PROBLEM SOLVING FACTOR IN THE DEVELOPMENT OF LOGICAL THINKING IN PRIMARY SCHOOL

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Abstract: *Thought process is, first, the process of solving problems that are raising from the life and from the theoretical or practical work of man. This resolution is performed through the intercession of knowledge gained using the generalized experience of the past. The author presents the results of his research conducted on two groups of children in preparatory class with which we worked with differentiated stockings to improve math performance and thus to develop the logical thinking in small schoolchildren.*

Keywords:*small schoolchildren, logical thinking, problem solvin*

Introduction

Our century and future centuries thinking required to be increasingly creative and present and future man becomes easily adaptable to changes and inventive. Mathematical thinking - thinking modeling, heuristic, extend increasingly becoming the characteristic thought of human in general.

What characterizes the man is thinking, a process which deciphers the mysteries of nature and society and provides for their future development. Growing thinking is the most precious thing. Therefore, along with the issue of improving his own way of thinking it remains for the man an open question (E. Rusu, 1969).

Everything that is right thinking - says the academician Miron Nicolescu – is or mathematics, or likely to be mathematized. What will help you think faster than it does and especially without the risk of error in the decision? The answer is known for a long time. These are all methods, rules, concepts, facts, called mathematics" (Nicolescu, 1972, p.307).

Theoretical frame

The centrality of thinking is not only the fact that it involves all the other availabilities and functions (to go beyond appearances in essence, beyond form to content, beyond the particular to the general), but also in the fact that by setting up as a "main star" of the system, guides, leads, takes

advantage of other processes and functions (perception becomes observation, verbal communication that acquires meaning, subordinating to the logic rules, the will that specifies its goals based on prediction and it devises plans based on judgments etc.).

The processuality thinking goes, from one sequence to another, to certain products: ideas, findings, concluded cognitive systems. They re-entered the circuit and serve as the basis for new approaches and ways of thinking that never ceases to activate and adjust to new content and new tasks (Golu P., 1993).

"The thinking of small children becomes operative, it is reversible and setted by default logic, using true inductive reasoning; it becomes causal for simpler relations "(Schwartz, 2009, p.124).

Thought process is, first, the process of solving problems which are posed by the theoretical or practical life and work of man. This resolution is performed through the intercession of gained knowledge and by using the generalized experience of the past. In search of an answer, the man makes various assumptions, usually in inside language on the mental plane, then the solution found is tested in practice, which is controlling the veracity of hypothesis, its confirmation or rejection. The human experience is richer, how their knowledge are more numerous, more precise and deeper, the thought process will be more effective.

In thinking process the man does not use isolated concepts, but the whole chain of concepts.

The links between concepts that reflect the connections and relationships between the objects and phenomena of the real world are called judgements. To form a judgment means to assert or deny anything about a thing. The judgements, in turn, bind to each other, forming reasonings. Based on the reasoning by confronting data and setting judgments of them, new judgments are obtained. Reasonings are inductive, deductive and by analogy (Iacob, 1999).

Between psychological processes and learning there are relationships of independence. On the one hand learning activity involves all the mental processes and functions such as the observative perception, the images of representation, and overall imagination, especially the thinking and the memory, motivation and affectivity, and especially language, will and attention. On the other hand, learning, especially in its intensive forms, contributes to shaping, structuring, even setting up mental processes because not only enriches the content but also requires the construction of new operator means, of restructuring or special organizing within the whole system of human psyche. Therefore, it is considered that learning is in various degrees generative or formative and constructive.

Cognitive learning contributes and supports the development of analysis and synthesis, abstraction and generalization of the comparison and classification of algorithms and heuristics, of the systematization and logical organization of thought.

In the center of cognitive learning process is the informational content cognitively assimilated. Cognitive learning is integral to full and thorough understanding of the studied material and proposes cultivating intelligence. The most active and fruitful strategy of the cognitive learning is questioning (presentation of the materials as problems) and, generally, problem-solving activity.

Especially, by resorting to heuristics can lead to creative performances. Because cognitive learning is not limited to the correct assimilation of scientific knowledge but tends toward their consistent development and their applied recovery.

