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The Transition From " Informal Knowledge / Formal Knowledge'' And Its Didactic Management System In Mathematics

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Abstract

The language is based on two essential sides: the semantic side and the syntactic one, but when we talk about the formal language, we associate spontaneously to this, the mathematics and data processing. Therefore, it is noted that the mathematical language does not comprise the semantic side, hence, the handicap of this language. The question which arises here: "can we highlight the semantic property in the mathematical language?"

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Keywords: Informal knowledge, formal knowledge, syntactic proprety, semantic proprety , Formal system symbolic system and Formalism.

Introduction :

Whenever high school's teachers of mathematics discuss between them, they agree that mathematics are a major obstacle to the learner(s).Usually, they attribute the problem themselves, and make them carrying the responsibility of the lowering of their level. The problem here attaches itself in reality to our pedagogical system and to the teaching system that gives the property in the study of the mathematics in the "property syntactic" to the determinant of the "semantic property ". It has to note, therefore that the interested oneself to the quotation syntax without paying attention to the quotation semantic.

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The question that puts oneself in this framework, if the formal (definite) knowledge explicitly is done, and the informal has done implicitly?

2. Problems :

1 - Mathematical objects referred by the education system constitute a sign, what is this existed element that sends back this sign?
2 - If the mathematical activity programmed by the education system is existed; what is the existed element that refers to an existed one?
3 - If the mathematical activity programmed by the education system is an abstract relationship, which is the element of existed (the sign) which returns with this abstract relationship?
4- What does the meaning of mathematical objects refer to?
5 -What is the mathematical reference for each object?
6-What is the matter of the each mathematical object?
7 -What is the role (place) of the syntactic property by the education system?
8 -What is the role (place) of the semantic property reserved by the education system?

3. Basic question of the item:

In the teaching skill works, as afterward in the works of educational ones, we should be very interested in the statute of the error, when the student commits it. And a little to its productions that do not behave any errors! A copy, or even a continuation of copies that would spread out themselves on a year or several years, and that do not present any error, does it mean for as much master by the student, author of these copies, conceptual system aims by the teacher?
This question arises when we consider that, as even regards the scientific speech itself, the form of mathematical reasoning defines the coherence, "...The mere fact that was conducted in its accordance standards immanent expelled by virtue of its content forms alone the forward wrong-ones" (Desanti J. T. 1975, p.11). We say that such a speech is endowed syntactic. It's the case of true particularly regulation of any calculation, that is to say, any demonstration made in a formal system determines: the construction by logicians such systems consists at the first place, as Gilles Gaston Granger well described in (Granger, 2003), the explanation of a finite set of rules, which is an homomorphic image of the whole system, which is designed so as whole productions (ie, calculation results) according to these rules, according to this author, the system of rules is set forth as belonging to a meta-language, since they denote properties of expressions of a formal construct, considered as it is, and we, enough naturally define the syntactic regulation as the presence of a meta-system, even within a system. *Errors that being anything other than malformed statements, their absence in the expressions presented by the student as productions of a formal system determined, would it be less due to some conceptual control that exercises the student only to the transformation, due to the use or construction, the meta-system standards immanent in accordance with which the computation takes place?*

4. Research of hypothesis:

With regard to formal symbolic systems included in the mathematics curriculum of Secondary Education, there are some rule formulations of these systems even preventing the use or construction of transforming these standards immanent in meta-systems according to which the calculation takes place by itself.

5. Theoretical Framework

5.1. Language:

A language is a set of signs (voice, graphics, tactile, olfactory,...) with semantics, and more often syntactic (but not systematic). More commonly, the language is a means of communication. Formally, if L is a set, we denote that L is the free-monoid of L *, i.e. all finite L sequences of elements, are equipped with the concatenation of two words. Language over the alphabet L by definition a subset of L*.

5.1.1. Symbolic system:

We call a set of symbolic system signs effectively given or effectively buildable. This definition emphasizes, seen on the closing character of all signs of the system.

5.1.2 Formal Symbolic System:

The proposed and discussed above definition of a symbolic system is intended to provide a minimal concept whose recognition should first effect to warn against the use of illegal properties postulation often too strong. We, now propose to identify the features of a particular kind of symbolic system, which we call formal (symbolic) system. Let us mention and fix ideas, three very different examples, suitable for mounting the extensions of the concept that we are trying to define: the classic elementary algebra, set of phonemes of a language, Morse code.

