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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

THE FORMATION OF THEORETICAL THINKING IN YOUNG SCHOOLCHILDREN

Speciality: 6104.01 – "Pedagogical psychology"

Field of science: Psychology

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INTRODUCTION

Relevance of the topic and degree of eloboration. The contradictions of the modern age, the development of our society and the increasing problems caused by this evolution, the various problems encountered during our daily activities, require that each individual (parents, teachers and psychologists) react independently to changes in life and it necessitates a holistic view of interdependence in different processes of society and nature, as well as developing a personality that can approach theoretical and practical problems in a non-standard and flexible way. A non-standard view of the problems faced, the ability to find effective solutions to these problems and the ability to see such paradoxical features in ordinary objects set us the task of going beyond the limits of the template thinking we are used to and developing the ability to approach problems within the framework of "flexible thinking".

In addition, the interest in studying theoretical thinking arises from the fact that in modern times, schoolchildren's practical approaches to the problem of theoretical thinking are not sufficient. Its practical importance for pedagogical activity reveals the necessity of studying the psychological regularities and mechanisms of the formation of theoretical thinking in young schoolchildren. Today, the problem of learning the essence of theoretical thinking is quite relevant, because its solution is the basis for building an effective educational system aimed at activating the intellectual capabilities of young schoolchildren. Taking into account the growing interest in this problem, psychologists try to identify and clarify its underdeveloped psychological regularities.

The complexity of the problem arises from the fact that the manifestation of theoretical thinking in young schoolchildren is not adequately explained in the psychological literature, its essence and psychological mechanisms, and as well as the methods of development have not yet been adequately expounded. Taking into account the insufficient level of development of the problem of theoretical thinking in young schoolchildren and its practical importance for pedagogical practice, this work focuses on researching and analyzing the above-mentioned issues and studying the psychological mechanisms of theoretical thinking.

In general, before conducting research on any topic, it is necessary to take into consideration the level of its researching in various literatures. It will allow any person to take the right direction in his research work, and at the same time refer to reliable sources in the analysis of theoretical issues. When we examine various psychological literatures, we find that the works of many foreign, Russian and local psychologists contain practically important information on this topic.

The study of the problem in the scientific, theoretical, practical, socio-historical aspects showed that pedagogical communication, pedagogical thinking and the relations between teachers and students have been sufficiently investigated by both foreign and Azerbaijani scientists. Of course, it is crucial to examine the issue from the perspective of the contemporary demands of society, the educational system, the dynamic nature of education, as well as national characteristics, referring to the conducted researches.

The problem was investigated in a general theoretical aspect by L.S. Vygotsky, A.R. Luria, A.N. Leontiev, J. Piaget, P.P. Blonskaya, A.V. Brushlinsky, S.L. Rubinstein, J. Gilford, E. Torrens, M. Wertheimer, K. Dunker and others.

In modern times, it is difficult the significant increase in the flow of information makes it difficult to promptly update the content of educational programs in accordance with the pace of acquiring scientific knowledge. When reforming the education system, the main focus is on primary education. As the intellectual potential of the students accumulates, furthermore, the cognitive interests and learning activity develop in primary classes. (V.A.Krutetsky, L.V.Zankov, D.B.Elkonin and others.).

Junior school age has profound potential for personal development. L. I. Boyovich, A. A. Lublin, L. M. Friedman and other emphasized the importance of a positive socio-psychological environment that enables the child to quickly master the initial requirements of the school and to become actively involved in the educational process. N. F. Talizina, N. A. Menchinskaya, M. I. Mahmutov and others indicated that one of the main reasons for failure is the inability of the student to learn. In order to teach children to study independently, to investigate the phenomenon, namely, to make them subjects of education, it is necessary to improve

their independent and theoretical understanding in the lower grades.

Properly planned learning activities in elementary and secondary school classrooms, mastery of theoretical concepts and knowledge systems, and a variety of other crucial factors enable the development of theoretical thinking. This way of thinking necessitates not just familiarity with the content, but also with the layout of "ideal products", (V.V.Davıdov, D.B.Boqoyavlenskaya, S.E.Kovalyov, L.K.Maksimov, M.A.Kholodnaya, A.Z.Zak and others.). The works of V. V. Belich, R. A. Atakhanov, X. J. Taneyev, L. S. Yakupova and others are dedicated to the study of the regularities of empirical and theoretical thinking. A.B. Vorontsov, V.A. Gurujapov, O.S. Ostroverkh, D.B. Elkonin, and others demonstrated the importance of psychological-pedagogical diagnosis and the establishment of each child's individual educational trajectory in primary classes, as well as systematic and comprehensive monitoring of the young schoolchild's overall development level (as well as theoretical thinking).

