

The obscured structure of the number in Preschool Education (pre-symbolic stage). Second Part

La estructura oscurecida del número en la Educación Preescolar (etapa pre-simbólica). Segunda 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, Word, Method

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 recíproca 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-simbólica.

Número, Palabra, Método

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Introduction

In the first part of the article, the obscured structure of the number, which is the word, and its elements, which are: syllabic organization and tones, the representative sounds of vowel letters and consonants, were revealed. The structural element investigated and the analyzed nature of the name of the number was the word "ONE", which on the number line is manifested after the "ZERO", but before the "TWO".

The syllabic organization of the word "ONE" is presented with a partition in the syllables (Figure 1) and with the graphic construction through a "connector" (Figure 2).

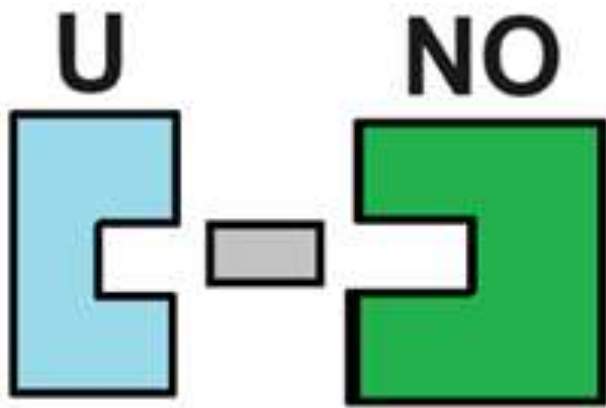


Figure 1 Division into "U" and "NO"
Own Elaboration

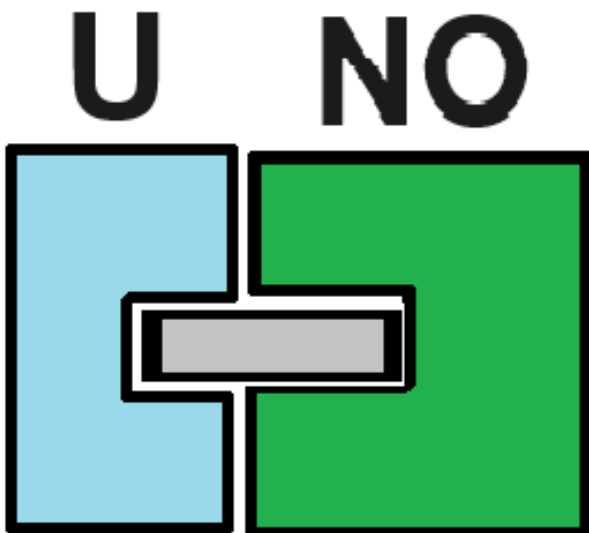


Figure 2 Word "ONE" under construction
Own Elaboration

It is safe to state that the data of the results of the research were equated with the results of the research of the acquisition of reading knowledge, where the object of speech formation was also the word.

That is to say, something common in the didactics of the teaching of number and language is noticed, namely, it is the construction of the visual and auditory images of the word.

The auditory knowledge of the word is vowel, it has all the particularities of sound and is acquired in childhood from its origin as psychic and mental abilities and later appears as cognitive functions. The common basis for language and mathematical thinking is a set of common elements, which are: the word perceived, thought and pronounced, the syllabic division of the word and the correspondence of the tones transmitted and perceived by the teacher and the student in both directions.

We agreed that, in order to be a part of the child's mental system as a concept of number, the word "ONE" in its structure, should pass through the entire sequential procedure of its auditory formation and relevance in the already established image. That is to say, the word transmitted by the teacher in the form of speech and heard by the child must be the same as the one thought by him. The correlation of 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.

We reconcile that language is a system of signs through which individuals communicate with each other. These signs are: sound, corporal and graphic. The word is presented as a sound object through the pitch of the syllable, constructed into an auditory image, and an idea of the number is formed without symbolic representation. According to researchers of language acquisition by children, the stages of speech and listening development in the first and second years of a man's life are presented in the form of shouting, humming, babbling and singing, manifesting sound reactions (vocalizations) and forming the first words. Vocalizations as a whole are tonal or atonal representatives with or without certain melodic constructions (Ushakova, 2011). That is why there is no doubt that the formation of auditory knowledge of the word "ONE" is in the early stage of speech acquisition.