5.2. Formalism:

5.2.1 Definition :

"According to Klages, the formalism is thought by pure signs." Computer programs are good examples. It is thought that such submission to the rule, the agreement is more important than thought by reference to real. "The purpose of formalist thinking, says Klages is: results of thought achieved without the effort of thinking, no answers were found through research, the rule of the Spirit without the means established and the instrument of consciousness, which still depends to a part of life. Without doubt, the perfect formal would be a precision device without conscience, capable of a variety of reactions that could be disturbing and then dial or in a workshop building or in a still, like a homunculus. "
We spontaneously associate the notion of formalism in philosophy and mathematics, rightly, for it is within these disciplines that the word takes its clearer meaning. The numbers mean something (land, oil, railroads, workers, etc.), but they are themselves living a sovereign life, in the brains of wrestlers and not their significant value: the sign dominates the signified and thought by pure signs replaces thought by meaningful units, and even thought the through the concepts. Here, that consists the essence of formalism. "

6. Practical Framework:

6.1. Methodology Research:

The education system uses the active teaching mathematics, based on activities at the beginning of each lesson to give meaning to mathematical concepts but normally presented by the knowledge situations that do not always have semantic property, and finally we end by presenting the knowledge in syntactic form, then changing anything formal. So, the education system considers the student assimilating the semantic side, which may involve syntactic side we give.
To verify this observation we formulated a questionnaire dealing with the first-degree equation "$ax + b = 0$ <=> $x = \frac{-b}{a}$ "as syntactic property, and we presented three forms as semantic property, the projection will be made in the geometrical context. The questionnaire was distributed to thirty high school teachers, we note that: there is nobody of them have been able to extract the semantic property, knowing that they were given geometrical figures, which help interpretation. This means that teachers have become accustomed to working only with "the table of the syntactic property."
Then, we distributed a second questionnaire to thirty high school teachers using "the implication table truth". As syntactic property, we proposed by the semantic side the specific examples " see questionnaire" The result we found is that 44% responded "possible", 32% responded "contingent", 20% responded "a necessary condition" and only 4% who say impossible. "

We can represent the obtained results by the graph above:

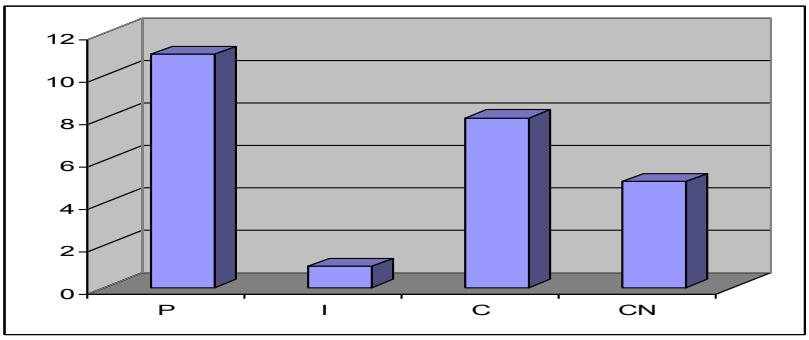

Figure 1

P: “possible” I: “impossible” C: “ fixes quotas for” CN: “a requirement”
The conclusion is that the minority refuses to investigate the proposed concept "P => Q " the minority said "impossible" hence the rest is not opposed to the way we teach this concept, especially since we had 44% who say it is possible.
Hence, we can say that the semantics facilitates intelligibility table truth for: "P => Q ".

In our article (point/item), we use the automata theory to highlight the property that represents the syntactic formal knowledge, and also we can use other contexts to represent the semantic property, such as the projection of an algebraic knowledge in geometric context "see the example of solving the equation of the first degree."