Psychologists and educators in Azerbaijan have also made significant contributions to this field of study. The issue was examined from the perspectives of personality, development and age, pedagogy, and social psychology by A.S. Bayramov, A.A. Alizade, A.A. Gadirov, B.H. Aliyev, M.A. Hamzayev, K.R. Aliyeva, R.I. Aliyev, A.N. Abbasov, I.I. Aliyev, H.A. Alizade, R.H. Kadirova, R.A. Javadov, O.F. Karimov, S.N. Aliyeva, M.H. Mustafayev, and R.V. Jabbarov. A.S. Bayramov studied the developmental aspects of thinking in young schoolchildren, emphasizing the value of independence and critical quality. Among the psychological issues with the modern school, A. Alizade identified the significance of the shift to the "school of thought" and the core of the new educational philosophy. A.A. Kadyrov studied how abstract thinking evolved during the elementary school years and the issue of abstraction's characteristics during this age period.

Cognitive activity, theoretical thinking, the pedagogical process, etc. have all been thoroughly examined in the conducted researches. But given how intricate and nuanced the issue is, it is challenging to claim that every part has been addressed. This approach clearly shows that the subject is of special relevance.

The object of research: It forms the process of development of theoretical thinking and psychological regularities.

The subject of research: It creates pedagogical and psychological conditions for the development of theoretical thinking in young schoolchildren.

The aims and objectives of the research: The major goals of the research are to ascertain the features of young schoolchildren's theoretical thinking development during the training process, to review those characteristics in a new context, and to examine each of its subtleties.

To achieve this goal, the following scientific-theoretical tasks need to be solved:

1. To give general characterization of thinking as a cognitive process.
2. To reveal the epistemological and psychological essence of theoretical thinking, to determine the place and importance of theoretical thinking in the cognitive activity of a person as a whole, to specify the main propositions on which the research is based.
3. To investigate the manifestation of theoretical thinking in young schoolchildren, its psychological characteristics and development dynamics.
4. To reveal and describe pedagogical conditions aimed at the formation of theoretical thinking in young schoolchildren
5. To determine the indicators and criteria of the formation of theoretical thinking in young schoolchildren.
6. To reveal the influence of educational materials with different contents on the character and development of theoretical thinking in young schoolchildren.
7. To investigate the possibilities of theoretical thinking in the context of teaching different disciplines.
8. To investigate the possibility of arranging educational subjects in a new order.
9. To conduct diagnostic studies to determine the level of theoretical thinking development in young schoolchildren.
10. Testing the effectiveness of pedagogical conditions for the formation of theoretical thinking in young schoolchildren in practice.

Research methods. The research was based on the works of P.Y. Galperin, V.V. Davydov, A.K. Markova, A.G. Asmolov, as well as, A.Z. Zak. Also, it was also referred to the existing scientific provisions and experiments and a comparative analysis was carried out based on works such as, "Unity of Consciousness and Activity" (S.L. Rubinstein 1957, A.N. Leontyev 1972, 1983), "Theoretical and Empirical Approach to Problem Solving" (S.L. Rubinstein 1958, V.V. Davydov 1972), V.V. Rubsov 1987), "Formation of mental activity by stages" (P.Y. Galperin 1965), "Conditioning of children's mental activity by the content of training" (V.V. Davydov 1986, D.B. Elkonin 1989 year, V.V.Rubsov 1996). In the study L.A. Venger's "Perceptual modeling", S.K. Ivankova's "Sequential explanatory design", S.Y. Subotin's "Color the figures" and V.M. Kogan's "Methodology for determining the development dynamics of mental activity", including L. I. Arshavina's "Strip" and "Find the figure" methods, A. Z. Zak's "Anagram" as well as J.C.Raven's "Progressive Matrices" method were used. Complex methods were utilized to perform the assigned tasks and check the hypotheses, depending on the subject and object of the research. Methods of research are determined by its objectives: in order to study the procedural features of thinking in the process of solving problems deterministic and formative experiments were used individually ; deterministic experiment was used to study the age dynamics of theoretical thinking: this work was carried out in an individual form during the longitudinal approach of the research, and in an individual and group form during the transverse approach; a large number of original methods created on the basis of a wide range of materials of various gender issues were used, and a total of 76 students enrolled in III-IV classes participated. Each group had 38 students selected.

The hypothesis of the research work. While the formation of theoretical thinking in young schoolchildren is determined by the degree of influence of various factors, it mainly depends on the level of development of generalization, planning, analysis and synthesis, comparison ability, including intellectual processes in educational activities.