Development

Everything would be fine if it weren't for a dark spot. In other words, it is said that the tense moments of the obscured structure of number and Frege's logical determinism are eliminated, that there is no decision-making, but it is worthwhile or not, to recognize the principles of sensory and cognitive development as Tonal Ear Balance for the acquisition and formation of the name image of the number that is the word "ONE".

The word "ONE" in its structure, on the one hand, should pass through the entire sequential procedure of its auditory formation and relevance in the already established image and, on the other hand, the word transmitted by the teacher in the form of speech and heard by the child must be the same as the one thought by him. It is clear that the word spoken by the teacher and perceived by the student should be thought and expressed by the equal. But only the thousands of dozens of data from the results of the research testify to the situation of the states of the auditory systems of the people, which can be transcribed as a situation of when "Everyone hears, but not everyone listens", in other words, the child does not listen to what the educator is saying, because he has difficulty in discriminating the sounds of the teacher's speech.

The perception and oral expression of the word is transformed in the child's mind into something that is different from what is spoken by the teacher. That situation is leading to speech incomprehension. The mind is forked. In mathematics education that means "A baculo ad angulum" ("The Absurd Conclusion"). And with that, the nature of speech and language remains largely mysterious. Some steps were taken by Piaget and Vygotsky.

Piaget y Vygotsky

Faced with this situation, it is necessary to pay homage to some of the thoughts of the two outstanding scientists mentioned in Part 1, Piaget and Vygotsky. It should be recalled that Piaget wrote about the teaching of the concept of "Number" through the word in the pre-symbolic stage, and Vygotsky emphasized the role of the adult in the transfer of knowledge.

According to Piaget (Piaget, 1953), "when adults try to impose mathematical concepts on a child prematurely, the child learns them only verbally; Although the child knows the names of numbers, he has not yet grasped the essential idea of number, namely, that the number of objects in the group remains the same."

In outlining the three stages of a child's intellectual development, Piaget pointed out that it is only at the age of 6 or 7 and with the correlation of "1" to "1" that children spontaneously develop the concept of number and learn it only verbally.

According to Vygotsky (Vygotsky, 2008), the mental development of the child and the special role of the adult was developed in the concept of the "zone of proximal development". It is mentioned that the child can do for himself with what he is capable of. And with what he is not able to do, for example, learning the number, he has to cooperate with the adult and do with his help. That is, as in our case, the adult teaches the child the word that means the name of the number. The child learns it only verbally (Figure 3).

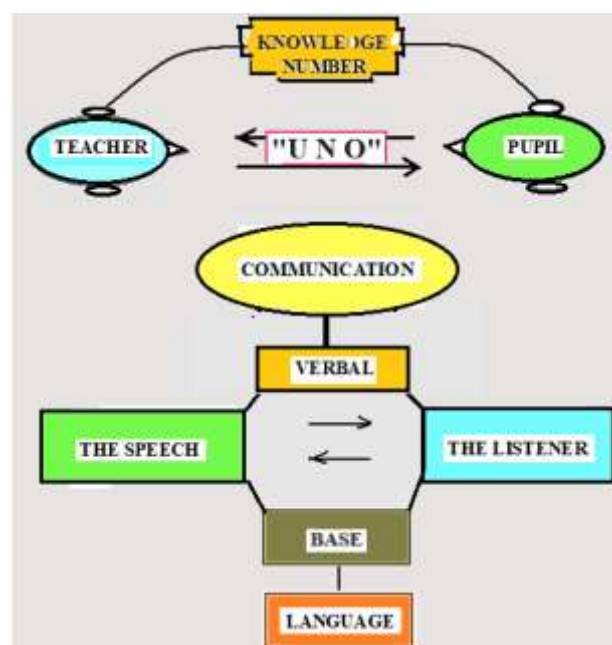


Figure 3 Word "ONE" in transmission
Own Elaboration

As can be seen from the diagram, the processes of current teaching and learning in their broad outline are similar to the processes mentioned by Piaget and Vygotsky. The sage was right.

