

Research activity as a means for the formation of cognitive-analytical skills in a younger student

Actividad de investigación como medio para la formación de habilidades cognitivas analíticas en un estudiante más joven

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ABSTRACT:

The article discusses the results of the experiment on the approbation of the model of the formation of cognitive-analytical skills in a younger student using research activities, based on a study of 48 students of 7-8 years old. The analysis revealed that the most significant changes occurred in the indicators of the cognitive component of younger students in the EG, in which almost all students demonstrated knowledge of the basic logical operations.

Keywords: Younger student, cognitive-analytical skills, research activity

RESUMEN:

El artículo discute los resultados del experimento sobre la aprobación del modelo de formación de habilidades cognitivas analíticas en un estudiante más joven que utiliza actividades de investigación, basado en un estudio de 48 estudiantes de 7-8 años de edad. El análisis reveló que los cambios más significativos ocurrieron en los indicadores del componente cognitivo de los estudiantes más jóvenes en el GE, en el que casi todos los estudiantes demostraron conocimiento de las operaciones lógicas básicas.

Palabras clave: Estudiante más joven, habilidades cognitivas analíticas, actividad investigadora

1. Introduction

In today's fast-paced world, a person's ability to learn throughout life is an urgent need. Among main elements of the ability to learn, researchers include logical thinking techniques and general abilities (Talyzina, 1988) and reflexive and productive actions (Tsukerman, 2000). One of the most important components of learning to learn are cognitive-analytical skills. The formation of these skills should be started at a younger school age, because without them, full-fledged mastering of educational material is impossible neither in elementary nor in high school.

Cognitive-analytical skills in their nature are a synthesis of cognitive and analytical competencies. The concept of "cognitive competence" is actively considered in the works of modern researchers (Vorovshchikov, 2006; Zeer, 2000.; Zimnyaya, 2004; Khutorskoy, 2007), and the connection with the younger school age (Davydov, 1981; Shchukina, 1979; Makhmutov, 1975; Pidkasisty, 1980; Volchegorskaya, Chernykh 2019). In our understanding, the cognitive competence of the younger student is the quality of the personality which is formed in the course of the educational process and is expressed in the readiness and ability of the child to motivated cognitive activity.

As for analytical competence, it is defined as the ability to accumulate theoretical knowledge and skills through self-education based on logical thinking, systematization, and interpretation of information (Trofimenko, 2011; Maslakova, 2015; Fedosov, 2014; Volchegorskaya, 2018). Studies on the specifics of the formation of analytical competence in primary school age are few (Piguzova, 2007). In our view, analytical competence is the quality of a person, expressed in the readiness and ability of an individual to perceive information and make decisions using logical thinking operations. Thus, cognitive-analytical skills are an integrative quality of an individual, determining its readiness and ability to implement cognitive mechanisms, acquire new knowledge and skills based on analytical operations of analysis, synthesis, comparison, synthesis, classification.

One of the ways to solve the problem of successful formation of cognitive-analytical skills in a younger student can be the use of the method of research activity in the educational process. B.E. Raikov determined it as a method of making new judgments from specific facts independently observed by students or reproduced by them in the course of the experiment (Raikov, 1960). A.S. Obukhov, under the term "research activity", understands the joint work of a student and a teacher in the discovery of new knowledge. This activity is always creative and informative, as a result of which the child masters the ability to see problems, formulate and ask questions, and find answers to them independently (Obukhov, 2006). A.V. Leontovich treats students' research activities as the solution of an experimental problem of an experimental nature, the result of which is unknown in advance. In the course of work on educational research, students go through the main stages inherent in research in the scientific field (Leontovich, 2003). A.I. Savenkov defines children's research activities as one of the forms of intellectual work that includes elements of creativity. This work is always based on the search activity of the child (Savenkov, 2006).