In the mental development of the human being, individual characteristics, particularities of the various psychic phenomena print a specific note development, its own rhythm of growth and transformation, differing from one individual to another, with the personal touch that is rooted in its biopsyhic potential as well as in the environment conditions in which he lives (Lievegoed, 2011).

The process of acquiring knowledge, skills and training skills during small school period, becomes a special form of activity of the child, distinguished from all other forms of his activity. This complex form of activity - learning - can not be fulfilled without the direct contribution of thought – a psychological process specific to human function.

In the learning context takes place the preparation of development phenomena: developing is prepared and accumulates its data. The development is explained by learning and learning finds its significance extending in development.

To learn something means to acquire, to transfer that thing in an internal quality, a tool that you can use to easily solve problems arising. But it also means development because the main indicator is the achievement of internal benefits - acts of understanding, flowcharts memory, creative thinking strategies in approaching the tasks, internal motivation for work etc.

Important progress throughout schooling are achieved by the thinking process, consisting mainly in the development and retrofitting of logic-mediated constructions which are reversible - that replace empirical, intuitive, naive processes of the previous stages. The logic constructions take the form of judgments and reasoning that allow the child that beyond his immediate sensorial experience, to foresee certain permanence, certain invariants, such as, for example, the amount of material, weight, volume, time, speed, space (Piscoi, Bonchis, 1991).

Small schoolchild stands in a considerable increase in intellectual potential. This is the natural consequence of direct and orderly knowledge development, realized through lessons and through the inferred, additional, latent learning, involved in the scientific knowledge as a whole. Following the imposition of the adult system of thought, according to a definition or a rule, a plan, a model, a diagram, a principle which organizes rules, rules of operation will have an active role in the development of thinking of the small school children.

Organizing the intellectual plan can be approached from three directions: the subordination of knowledge in the domain of a specific plan in which knowledge is expressed through concepts subordinate and superordinate (logically) to reflect the reality; subordination of mental operations to some rules that contain given sequences of analytical steps involved to solve problems in a particular field; finding the operations to follow for solving a problem, subordinating any ideas formulation to the rules of formulation (Cheta, Binchiciu, 2009).

The notion of problem is not encountered only in mathematics. As stated G. Polya (1971, p.141), "to have (or to put) a problem is to seek consciously an appropriate action to achieve a clearly designed purpose, but not immediately accessible. Solving a problem means finding such an action".

Radu I. - shows that problem solving alternates, usually, systematic strategies - sometimes algorithmic - and heuristic strategies. In the frame of systematic strategies search of the solution, which often correspond algorithms, we are dealing with processes (plans) including schemes of work fixed in precise prescriptions, which can be learned and applied to various kinds of problems and gives the certainity of the result (1983).

Methodology

Hypothesis

Hypothesis: Solving and creating mathematical problems using various methods and team work in mathematics lesson helps to improve significantly the school performance and positively affects the percentage of students who achieve better ratings to final evaluation.

Null hypothesis: Solving and creating mathematical problems using team work consistently maintain the same percentage of students who obtain the same qualifications both at initial assessment and final assessment.

Objectives

- to know the level of intellectual training of students;
- to measure and to assess the progress;
- to detect gaps and identify concepts that are learned with difficulty;

- to highlight the role that solving and creating mathematical problems have in logical development of tinking, in fostering creativity of primary school students.

Samples

The two classes that were involved in this pedagogic research project were two preparatory classes whose level proved to be worth close.

Used methods

To the experimental sample (ES) we applied as an intervention method solving simple problems, game problems, agility problems using cooperative learning, group work and the didactic game.

Results

In the pre-test (February 2016) we applied to both classes, experimental and control, an identical assessment test, which focused on the contents studied during the first semester (see table 1 and figure 1).

TABLE 1

Initial evaluation results in the two classes involved in the experiment

Sample	Number of schoolchildren	Realised (R)	progress (P)	Non-realised (N)
ES		4		3
CS		4		2

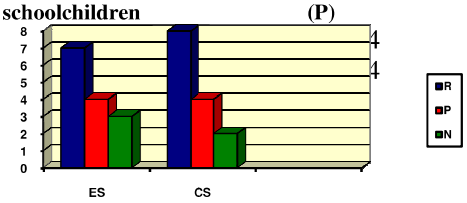

Figure 1. Initial evaluation results in the two classes involved in the experiment

Statistical analysis of the data shows that the number of students who have achieved the tasks is higher for the control sample - CS; the number of students under construction (in progress -P) is equal, and the number of students who did not realised the tasks is higher in the experimental sample - ES.