"Knowledge" of the word "ONE" in the processes of speech and listening is transformed into the shadowy. The cognitive process evolves and becomes the dark spot: "everyone hears, but does not understand". Learning gets worse. The word "ONE" pronounced by the teacher in the manner of existence that, yes, it is, but in the perception and thought by the student the word is presented, but as the different and completely different tone. That is to say, in a rough way, the word "ONE" accompanied by some sounds does not exist. It guides us to think about the beyond of the real, in other words, we have to "enter" the metaphysics of sound, where we can notice that an essence of the non-existent is presented.

Essence of the non-existent (Fokin, S. K, 2009)

First of all, we must continue with the following. This article was inspired by the most interesting reasoning of the Sextus Empiricus "Critique of the Platonic Concept of One" (Empírico, Crítica del concepto Uno (11 - 20), 1997).

According to Sextus Empiricus (Empírico, Ezbosos pirronicos, 2014), "... no one is likely to hesitate as to whether the subject is such or otherwise, but he doubts whether it is really what it appears to be." The need to consider the metaphysics of sound and its perception by man in space is caused by a number of reasons:

- The limited possibilities of explaining some sound phenomena by the methods of exact sciences in psychoacoustics;
- Insufficiency of modern methods in traditional medicine, in neuro-otorhinolaryngology;
- The inevitability of establishing metaphysics as an element in scientific research programs and recognizing its importance in the creation of new hypotheses, experiments, and discoveries.

Let's explain:

- By proving that Essence may not exist, we are obliged to admit the existence of truth, that which exists as Essence is true;
- The philosophical tandem - Parmenides, Kant and Hegel - is united in the main thing, it is the comprehension of being, substance, and essence. The basis for this is reason, understanding, and feeling.

Let's confirm the following:

The universe is a collection of material and ideal entities that have their own being and their own being. At the same time, the being (existence) of ideal essences depends on the being (existence) of material entities, and the essence of ideal essences can exist or not exist (the only agreement is that the essence of material entities always exists). As you know, sound is elastic waves that propagate in the medium and create mechanical vibrations in it, as well as the subjective perception of these vibrations by special human organs. In perception, sound is detected by the subject as a sounding phenomenon.

The modal structure of the metaphysics of Essence, which has been formed through the efforts of many thinkers of both the past and the present, could and should be supplemented by another mode as *the essence of the non-existent*. The addition is connected with the urgent need, on the one hand, for a philosophical comprehension of the problem of perception and thinking of sound, and on the other hand, for a metaphysical study of the transcendental conditions of existing and non-existent in the sound phenomenon that arises in the consciousness of man and forms subjective reality. Subjective reality is the totality of ideal images of human consciousness.

As is known, the presence of sound (sound matter) can be recorded by instrumental means of control or by the human auditory system, while the auditory system has a limit (frequency) in the perception of a sound signal (music, speech and noise).

The long history of the study of auditory phenomena by psychoacoustics (the science of quantitative dependencies between external stimuli and the sensations they evoke) has not led to the explanation and solution of a large number of problems, one of which is that a person, perceiving a sound signal in the form of a musical tone (essence) with a fixed pitch (existing), cannot determine it. To distinguish from other signals, in other words, to discriminate against the sound signal with its own given pitch. As a consequence, a musical tone (essence) appears (exists) in a person's consciousness with a different, non-given pitch (non-existent). In this regard, how is it possible to understand the metaphysical nature of sound?

Firstly, according to Parmenides (Parmenidas, 1914-1919): Being is, there is no non-being. Everything that is conceivable is Being, that is, the thinking of sound, no matter what pitch, is also Being, its existence.