Many researchers considered the possibilities of applying the research method in the educational process, however, there is no work on the study of the relationship between educational research and the effectiveness of the formation of cognitive-analytical skills among younger students. Meanwhile, the research method of teaching skillfully "woven" into the lesson and extracurricular activities allows you to teach children to learn, i.e. to think correctly, independently observe and study the surrounding reality, record the observed phenomena not only verbally, but also graphically, comprehend and draw logical conclusions based on the information received, make correct, balanced decisions and predict all possible results of their activities.

The solution to the problem of formation of the basic cognitive-analytical competence of the younger student lay in the development and implementation of the pedagogical model, the core of which is the idea of letting a child become a "builder and architect" of his cognitive initiative through the use of research tools.

The model that we have developed includes four interdependent and interdependent components. The motivational-targeted block forms a positive motivation of the younger student to research activities through the creation of an enabling environment and teacher's actions aimed at activating the cognitive need of the younger student. The content block is aimed at acquiring knowledge about the stages, the structure and logic of constructing an academic study, planning and conducting an educational experiment, and formatting the results of its research activities. The procedural unit determines the forms, methods, means and stages of the formation of the foundations of cognitive-analytical competence in the younger student by means of research activities. The evaluation and performance unit performs diagnostic, analytical and generalizing functions and determines the effectiveness

2. Methods

48 primary school students of the initial classes of the control (CG) and experimental (EG) groups were included in the sample population. We carried out the quantitative characterization of the levels of formation of cognitive-analytical skills in the younger student according to four criteria: motivational, cognitive, activity and reflexive. The following diagnostic tools were selected:

1. Questionnaire Ch.D. Spielberg (modification A.D. Andreeva) "Diagnostics of learning motivation and emotional attitude to learning" (motivational criterion) (Andreeva, 2004);
2. test diagnostic work on the evaluation of such indicators as knowledge of the main types of text, knowledge of the structural parts of the abstract, logical operations, stages of solving a problem task (cognitive criterion);
3. test E.F. Zambacevichene "Determination of the level of mental development of children" (Zambatsyavichene,1984); integrated test work "Determining the level of development of cognitive skills" (activity criterion);
4. methods of A.Z. Zack "Anagrams" and "Diagnosis of the features of the development of search planning" (reflexive criterion) (Davydova, 1990).

Three levels of development of these skills were identified: creative, reproductive, and intuitive. In a generalized form, the levels of formation of cognitive-analytical skills in a younger student are characterized as follows:

- *creative level* - students own and use the full range of cognitive-analytical skills, if necessary, know how to creatively apply them to solve new non-standard tasks;
- *reproductive level* - students own and use the full range of cognitive-analytical skills to solve standard problems, but find it difficult to solve new problems, where a creative, non-standard approach to solving the problem situation that arises is required;
- *intuitive level* - students partially possess cognitive-analytical skills, find it difficult to apply these skills in practice, solving an educational problem requires an algorithm of actions, help from friends or a teacher (Ryabova, 2017).

3. Results

Obtained at the ascertaining stage of the experiment, the results of the formation of cognitive-analytical skills in younger students are presented in Table 1.

