# Grouping 10: the Software and Its Potential in the Construction of Mathematical Logical Knowledge

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## 1. Introduction

This paper present the development of a software called "grouping 10", in the form of educational game, which aims is to help the teacher who works in the first years of elementary school with the initial concepts in the area of mathematics using methodology based on the manipulation of significant resources for children: sticks and dice.
Thus, the game aims to contribute to the appropriation of mathematical concepts, especially of the notions of unity and ten (decimal system), as well as the addition, these concepts fundamental to the development of logical reasoning of math students. For this, we search as foundations for the development of this teaching resource the studies of Jean Piaget by showing that mathematical thinking develops through processes experienced by individuals [1]. As well as, the theoretical framework of Rangel [2] and Ferreira [3], among others authors, engaged in the study about the processes of teaching and learning of mathematics by children mediated by digital technologies (computer graphics, digital simulations and educational games).

## 2. The teaching of mathematics and theoretical concepts: some approaches

Having as theoretical studies related to Piagetians psychogenesis of the paragraph, we assume that the construction of the concept of number by the child does not occur directly, ie, only from the outside as predicted empiricist conceptions of teaching and learning. However, we know that long empiricism substantiate the pedagogical practices of the basic education schools. That understood that knowledge had its source outside the individual, leaving only the teacher to stimulate the senses of the learner to internalize them.
Following Rangel [3] these issues are not sufficiently clear to educators who propose interventions epistemological of empiricist nature, calling for the training and repetition of responses, believing that both the count and write, children learn the number.
Thus, from his studies, Piaget revealed that both the cognitive and logical-mathematical knowledge, occur from the establishment and coordination of relationships offered by the continuous interaction of the subject with the physical, social and cultural-historical.
In this direction, beyond the theoretical support focused on issues of teaching and learning in the early years of elementary school, the school experiences show us the importance of working with concrete objects and meaningful for the students. The experience of many teachers who work in the early years of elementary school, shows that the contact of children with materials of count as teaching strategy of critical importance to the learning of many mathematical concepts, involving, for example, sorting, classification, seriation, addition and subtraction.
We understand that this occur due the direct contact with concrete materials and playful, so according with the stage of the concrete operations in which children are yon of the stimulus and the emotions present in recreational activities. According to Piaget [1], the activity of intelligence requires not only continuous reciprocal stimuli, but also and above the mutual control and the exercise of critical spirit, the only individuals that lead to objectivity and the need for demonstration. The logic operations are, in effect, every cooperation, and imply a set of reciprocal relations and intellectual cooperation both moral and rational.
As we seek tools of the new technologies of information and communication as allies in the promotion of teaching and learning process, we consider the potential of these resources to promote meaningful learning in the educational context. In this sense, it is worth mentioning the words of PRETTO [4], when the author states that the technology should serve as a stimulus to the creation and ongoing production and not just mere tools trapped in the grids of school, whether the doors of computer lab or of the curricula. Therefore, we understood that the use of computer by both the student and the teacher needs to be designed as a tool in facilitating the organization of teaching and learning, as well as their educational value. Still, it must have meaning for the life of the school subjects teachers and learners, ie, must be integrated to the projects developed by the school in order of to expand and promote the learning of all involved.
It is worth noting yet the Rangel's words [3] when the author refers to a change paradigmatic that needs to be brought into educational settings to ensure the academic and success of all students. Research investigating the genesis of knowledge and the possibilities of intervention through education favoring the construction of knowledge by children, through different play resources and interactive environments, are necessary to promote teacher training and qualification of the action pedagogical committed to education in inclusive schools [3].
On this basis, we propose the following to present the software development "Grouping10", as well as the proposed integration of digital artifact as an object of learning in mathematics.

**2.1 O Software "Agrupando 10": ampliando espaços e tempos de aprendizagem**

Given the potential of new technologies of information and communication when linked to the pedagogical practices of teaching and learning, we propose to develop an educational software, built from the game "Grouping 10" which is usually applied with concrete material in the early years of elementary school with children aged 6 to7 years. This game was being used by a teacher who worked with the first year of primary education in order to build with their students the concepts of unity and tens.