Secondly, according to Kant (Kant, 2001-2006): the inner sense presents an object to consciousness only as it is, and not as it exists in itself, i.e., the representation of a tone in consciousness of another height is a phenomenon (existing as a height), but the pitch of another tone (non-existent) in a phenomenon is not the pitch of the tone, which serves as the primary source for the phenomenon. Thus, the essence of non-existence is nothing.

Thirdly, according to Hegel (Hegel, 1929): Being as the substance of the existence of essence (existing) and Nothingness as the substance of the existence of essence (non-existent) are one and the same, and the simple unity of Being and Nothing is Present Being, i.e., the essence of the existent and the essence of the non-existent are the transcendental conditions of the presence of the existent and the non-existent in the sound phenomenon. Thus, metaphysical studies of sound provide a basis for confirming the earlier observation that everyone can hear the music, but only some can listen. The writing reminds us of argumentative flying thinking: "Everyone hears, but some listens."

Results

Something is shown in some examples, which is made conspicuous by the obscured structure of the number: that is the word "ONE". At the same time, arguments are provided not only to the lack of development of the auditory system and the strengthening of tonal balance in the human being, but also to demonstrate the need to teach arithmetic from the acquisition of language knowledge, remembering that the word transmitted by the teacher in the form of speech and heard by the child must be the same as that thought by him. It is clear that the word spoken by the teacher and perceived by the student should be thought and expressed by the peer and vice versa.

Understanding of Being of Sound (Figure 4) and Being of a Sound Phenomenon (Figure 5)

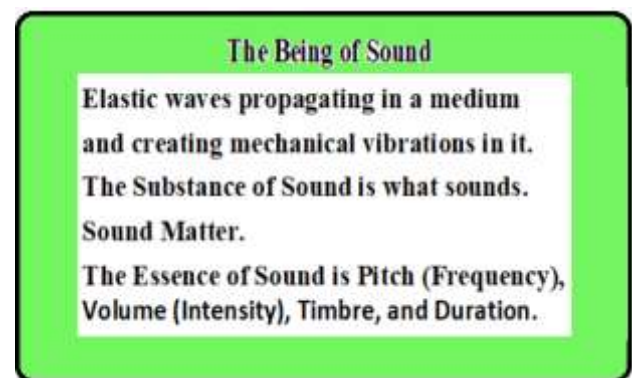


Figure 4 The Being of Sound
Own Elaboration

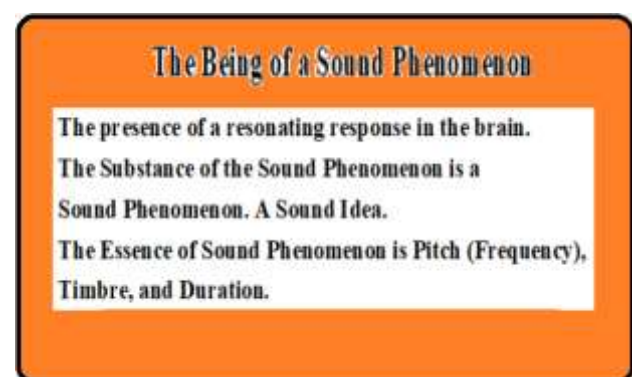


Figure 5 The Being of a Sound Phenomenon
Own Elaboration

Visual demonstration (Figure 6)

- Its pitch is used as the "Essence" of sound.
- The Essence of Sound – St (2) Pitch.

- The response to a stimulus is a mental act.

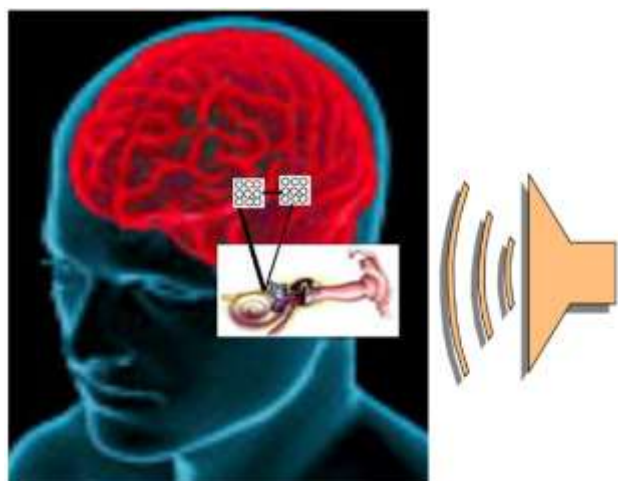


Figure 6 Visual demonstration
Own Elaboration

Numbers 1, 2, 3, 4, 5 ... n stands for the sequential numbers of neurons in the auditory area (Figure 7).