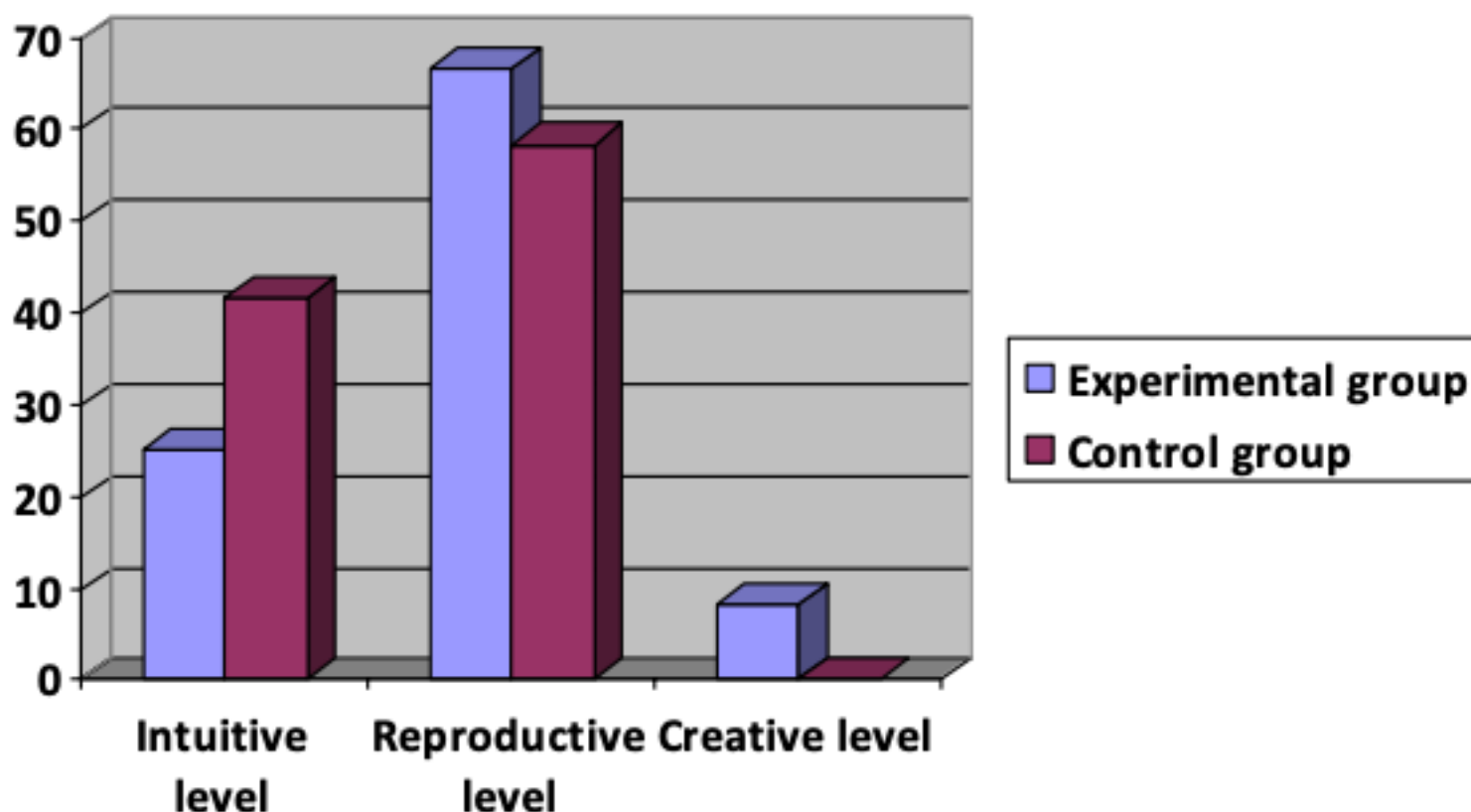
Table 1
Indicators of the input slice on the assessment of the initial level of formation of cognitive-analytical skills in younger students of the CG and the EG at the ascertaining stage of the experiment

Group	Qty inGroup	Levels of formation of cognitive-analytical skills in a younger student					
		intuitive		reproductive		creative	
		Abs.	%	Abs.	%	Abs.	%
CG	24	10	41.66	14	58.33	0	0
EG	24	6	25.00	16	66.66	2	8.33

The distribution of primary school students participating in the experiment, according to the level of development of cognitive-analytical skills at the initial section, is clearly shown in Figure 1.

Figure 1

The distribution of students in the EG and CG according to the levels of formation of cognitive-analytical skills (initial section)



According to the results of the zero slice, it was revealed that before the start of the experiment, only 4.1% of the students demonstrated the creative level of development of the skills studied. More than half of the children (62.5%) of students use the full range of cognitive-analytical skills to solve standard tasks, but they find it difficult to solve new problems, where a creative, non-standard approach to solving a problem situation arises. One third of children - 33.33% - possess these skills only on an intuitive level. To assess the correctness of the formation of the EG and CG, we used Pearson's chi-squared criterion, which revealed that the difference in the ratio of students with the intuitive, reproductive and creative level of development of cognitive-analytical skills in the EG and CG groups is statistically insignificant.