To develop this activity the teacher used popsicle sticks, cubes numbered 01 to 06 ("dice") and rubber bands to the achievement of set  (which will form the tens).For this, the class was divided into small groups, each group received several popsicle sticks, rubber bands and two numbered cubes. Thus, each student should play the two cubes on the table and add the amount disclosed by them. From this, it should remove the pile of sticks the amount the sum of the cubes. When this sum result the quantity 10 or more the students should form a set tied them with the rubber band (then forming tens). If there remained sticks, the same would remain loose for adding the next moves. The game ended when no more sticks were left on the table of the group. If you still have popsicle sticks on the table, this remain loose to be added in the next moves. The game ends when no more popsicle sticks on the table of the group. At the end of the activity, the teacher with his students did the register of the quantities of set tied (tens) and not tied (units) of each member of the group, calling attention to the constitution of the formations in tens and units.

Given the degree of involvement and participation of children at play, provided meaningful learning, we are motivated to develop this game, turning it into an educational software. In the development this software we try to maintain the same characteristics of the traditional game, using representations of objects similar the sticks, numbered cubes (dice) and tied. Furthermore, we introduce the audio option in order to make it interactive and motivating for the child. We also seek to care the colors of your interface as well as its usability.

Figures 1 and 2, present the two main pages of the software where you can observe the main elements that constitute the game of "Grouping 10."

In the Figure 1 is showed the possibility of the user to choose the object to start the game. It is worth noting that among the four options set out the popsicle stick as one of the meaningful objects.



Figure 1 – Choose the toy play

In the Figure 2 is showed an example of the progress made by the user of the game "Gabriel", where the player selects the number of pencils (redframes) according to the amount represented faces of the dice.
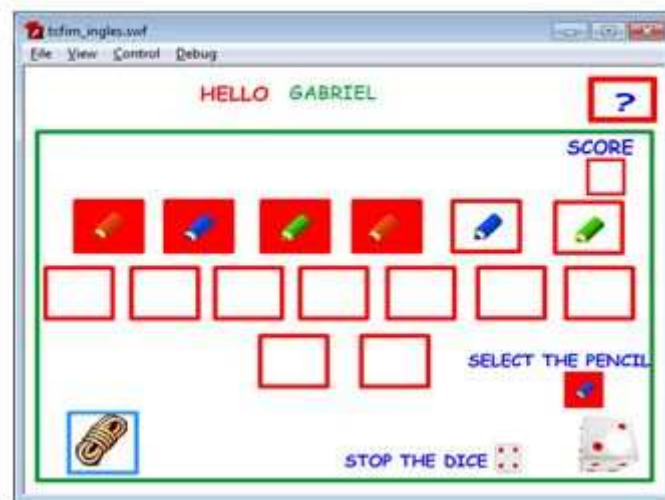
Figure 2 – Playing the game

We can see that the development of this software expands the opportunities for access to an educational tool, allowing the educator to propose activities that go beyond of the scope of the classroom. Also can count with teaching resource highly stimulating and meaningful for students considered digital natives, born by immersed in a world of new technologies. In this sense the advance of digital technology, allowing the re-use of scenes, images, sounds, simulations, texts, etc, has provided, very effectively, the creation of many learning situations that certainly becomes like an alternative to disposal of the educator [3].

### 3. Final Considerations
In order of to analyze the potentialities of software, as well as their integration in pedagogical practices of teachers, the system was inserted in the educational routine of an initial class of elementary school to enable their use by students.

According to the observations made so far by both the teacher of class as the development group, we can say that the system not only meets the expectations of making the teaching-learning process more attractive as enhances the teaching proposals of the teacher. Thus, encouraging the students to advance their assumptions about the quantification and numerical representation.

This set of observations has also served as a motivating factor in the search for new methodologies and consequent improvements to be aggregated in the process of system development.

Thus, we believe that effective integration of software "Grouping 10" in the proposals of the teaching will can contribute significantly in the learning of mathematics in the early years of elementary school, in view of its potential with regard to the appropriation of some numerical concepts. Therefore, contributes for the development of logical and mathematical thinking.

### References

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