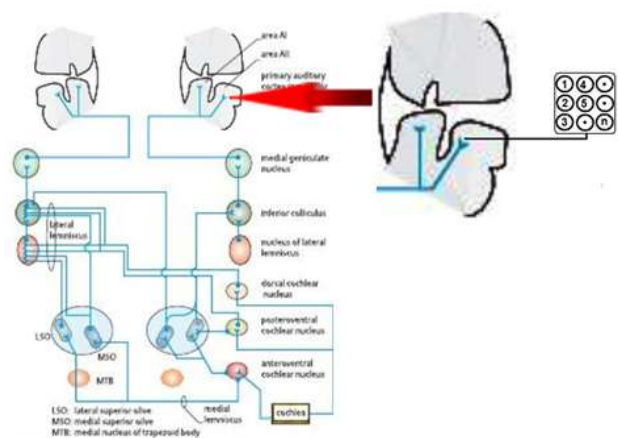


Figure 7 The Auditory Area
Own Elaboration

Inference (Figure 8)

- The essence of the sound phenomenon - the pitch of St (2) – is identical to the essence of the sound St (2).
- The essence of sound and the essence of sound phenomenon are identical St (2) = St (2), similar.
- The essence of the sound phenomenon St (2) is true and exists.

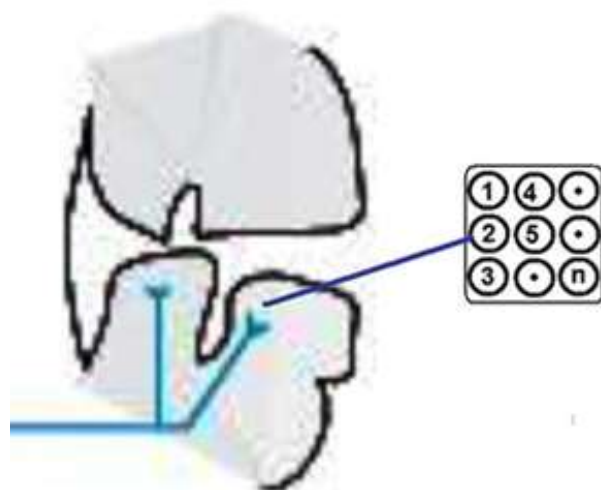


Figure 8 Inference
Own Elaboration

Inference (Figure 9)

- The essence of the sound phenomenon - the pitch of St (3) – is not identical whit the essence of the sound of St (2).
- The essence of sound and the essence of sound phenomenon are not identical St (2) ≠ St (3), they are not like.
- The essence of the sound phenomenon St (3) is not true and does not exist.

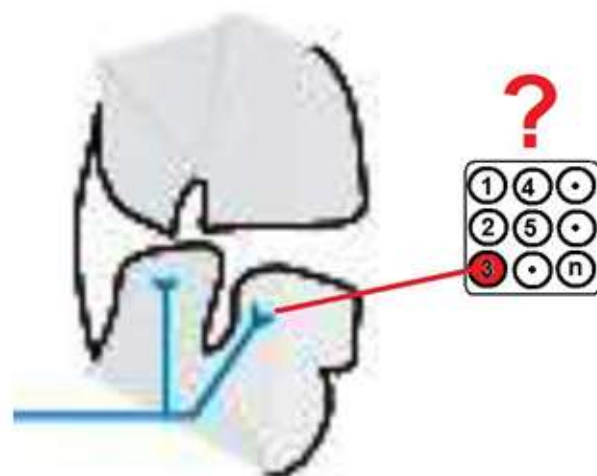


Figure 9 Inference
Own Elaboration

Creating the Image of the Word "ONE"
Pre-Symbolic Stage

Identity of the sound St and of the sound phenomenon RSt (Figure 10)

