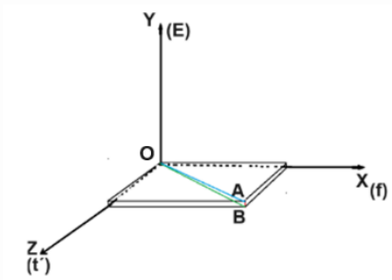


**Figure 5** Plane Q
*Source: Own elaboration*

The altered mental process of thinking the tone of the word "ONE" with f(RSG5) (Q'). The situation is: f(RSG5)1 is NOT the same as f(StG5).

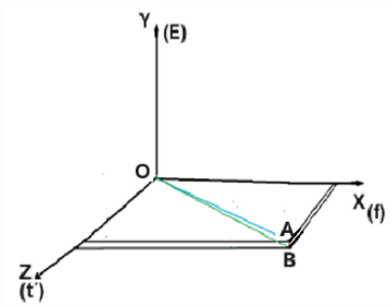


**Figure 6** Plan Q' with alteration
*Source: Own elaboration*

This is the call of the second phono-semantic uncertainty of the word "ONE", which leads to misunderstandings.

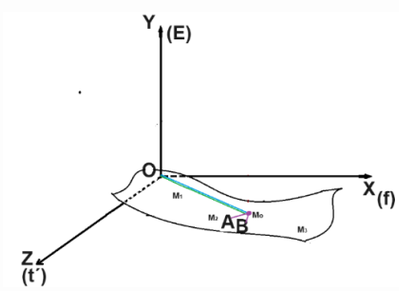


**Figure 7** Plans P and Q
*Source: Own elaboration*

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The result of the thought: there is a double uncertainty due to the auditory alteration and presence of tonal imbalance.

If it is impossible to define the semantic field of the word "ONE" and its.

If it is impossible to define the semantic field of the word "ONE" and its meaning, then it is necessary to develop a phono-semantic a phono-semantic ability.

The teaching of the first arithmetical representations in the long historical period of education can be historical period of education can be conventionally divided into stages. According to Petrova (Petrova, 2013) the first stage included empirical development of the method: various counting, proverbs, sayings, riddles, nursery rhymes were a good material for teaching children to count, they allowed the child to form the allowed the child to form the concept of numbers, shape, magnitude.

Later, at this stage, the idea of the idea of the necessity of mathematical development of pre-school children was raised. preschool children. Prominent thinkers of the past, such as Komensky, Pestalozzi, Ushinsky and notorious figures such as Montessori and Froebel realised that, without a mathematical that without a preliminary mathematical education and the important role of teacher-pupil relationships, it would be teacher-pupil relationships it would be difficult for children to master the school curriculum.

School curriculum. It may also be significant and necessary to comment on Vygotsky's fair criticism of Piaget. Piaget did not attach importance to the psychic as a phenomenon of cultural-historical practice, that is, he simply ignored it, he ignored it. Vygotsky in the discussion with Piaget showed that, although he agreed with Piaget's theory, he did not agree with it. He agreed with his theory, he mentioned, that Piaget rejected the social phenomenon of speech, which meant to speak social phenomenon of speech, which meant talking to the other and this could lead to the exclusion of speech. To the exclusion of speech, and the effect could be the absence of communication with the other.

Since then, the development of the child's mathematical thinking is spontaneous and sporadic, exhibits ignorance of things and disorientation in the learning of number. learning of numbers. In such a situation, there is a lack of experience of meaning and the annihilation of the children of sense and the sensory basis for counting is annihilated: there is no oral communication, no auditory communication, nor auditory perception, nor the presentation and imagination of the sound idea of number. Sound idea of the number, so there is no knowledge of the number itself.

It can be realised, that the idea of number in the pre-symbolic period, i.e. the one in which there is no graphical is linked to the idea of the number in which the pronounced and perceived word will appear, which is word pronounced and perceived, which represents it. For this purpose, the word is analysed as a syllabic organisation (Fokin, Ariceaga Paredes & Perez Perez, Intelligent system in sensory and cognitiv development for the pre-reading stage, 2021), which has a phonetic-phonological basis (the phonological basis (the tones of the word).

The syllabic organisation of the word "UNO":

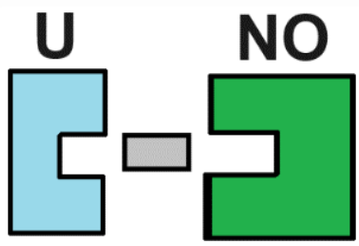


**Figure 8** Division in "U" and "NO"
*Source: Own elaboration*

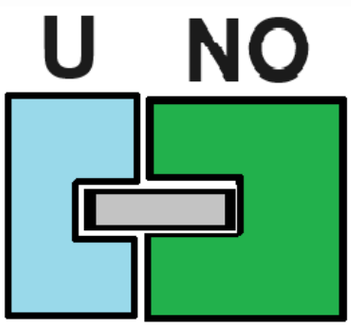


**Figure 9** Word in construction
*Source: Own elaboration*

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The syllabic organisation and construction of the word "ONE" allows the child, firstly, to continue with the acquisition of knowledge of the number name on the same basis as he/she is using for acquisition-construction-formation of language knowledge; secondly, to equalise the processes by constructing the image and idea of it, and thirdly, to obtain auditory comprehension of the number name and to develop number sense.