The results of the empirical study also revealed that the indicators of cognitive and activity criteria of the level of development of cognitive-analytical skills are the most poorly developed among younger students (see Table 2).

Table 2

The severity of the criteria for the formation of cognitive-analytical skills among younger students of the CG and the EG at the ascertaining stage of the experiment

Criteria /Level manifestations of the criterion	Motivational criterion		Cognitive criterion		Activity criterion		Reflective criterion	
	Abs.	%	Abs.	%	Abs.	%	Abs.	%
Criterion not expressed	9	27.75	45	93.75	1	2.08	0	0
Low level	26	52	3	6.25	33	68.75	19	39.58
Average level	11	22.91	0	0	14	29.16	23	47.91
High level	2	4.16	0	0	0	0	6	12.5

So, almost all students (93.75%) do not have an idea about the main types of reading, they

do not know the main ways of cognitive activity and the basic logical operations. Almost two thirds of children (68.75%) cannot read information in the form of graphs, diagrams, illustrations or tables; they find it difficult to define a goal, do not know how to single out signs of similarity / difference of objects, distribute objects according to a given criterion, divide a simple object into parts, arrange parts in a certain sequence or make a simple plan. A third of schoolchildren show no interest in cognitive activity. When difficulties arise, the children do not seek to overcome them, they do not strive to achieve success in learning, practically without showing an emotional attitude to cognitive activity.

The most developed were reflexive skills. Thus, almost half of the children surveyed (47.91%) were able to independently assess the possible results of their cognitive activity, be ready to review their actions if the goal was not achieved or the results of the activity did not satisfy the child.

After the introduction of the model developed by us, the final cut was made. The purpose of this slice is to determine the level of development of cognitive-analytical skills in the experimental and control groups; evaluation of the effectiveness of the educational process developed by us in the educational model of the formation of cognitive-analytical skills through research, as well as determining the degree of influence of the proposed structural-functional model on the level of formation of each component included in the cognitive-analytical skills.

The assessment of the level of development of cognitive-analytical skills among the younger schoolchild at this stage was carried out using the level scale and criteria developed by us, which were used at the stage of the control section. The results of the final slice are presented in table number 3.

