

## FORMATIVE VALENCES OF LOGICAL-MATHEMATICAL GAMES FOR PRESCHOOLERS

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**Abstract** :Psychological research conducted in our century on the subject of play has emphasized the many psychological elements that shape this form of human activity. These are those psychological elements that define the game in general and which are sufficiently operative in preschool children. Through the presence and action of these psychological elements, children stand out and appear to us as beings with the personality under development, who think, act motivated by possibilities and aspire to perfection. At preschool age, learning (acquiring new knowledge as well as skills and skills training) has as its main feature the pleasant and attractive character of the activity. That is why at this age it is necessary to combine the elements of learning with elements of the game and this is done through a specific form of preschool activity, namely the didactic game. The introduction of generic, unifying concepts while learning mathematics does not imply acquiring them as an independent unit, but it cultivates a new possibility to understand mathematics through the dynamic knowledge of mathematical relations and classifications.

**Keywords:** learning, didactic game, knowledge, math, preschool age.

### 1. INTRODUCTION

From the very first months of activity in kindergarten, the child establishes the first contacts with a fundamental concept of mathematics - the notion of set. The game is a very precious helper, particularly entertaining in initiating set operations. One of the simple games in content and form, but having difficulty in solving compared to the preschooler's development level and welcome to complete, assimilate and impress the knowledge of the children is the logical-mathematical game.

These games play an overwhelming role in providing children with a logical and multifaceted reasoning that allows them to orient themselves in the surrounding realities and express judgments in an appropriate language. Logical games are one of the ways to achieve an active education, which by offering a dynamic role to intuition, emphasizes the action of the child on objects themselves. They are meant to put the child in a position to act, observe, compare and discover logical relationships and implications between real phenomena and things. Logical-mathematical games have proven their outstanding educational value to the actual development of children's intelligence. They contribute to the realization of the formative aspect of the mathematical activity, developing their logical thinking, because they are in a position to seek solutions and to verbalize the actions performed. These games develop the intellectual and actively-creative potential of the preschooler, the spirit of observation, the possibilities of verbalization and oral expression, the ability to analyze and synthesize, to compare, abstract and generalize.

### **The purpose of the research**

The present study aims to make a contribution to the expansion of the mathematical didactic game with a particular importance in the amplification of the formative activity of the kindergarten by the fact that it can be included in the structure of the common activity, thus creating a continuum between the learning activity and the game activity.

### **Research objectives:**

- Development of a set of logical-mathematical games necessary for the achievement of an active and qualitative education, which allows the children to focus on the issues of the surrounding reality;
- Expressing judgments and reasoning in a simple, familiar mathematic language;
- Presentation of mathematical activities performed by logic-mathematical games;
- Emphasizing the effectiveness of logic-mathematical games in stimulating thinking, observation, imagination, creativity and the development of mathematical language;

**The research hypothesis** was the assumption that if the logic-mathematical games will be intensively used in the educational-training process in kindergarten, higher intuitive and behavioral performances will be achieved.

## **2. ORGANIZING AND CONDUCTING RESEARCH**

The pedagogical research was carried out on a number of 40 subjects (19 girls and 21 boys). They are between 4 and 5 years old.

### **Presentation of the group and the working tools**

The following *research methods* have been used in this paper:

- observation;
- pedagogical experiments;

We used *research tools* such as:

- observation protocol;
- initial assessment test (individual worksheets);
- final assessment test (individual work papers).

**Observation** is one of the oldest and best known research techniques. It consists of intentional, methodical and systematic observation of a human subject, of mental manifestations in their natural development, and in the accurate recording of significant, essential facts. It is a method used to collect data and information related to the researched theme, which involves the intentional and systematic surveillance of objects, phenomena and events in a natural state under ordinary conditions of existence and manifestation in order to know them more deeply and to discover their essential features.

As a method of research, it implies the specification of the objective and the tasks of the observation, to establish the conditions for carrying it out, the development of the implementation program and the observation protocol with well-established observation indicators.

### **The pedagogical experiment**

"There is a close association between observation and experiment. The observation is in fact present in all methods of pedagogical research. The experiment is the method of researching the data necessary for the capitalization of the hypothesis (Muster, D. Methodology of research in education, Literary Publishing House, Bucharest, 1985).

In the experiment, the researcher deliberately provokes the phenomenon to be studied, repeats it whenever necessary, can change the conditions and can isolate the studied phenomenon.