- The essence of the sound phenomenon - the pitch of RStG5 (U) – is identical to the essence of the sound StG5.
- The essence of the sound phenomenon - the pitch of RStC5 (NO) – is identical to the essence of the sound StC5.
- The essence of sound and the essence of sound phenomenon are identical StG5 = RStG5, similar.
- The essence of sound and the essence of sound phenomenon are identical StC5 = RStC5, similar.
- The essence of the sound phenomenon of StG5 and StC5 are true and exists.

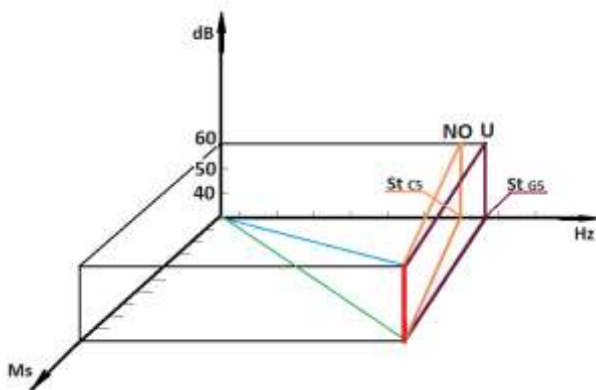


Figure 10 Identity of the sound and of the sound phenomenon
Own Elaboration

Identity of the sound and of the sound phenomenon (Figure 10a)

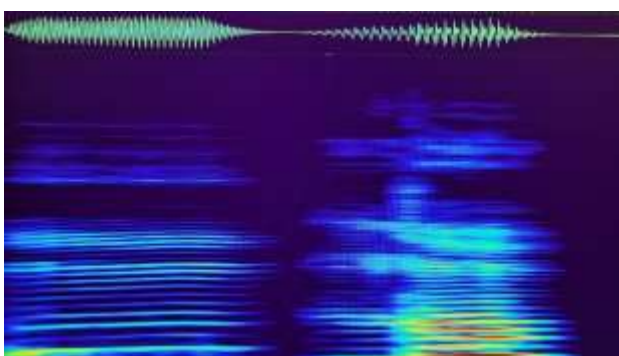


Figure 10a The Word “U-NO”
Own Elaboration

Figures 10 and 10a show the transmission of the word "ONE" divided into syllables by the teacher and the child's perception and thinking are identical, the same. It is worth mentioning that there is an understanding and comprehension of the word "ONE".

Not Identity of the sound St and of the sound phenomenon RSt (Figure 11)

- The essence of the sound phenomenon - the pitch of RStF5 (U) – is not identical whit the essence of the sound of StG5 (U).
- The essence of the sound phenomenon - the pitch of RStE6 (NO) – is not identical whit the essence of the sound of StC5 (NO).
- The essence of sound and the essence of sound phenomenon are not identical StG5 (U) \neq RStF5 (U), they are not like.
- The essence of sound and the essence of sound phenomenon are not identical StC5 (NO) \neq RStE6 (NO), they are not like.
- The essence of the sound phenomenon RStF5 (U) is not true and does not exist.
- The essence of the sound phenomenon RStE6 (NO) is not true and does not exist.