For the *experimental intervention stage* (February 16-April 30) – we act only on the experimental sample.

The concept in which has been constructed the new math curriculum aims to:

Changes in contents approach

- that means the replacement of theoretical content with a variety of problematic contexts to develop students' mathematical abilities;

Changes in what is expected of the student:

- mechanical application of the algorithms will be replaced by the use of strategies in problem solving;

Changes in learning:

- shifting of the emphasis from memorization and repetition activities in exploration and investigation;
- fostering cooperative attitude;

Changes in teaching:

- changing the role of the teacher from,,transmitter of information" to an organizer of various learning activities for all children regardless of their own level and pace of development of each.

At the end of the experimental intervention stage were compared all the results of schoolchildren from the two classes (the experimental sample ES) - the one over which we intervened with new ways of teaching by using solving teamwork of problems and the control class (CS) - the one on which we do not intervened, continuing teaching in traditional version.

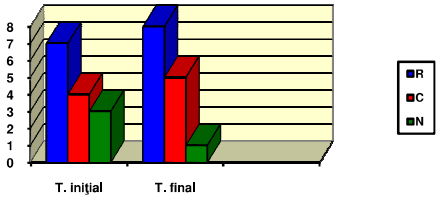

Fig. 2 - Comparison between the results of the initial and final test for the childrenschool of the experimental sample (ES)

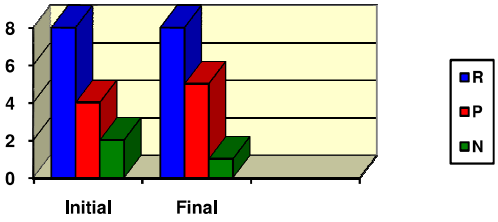

Fig. 3 - Comparison between the results of the initial and final test for the childrenschool of the control sample (CS)

The comparative analysis of the results highlights the following issues:

- In the experimental group the number of students who have completed the tasks (R) has increased;

- The number of students who obtained performance (P) increased both in the control group and the experimental group.

Based on these concrete observations we can say that *the hypothesis* stated at the onset of experimental research, namely that solving problems contributes to significant improvement in school performance *is confirmed* and the null hypothesis, that problem solving keeps constant the percentage of students who achieve the same grades, to the initial assessment and final assessment, is refuted.

Analyzing the results we have seen the progress of each student. In addition, based on direct observations, we noticed that the atmosphere in the classroom was one of elation, students solved problems with pleasure without fatigue or worse, boredom.

According to statistics it is observed that if we know our resources (work done by the initial assessment), if we design the teaching knowing all its aspects, if we use methods that stimulate all students, the success is guaranteed.

Conclusions

A flexible and fluid thinking is that by which can be driven all the other mental processes, and the student manages because his thinking to adapt to the changed conditions he faces in school and beyond.

Starting from this idea we have demonstrated in this paper that solving problems is difficult for students, but made methodically, merged, where possible, with the game and held within the frontal individual work, but also in teams work, has as a result the development of logical thinking to schoolchildren and the forming of creative behavior and the performances give to the students the satisfaction in activity.

In the experiment we organized and conducted, we suggested as objective that frequent use of the activity of solving and creating various problems lead to acquire knowledge and understanding of mathematical concepts. The paper highlighted the idea that confirms the hypothesis from which we started namely that solving problems increases the efficiency of acquiring mathematical concepts and thereby is useful to children's school progress.

The results obtained by the application of knowledge tests led to the following findings:

- The problems are within those motivational situations having efficiency in that that it mobilizes the child;

- children’s results at tests are superior;

- the teamwork trained also the children with poor results, eliminating the fear of mistake, shyness, discouragement;

- children are developing team spirit, are forming habits of civilized behavior and a creative and tolerant conduct.

The children managed through arithmetic and perspicacity problem solving, to make progress in learning activities, facilitating assimilation of mathematical concepts, which fully confirms the hypothesis proposed.

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