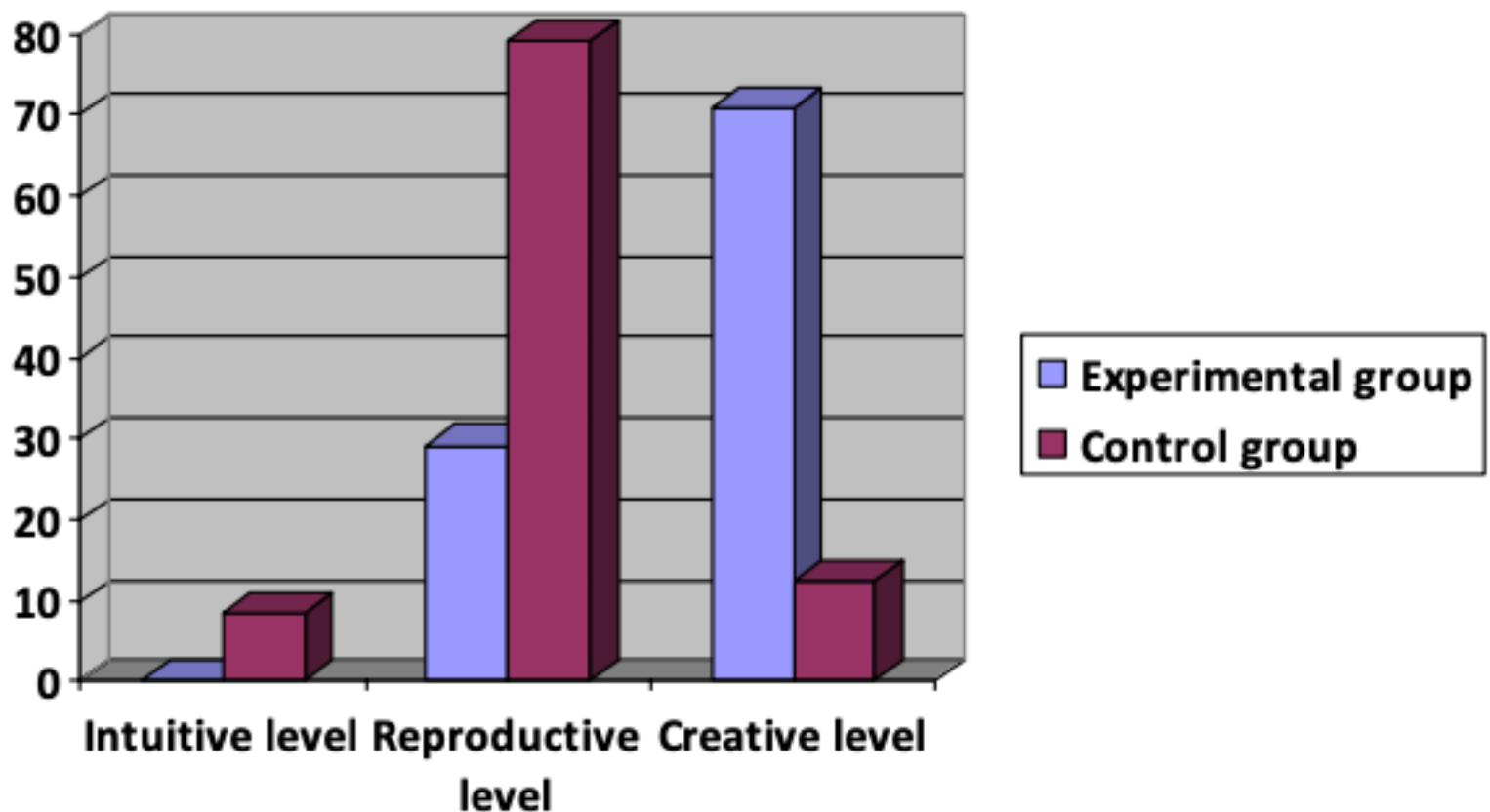
Table 3
The dynamics of the level of formation of cognitive-analytical skills in younger students in the CG and the EG

Group	Qty inGroup	Levels of formation of cognitive-analytical skills in the younger student					
		intuitive		reproductive		creative	
		Before	After	Before	After	Before	After
KG	24	41.66	8.33*	58.33	79.16	0	12.50
EG	24	25.00	0*	66.66	29.16*	8.33	70.83*

Note: * - statistically significant difference between the studied groups at the critical level of significance $P \leq 0,01$.

The distribution of primary school students participating in the experiment, according to the level of development of cognitive-analytical skills at the initial section, is clearly shown in Figure 2.

Figure 2
The distribution of students of the EG and CG according to the levels of formation of cognitive-analytical skills (final section)



Thus, in the EG, not a single child was identified who was at the intuitive level of development of cognitive-analytical skills, and the number of students with creative levels increased by 62.5% compared to the results of the zero slice. It is worth noting that positive dynamics was also observed in the CG, however, no statistically significant increase in the reproductive and creative indicators of the development of cognitive-analytical skills in the CG was found.

As for the influence of the model developed and implemented by us on the development of each component of cognitive-analytical skills, the analysis revealed that the most significant changes occurred in the indicators of the cognitive component of younger students in the EG, in which almost all students (95.2%) demonstrated knowledge of the basic logical operations, understanding the essence of the definitions of "problem task", "outline", "abstract".

4. Conclusions

Thus, we can conclude that the implementation of the developed model of the formation of cognitive-analytical skills in a younger student by means of research activities and the use of the whole complex of pedagogical conditions provides a higher level of development of the skills studied in primary school students.

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