6.2.The study of first-degree equation "ax + b = 0":

I $-a \in IR^*$ and $b \in IR$: $x = -\frac{b}{a} \Leftrightarrow \left(\forall \lambda \in IR^*, \quad x = -\frac{\lambda b}{\lambda a}\right) \Leftrightarrow \lambda a x + \lambda b = 0$

$\Leftrightarrow$ $\begin{cases} \lambda a t + \lambda b = y_\lambda \\ y_\lambda = 0 \end{cases} \quad (t \in IR)$

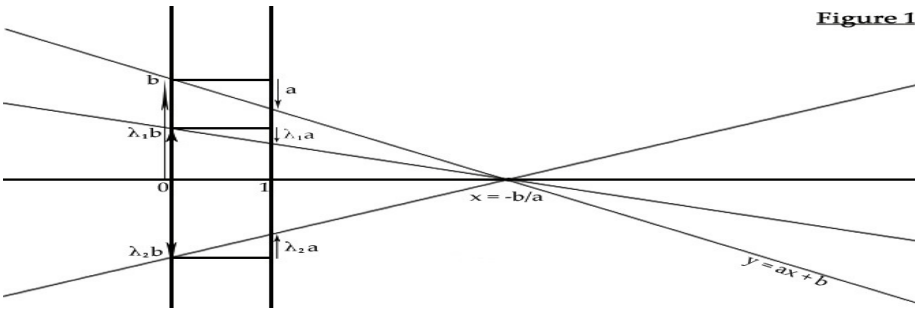

Figure 2

$\left(y_\lambda = \lambda at + \lambda b\right)_{\lambda \in IR}$ is the beam of lines passing through the point $\left(-\frac{b}{a};0\right)$

II $-a \in IR^*$ and $b \in IR$:

$$x = -\frac{b}{a} \Leftrightarrow \left(\forall \lambda \in IR^*, \quad \lambda x = -\frac{\lambda b}{a}\right) \Leftrightarrow \left(\forall \lambda \in IR^*, \quad \lambda ax + \lambda b = 0\right)$$

$$\begin{cases} \lambda x = t \\ at + \lambda b = 0 \end{cases} \Leftrightarrow \begin{cases} \lambda x = t \\ y_\lambda = at + \lambda b \\ y_\lambda = 0 \end{cases}$$

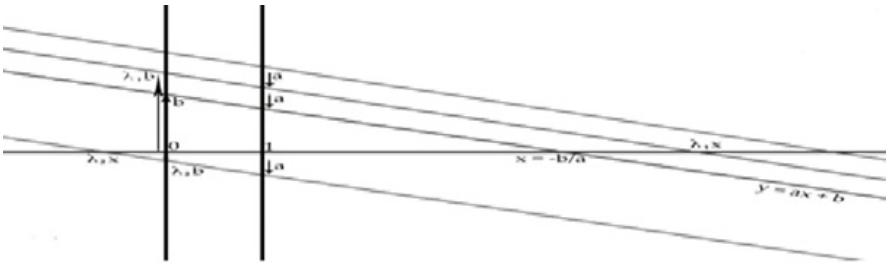

Figure: 3

$\left(y_\lambda = \lambda at + \lambda b\right)_{\lambda \in IR}$ is the beam of parallel lines to the line $\left(\Delta_1\right): y = at + b$

III $-a \in IR^*$ and $b \in IR$:

$$x = -\frac{b}{a} \Leftrightarrow \left(\forall \lambda \in IR^*, \quad \lambda x = -\frac{b}{\frac{a}{\lambda}}\right) \Leftrightarrow \lambda ax + \lambda b = 0$$

$$\Leftrightarrow \begin{cases} t = \lambda x \\ \frac{a}{\lambda} t + b = 0 \end{cases} \Leftrightarrow \begin{cases} t = \lambda x \\ y_\lambda = \frac{a}{\lambda} t + b \\ y_\lambda = 0 \end{cases}$$

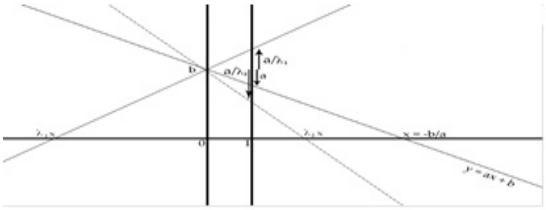

Figure: 4

$\left(y_\lambda = \frac{a}{\lambda} t + b \right)_{\lambda \in IR}$ is the beam of the passing lines through the point (0,b)

6-Conclusion :

From this work, it necessary seemed to look into the history of mathematics to understand the structure and epistemological foundations of this subject, and we must especially look in the "crises" that have marked its history, directing them to the axiomatization, which can be responsible for the current problems. Finally, we can contribute to building a good formulated reflection to exceed the educational problems and barriers that affect the teaching of mathematics.

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