NUMBER IDEA, which represents the name of the number, contains the following fields:

- Semantic field (Meaning, Reason and Name).
- Phonetic-phonological field (Word, Syllable, Letter, Rhythm and Tone).

The analysed structure, which includes the idea of the number, is formed by the meaning and the feeling. To form the idea, the first thing that is needed is to perceive, listen and think. Periphrasing Kant, "We cannot think sound without hearing it by thinking" (Kant, Werke. Zweisprachige deutsch-russische Ausgabe, 2001-2006).

It is obvious that later on, the vision of the graphic sign will be of great help in this process of number recognition.

Starting from the idea of number without the symbolic representation, the figurative thought of number will be constructed by means of the word, a sound object which is represented by the tone and the syllable. After some considerations, a digression is necessary. Approaching the subject of the teaching and learning of number, one finds something in common. It is the acquisition of the knowledge to build the auditory image of the number and to build the image of the word. The former are necessary for arithmetic and the development of the fields of mathematics and the latter are necessary for language, reading and communication. In this sense we come to a very important conclusion about the knowledge formed for language and communication and mathematical thinking:

- The common basis is the thought/pronounced and perceived/thought word, which is analysed from above mentioned fields.
- Syllabic division of the word
- Correspondence of transmitted and perceived tones of syllables

We know that the acquisition of knowledge of the world by man begins from the first day after birth and is organised in a system of experiences.

Through the processes of sensory perception, man acquires information about the world around us, activates cognitive processes and begins to develop skills and abilities to memorise, differentiate or match objects. The basis for the accumulation and assimilation of sensory information is language, and in the early stages of child development primitive language is the basis for the accumulation and assimilation of sensory information.

At the same time a set of mental presentations and imaginations about the world are formed, which are accommodated in different areas of the brain and at the first request of the baby's will are explored by the mind in speech. The sensory and cognitive processes are repeated once, twice, three and more times until the mastery of language appears which allows the individual to accumulate and consolidate into a mental and sensory image of which word he wants to speak in most of its sensitive part depending on the periods of development of the human being. The precision of the sensory and cognitive processes to clarify the movement of thought in the maze of argumentation is completed with the background information on the formation of auditory knowledge of the number word, which has the name "ONE" and the object of study is the obscured structure of the number in pre-school education, where the age of the child corresponds from 3 to 7 years.

To become a part of the child's mental system as a concept of number, the word "ONE" in its structure, should pass the whole sequential procedure of its auditory formation and relevance in the already established image. That is to say that the word transmitted by the teacher in the form of speech and heard by the child should be equal to the one thought by him.

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The correlation of the assimilated information about the name of the number can be understood as the encoding of a certain fragment (reason) and section (feeling) of the mental image of the word "ONE" by linguistic means.

The process of human cognition, which consists in the development of his auditory ability for arithmetic, is the process of formation of meanings, reasons, on the one hand, and signs, including sound, of language, on the other hand. According to Ushakova (Ushakova, 2011), the ability of human being to use language and speech has become the subject of study of many sciences: psychology, linguistics, psycholinguistics, linguistic philosophy. For all that, the nature of speech and language remains largely mysterious.

We agree that language is a system of signs through which individuals communicate with each other. Among these signs are: sonorous - speech, bodily - gesture and graphic - writing. Let us continue with Ushakova's thoughts. There is no convincing explanation for the cardinal basis of the speech process: the transition from immaterial thought to the matter of sound (in speaking) and from the matter of sound to an idea, understanding (in listening).

For almost everyone, and for psychologists, and linguists, and psychophysicists, the developmental stages of speech and listening in the first and second year of life take the form of shouting, humming, babbling and singing, forming the first words. On the basis of the selection of periods there is a change in the nature of sound reactions (individual sounds, sound chains, etc.), i.e. the stages of mastery of linguistic means occur. The background of the construction and formation of auditory knowledge of the word "ONE" is in the early period of speech acquisition. The basis is a set of auditory vowel knowledge acquired in childhood from its origin as psychic and mental abilities and appears as cognitive functions. The stages of development of children's vocalisation are divided into several periods.