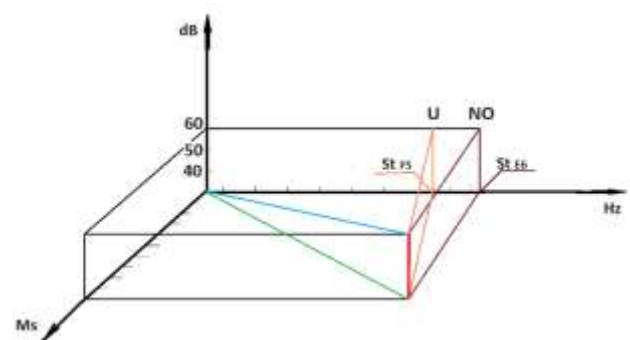


Figure 11 Not Identity of the sound and of the sound phenomenon
Own Elaboration

Not Identity of the sound St and of the sound phenomenon RSt

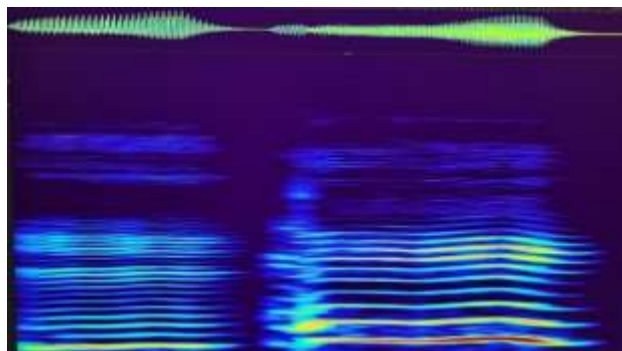


Figure 11a Palabra "U-NO"
Own Elaboration

Figures 11 and 11a clearly show the deviation of the sound signal of the word "UNO" divided into syllables. It is observed that the transmission of the word "ONE" divided into syllables by the teacher and the perception and thought of the child are not identical, they are not the same. It is worth mentioning that there is NEITHER the understanding nor the comprehension of the word "ONE".

The situation with the teaching and learning of number in the preschool classroom is inconceivable, but it can be reformed, changed, and improved. 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 Organization of the word and the Evolutionary Method Learning to Read, which includes: software TOTEM 1.0 y 1.2, NOMOS 1.0 (Fokin, Ariceaga Paredes, & Perez Perez, Intelligent system in sensory y cognitiv development for the pre-reading stage, 2021) and Aprende a leer (Fokin & Ariceaga Paredes, Evolutionary Method for Learning to Read, 2021).

The Learn Number Method is extended with counting and arithmetic operations. Phase I is pre-symbolic and develops together with the acquisition of language and the formation of reading skills. The preschooler can construct the linguistic reality with the teacher.

Conclusions

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

It was shown that there is a principle that can be called universal, since it is at the basis for the acquisition, construction, and development of language and arithmetic.

References

- Empírico, S. (1997). Crítica del concepto Uno (11 - 20). En S. Empírico, *Contra profesores* (págs. 172-198). Madrid: Gredos.
- Empírico, S. (2014). *Ezbosos pirronicos*. Madrid: Gredos.
- Fokin, S. K. (2009). The Metaphysics of Sound: The Essence of the Non-Existent. *Science. Philosophy. Society. Proceedings of the V Russian Philosophical Congress. Volume 1. Novosibirsk: Parallel, pp. 55 – 56*. Novosibirsk, Russia: Parallel.
- Fokin, S. K., & Ariceaga Paredes, R. (2021). Evolutionary Method for Learning to Read. *Journal of Technology and Education*. DOI: 10.35429/JBE.2021.14.5.1.9, 1-15.
- Fokin, S. K., Ariceaga Paredes, R., & Perez Perez, T. (2021). Intelligent system in sensory y cognitiv development for the pre-reading stage. *Journal of Technology and Education*. DOI: 10.35429/JTAE.2021.13.5.10.19, 1-10.
- Hegel, G. F. (1929). *Encyclopedia of Philosophical Sciences / V., I 1, Moscow-Leningrad, 1929, p. 148*.
- Kant, I. (2001-2006). *Werke. Zweisprachige deutsch-russische Ausgabe*. Moscú: Nauka. ISBN: 5-02-034318-8.
- Parmenidas. (1914-1919). On Nature. En A. O. Makovelsky, *Presocratics* (págs. T. 1-3). Kazan.
- Piaget, J. (1953). *How children form mathematical concepts*. Scientific American. V. 189. No. 5. P. 74 - 79.

Ushakova, T. N. (2011). *El nacimiento de la palabra*. Moscú: Instituto de Psicología.

Vygotsky, L. S. (2008). *El desarrollo de los procesos psicológicos superiores*. Barcelona: Critica.