The main points of the defense. :

- A psychological prerequisite for the development of young schoolchildren's theoretical thinking is to activate their independent action. Consequently, this is one of the prerequisites for their capacity for autonomous and critical thought, the growth of their research abilities, and their innovative approach to acquiring the curriculum.
- Theoretical thinking, in addition to being a cognitive activity aimed at reflecting essential relations in the condition of the issue through analysis and reflection, manifests itself based on the content of the condition of the issue and what the student learns from it.
- Theoretical thinking in younger schoolchildren develops more ideally in the context of the production of cognitive contrasts, and key linkages between task conditions are conveyed through analytical and reflective processes.
- Establishing a discourse between teachers and students is essential for the development of theoretical thinking of primary school students.
- The ways of implementing theoretical thinking in young schoolchildren are directly connected to the forms of assigned activities.

Scientific innovation of the research work. For the first time, in research work, the nature of the impact of secondary school education on the development of theoretical thinking of young schoolchildren was determined. At the same time, the relation between the development of the components of theoretical thinking in the lower classes and the educational periods was found.

Theoretical and practical significance of the research. The results of the research contribute to the further development of psychological ideas about the conditions for the evolution of theoretical thinking of young students, and to the solution of fundamental psychological and pedagogical problems. The practical significance of the research is that the results obtained from a paper play an esssential role in a solution of the problems of organizing education in primary classes of general edu-

cation. The methods used in the research can be used to monitor the mental development of young students in secondary schools.

Approbation and implementation. The main provisions of the dissertation work were widely discussed in the scientific seminars of Ganja State University, reflected in the author's articles and theses published in both local and international scientific press, and thus it has been approved.

The name of the organization where the dissertation was performed. The dissertation work was performed at Ganja State University.

The structure and volume of the work. The dissertation consists of introduction, three chapters including 6 paragraphs, conclusion, list of references and appendices**.**

Introduction 6, Chapter I 32, Chapter II 57, Chapter III 31, Conclusion 5, a list of references 13 pages, the total volume is 243377 symbols.

THE MAIN CONTENT OF THE WORK

In the "Introduction" part of the dissertation, the relevance of the topic is substantiated, the goals and objectives, object and subject of the research, the hypothesis, its methodology, scientific innovation of the research work**,** theoretical and practical significance of the research are defined and the main points of the defense are indicated.

The first chapter of the dissertation is composed of two paragraphs and is titled **"General theoretical issues about the problem and its setting in the literature"**. In the first paragraph of the first chapter, "The concept of thinking and its psychological content", the psychological essence of thinking in psychology is determined and its types are analyzed. Theoretical thinking investigates the seen object in its system of necessary association, revealing general relationships. Its outcome is the formation of a conceptual model, the formulation of a theory, the generalization of experience, the finding of the regularities and laws in the evolution of numerous phenomena, and so on. The basis of theoretical thinking

is a content (complete, theoretical) generalization. This generalization defines a certain system of things and makes it possible to clarify the recipricol relations between them.

Theoretical thinking means acquiring important and reliable knowledge about the world. A person with independent thinking is able to respond specific questions. This type of thinking allows one to obtain crucial knowledge about the world and make reasonable judgments based on the facts at hand. In general, theoretical thinking does not come naturally to people; it must be developed and taught children to think systematically. In this paragraph, the essence of theoretical thinking is explained and its main structural components are examined by giving examples from different theoretical perspectives.

When it comes to solving mental problems, our comprehension of theoretical thinking is associated with the modification of how signs and attributes of the object are interpreted, or the qualitative transformation of the object. We believe that mediating mechanisms are the basis of theoretical thinking. If words (signs) were considered a universal tool in L.S. Vygotsky's research, then figurative as well as verbal tools started to be investigated in later periods. Having this quality during school age enables the student to tackle intellectual tasks involving complex hidden interconnections and relations between objects

The second paragraph of the first chapter, entitled “Directions of the study of theoretical thinking”, examines the directions for researching theoretical thinking. The ideas in the scientific psychological literature are interpreted. It is noted that in recent times many psychological (D.B. Bogoyavlenskaya, V.V. Davydov, A.Z. Zak, P.Y. Galperin, S.E. Kovalyov, L.K. Maksimov, M.A. Kholodnaya), and pedagogical (R.A. Atakhanov, V.V. Belich, X.J. Taneyev, L.S. Yakupova, A.B. Vorontsov, V.A. Gurujapov) studies are devoted to the study of the laws of two types of thinking: empirical and theoretical thinking. Monitoring its level of formation during the primary education process is one of the crucial points in an educator's work.

According to A.Z.Zak, children of junior school age are capable of acquiring theoretical knowledge. Children assimilate this knowledge with the help of the mental activity, getting to the origin of the concept.