As is evident and deserves much attention, the works of the analysed theorists Kuhl, Meltzoff, (Kuhl, 1996, October); Brunner (Brunner, 1981), have as their object of study only the development of speech from birth, which are physiological, communicative and psychological speech. He gives a certainty, that the basis of the formation of auditory knowledge of speech as a structure of different fields, mentioned above, is infant vocalisation. Brunner's main idea is also that the development of speech follows cognitive development. This is true, but in this chain there is a missing link, namely sensory development, to be precise, that is auditory development.

**Pre-verbal period of development of children's vocalisation**

According to Titova (Titova, 2003), the child begins the assimilation of language from the most electronic level, with the development of basic types of intonation, gradual mastery of the speech sound system and the periods of humming and babbling are a kind of preparatory stage for the pronunciation of words. Stark, R. E. (Stark, 1980), "...Children do not pronounce their first words until they are about 12 months of age, the ability to pronounce speech sounds begins to develop at a much earlier age". Wichman, M. M. (Wichman, 1996), "...Infants make a variety of sounds, similar to vowels and consonants, which they combine into longer and longer sequences. The formation of vowel sounds (as early as 2 months) precedes the formation of consonants.

Based on the data of the research results it is safe to conclude that the basis of the word "ONE" is a set of auditory vowel knowledge acquired in infancy from its origin as psychic and mental abilities and appear as cognitive functions. The period of the child's development that follows is the stage from 3 to 6 years, preschool age.

**Conclusions**

The objectives of the research to make known the obscured structure of number and its elements and to analyse the nature of the number name were achieved.

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It is proposed to use as the principle of sensory and cognitive development for the acquisition and formation of number in the child of preschool education the Balance of the tonal ear, also the Syllabic organisation of the word and the Evolutionary Method Learning to read, which includes: software TOTEM 1. 0 and 1.2, NOMOS 1.0 and Learn to readAt the same time a set of mental presentations and imaginations about the world are formed, which are lodged in different areas of the brain and at the first request of the baby's will are explored by the mind in speech. The sensory and cognitive processes are repeated once, twice, three and more times until the mastery of language appears which allows the individual to accumulate and consolidate into a mental and sensory image of which word he wants to speak in most of his sensitive part depending on the developmental periods of the human being. The precision of sensory and cognitive processes to clarify the movement of thought in the labyrinth of argumentation is completed by the background of the formation of auditory knowledge of the word number, which has the name "ONE" and the object of study is the obscured structure of number in pre-school education, where the age of the child corresponds from 3 to 7 years.

To become part of the child's mental system as a concept of number, the word "ONE" in its structure must pass the whole sequential procedure of its auditory formation and relevance in the already established image. In other words, the word transmitted by the teacher in the form of speech and heard by the child must be equal to the one thought by the child. The correlation of the assimilated information about the name of the number can be understood as the encoding of a certain fragment (reason) and section (feeling) of the mental image of the word "ONE" by linguistic means.

The process of human cognition, which consists in the development of his auditory capacity for arithmetic, is the process of formation of meanings, reasons, on the one hand, and signs, including sound signs, of language, on the other hand.

According to Ushakova (Ushakova, 2011), the ability of human beings to use language and speech has become the object of study of many sciences: psychology, linguistics, psycholinguistics, linguistic philosophy. However, the nature of speech and language remains largely a mystery.

We agree that language is a system of signs through which individuals communicate with each other. These signs include: sonorous - speech, bodily - gestures and graphic - writing. Let us continue with Ushakova's reflections. There is no convincing explanation for the cardinal basis of the speech process: the transition from immaterial thought to sound matter (in speaking) and from sound matter to an idea, understanding (in listening).

For almost everyone, and for psychologists, and linguists, and psychophysicists, the developmental stages of speech and listening in the first and second year of life take the form of shouting, humming, babbling and singing, forming the first words. On the basis of period selection there is a change in the nature of sound reactions (individual sounds, sound chains, etc.), i.e. the stages of mastery of linguistic means take place. The background of the construction and formation of auditory knowledge of the word "ONE" is in the initial period of speech acquisition. The basis is a set of auditory vowel knowledge acquired in childhood from its origin as psychic and mental abilities and appears as cognitive functions. The stages of development of children's vocalisation are divided into several periods.

As is evident and deserves much attention, the works of the analysed theorists Kuhl, Meltzoff, (Kuhl, 1996, October); Brunner (Brunner, 1981), have as their object of study only the development of speech from birth, which are physiological, communicative and psychological speech. He gives a certainty, that the basis of the formation of auditory knowledge of speech as a structure of different fields, mentioned above, is infant vocalisation. Brunner's main idea is also that the development of speech follows cognitive development. This is true, but in this chain there is a missing link, namely sensory development, to be precise, i.e. auditory development (Fokin & Ariceaga Paredes, Evolutionary Method for Learning to Read, 2021).

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To be continued …

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