## **3. STAGES OF RESEARCH:**

### **a) Pre-experimental stage:**

Collecting and using on the data provided by the current observation of preschooler's activity and behavior led to the knowledge of the used mathematical language, the personal working pace of each child and the level of involvement in their learning activity. At this stage, the behavior, attitudes and interest shown by the subjects in the mathematical activities were followed. For this an observation protocol has been developed and used.

Based on the analysis of established observational indicators, it was possible to determine the level of the subjects' involvement in the learning activity, the mathematical language used, and their working pace. During this stage, the two groups of subjects took an identical initial assessment test.

The initial assessment test was the starting point for establishing the didactic strategy used in the two groups of subjects. Starting from the data contained in these assessments, it was possible to analyze the knowledge of the subjects until the date of application of the samples on which is based the research.

**b) The formative stage of the research:**

At this stage, mathematical activities were carried out in both groups of subjects. In the control group, mathematical activities were routinely carried out by means of didactic games and exercises with individual material, and in the experimental group these activities were carried out through logic-mathematical games. During this period the experimental group has worked on evaluation forms.

**c) The post-experimental stage:**

It is the stage in which the results obtained by the two groups of subjects, the experimental group and the control group, were recorded, the differences were established, the data have been statistically processed and the results were interpreted. This was done with the final assessment test for which three performance descriptors were set with performance indicators for maximum, medium and minimum levels.

#### 4. PROCESSING AND INTERPRETATION OF RESEARCH RESULTS

After analyzing the responses for each observation indicator, one can observe the following: in the experimental group the attention of 85% of the subjects was held by the activities carried out, and the attention of 80% of the subjects was held in the control group. By looking at gender, girls are more likely to be caught up in the kindergarten activities than boys. In the experimental group, 80% of the subjects were fully involved in the activity and 75% in the control group.

It was observed that in the experimental group 80% of subjects respond only if they are asked by the kindergarten teacher and the remaining 20% are responding at their own initiative. In the experimental group, 55% of subjects gave closed responses and 45% of subjects gave complex responses while in the control group, 60% of subjects gave complex responses and 40% of subjects gave closed responses. In the experimental group, 70% of the subjects use a suitable mathematical language as compared to 65% of subjects in the control group.

From the analysis of the results obtained on each observational indicator it was found that the mathematical activities are of interest to the subjects, and the research will continue. Analyzing the results obtained after the initial assessment test, it can be noticed that the difference between the control group and the experimental one is relatively small in the subjects with very good and good results and the same for poor results.

Analyzing the results obtained at the final assessment test it can be noticed that there are no poor results in the experimental group, the percentage of the good results is relatively small, and the percentage of very good results is high.

Analyzing the results obtained in the two assessment tests (initial and final), it is noticed that in the experimental group there are no poor results, the percentage of the good results is lower and the percentage of the very good results has increased considerably. At the level of the control group the percentage of poor results decreased, the percentage being very low, the percentage of good results decreased, and the percentage of very good results increased.

Both groups of subjects experienced progress, but the results obtained in the control group were not at the level of the experimental group. These results obtained by subjects from the experimental group were recorded as a result of mathematical activities in the form of logical games.

*In conclusion, it can be stated that the research hypothesis is confirmed and the subjects achieved superior intuitive and behavioral performances.*

## 5. CONCLUSIONS

The logical game, as a way of educating and training preschoolers, consists of achieving an optimal combination of the objectives pursued, the content of the activity and the psychic particularities of the preschool age by translating the learning tasks into game.

This gives the child the opportunity to develop his / her creative capacity, performing without too much effort, an intense intellectual activity. In game he/she finds new ways of assimilation of knowledge, establishes links between facts, ideas, actions - the opportunity to accumulate other knowledge. Intellectual development of the child is taking place now, gradually assimilating some logical operations and structures, at first simpler and related to the direct action with the objects, and then more complex, specific to the operative intelligence and later to the hypothetical-deductive thinking.

In the logical-mathematical games, the emphasis is on the formative nature of the activity, aiming to prepare preschoolers for the learning process. It is specific to the game to be based on elements of set theory and logic, considered as basic elements necessary for the subsequent assimilation of mathematical concepts, aiming at the formation of the ability to think logically, to work with structures and logical operations.

In conclusion, it can be said that logical-mathematical games contribute to the formative aspect of the mathematical activities, by using them preschooler develop their capacity for analysis, synthesis, comparison, generalization and abstraction, they train the skill to act orderly with the objects, to correctly represented their objects and attributes. When working with geometric figures, children are asked to express themselves, but not in any way, but using correct, accurate, concise terms, to observe the rules of the game, to be polite with others. The fulfillment of the tasks imposed by the game cultivates the initiative, the independence and the perseverance to finish the game.

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