A.Z. Zak distinguished and explained three means of theoretical thinking. The first tool is an analytic tool, in which analysis plays a leading role in theoretical thinking, and reflection plays an auxiliary role for distinguishing general relationships. The second tool is a reflexive tool, in which reflection plays an independent, guiding role in theoretical thinking, distinguishes special forms of general relationships, and clarifies specific principles of solving subclass problems included in a particular problem class. The third tool is an analytic-reflexive (synthesizing) tool, in which analysis and reflection interact, and general and special forms of relations are determined in unity. These tools act as three genetic forms of theoretical thinking.

The second chapter of the dissertation entitled, **"Factors affecting the formation of theoretical thinking in young schoolchildren"** consists of two paragraphs. The directions of the formation of theoretical thinking are analyzed in the first paragraph titled "Features of formation of theoretical thinking in young schoolchildren". In this regard, the content of several of issues are clarified.

Firstly, theoretical thinking is directed to the formation of concepts about perceived objects, or rather, to the reflection of their vital and internal relations. Empirical thinking refers to the ready-made information about perceived objects, their external characteristics and relations are reflected through the senses.

Second, using theoretical thinking, a person makes generalizations by studying the necessary relationships of perceived objects through analysis and composition. Analyzing and composing such relationships involves conducting thought experiments with specific means and summarizing the results. Here, the spesific materiality of idealized objects—such as conceptual models—serves as a special tool.

Third, by applying theoretical thinking, the individual manages and assesses methods and results (theoretical generalizations) of analysis-composition, which are characteristic of significant connections between perceived objects. Somewhat, he utilizes reflection as a research method for studying objects.

Fourth, viewing theoretical thinking in a special logical aspect allowed us to consider it as a mental cognitive process aimed at the formation of general, special and single, complete unity of concepts.

Theoretical thinking has a mediated character as it reflects internal relations. Theoretical thinking can be defined as the activity of creating concepts about perceived objects, which includes the following tasks: identifying the certainty of expressing general, special, and single, complete categories in perceived objects. Here the finding of common relations is an important condition for the distinguishing of its special forms, and the latter is a condition for discovering the integrity of the general attitude and its special forms, thereby achieving the ultimate goal of theoretical thinking - the formation of general, special and single unity of concept.

The methods of theoretical thinking, by their nature, objectively act as a totality of two types of cognitive acts - directly related to the study of the condition of the issue and related to the consideration of the features of its study. The first type of cognitive acts allocates the necessary features (general, special and complete) in perceived objects through analysis. The second type of cognitive acts, more precisely, observation of one's own activity of the mind and ways of its formation, as a result of which ideas of this activity arise in the consciousness, can be called reflection, based on its characteristics and philosophical tradition.

Theoretical thinking can be considered in 3 different aspects. I as an important cognitive method for understanding the essence of things, II as a type of thinking that forms a true concept as the totality of general, particular and only, III as a complex activity of a person who realizes familiarization with its condition during problem solving.

Theoretical thinking as one of the most important qualities of students is manifested:

a) In the ability to create independently certain problem-based questions and problematic conditions ;
b) Finding solutions to the problem independently and coming to a certain conclusion based on them ;
c) In the ability to make judgments about various problems and factors influencing their formation;

d) In the ability to apply preexisting concepts and principles to a new situations.

Theoretical thinking is carried out by analytical, reflexive and synthesizing methods during problem solving. The mentioned methods have a common operational core: the interaction of analysis and reflection, - the idea of its realization is determined by the ability to work within the framework. The content and role of analysis and reflection varies according to the method of theoretical thinking - analytical, reflexive or synthesizing.

The second paragraph of the second chapter is called “Pedagogical conditions of the formation of theoretical thinking in young schoolchildren”. Here, the conditions for the formation of students' theoretical thinking and the role of pedagogical conditions in this process are clarified. In order to study and develop students' theoretical thinking in the learning process, first of all, it is necessary to expand their range of imagination and knowledge. Expanding imagination and knowledge is the basis for critical thinking. Students possessing an extensive imagination and knowledge base are capable of viewing reality with an open mind and differentiating between right and wrong with ease. During learning process, students' mental activity must be increased in order to foster the development of their theoretical thinking. The simplicity, briefness and comprehensibility of the topics covered by teacher have a positive effect on activity and create a favorable basis for the development of independence. However, a lot depends on the teacher's own methodology and how he conveys the material to the students.

There are many ways and means of studying, developing and fostering the theoretical thinking abilities of primary school students in the learning process. However, it is impossible to educate students in the true sense by using these means from time to time. To do this, it is necessary to adapt the thinking of students in these areas. Because theoretical thinking develops not only as a result of conscious activity, but also through the strengthening of habits. Students with the ability to think theoretically are able to solve problems that arise during the learning process, distin-

guish key features and characteristics of objects and phenomena, and easily perceive the relations that exist in the objective world. As a result, students make significant progress in their studies

The formation of theoretical thinking in students is critical for achieving excellent educational results. Theoretical thinking enables students to systematize their training work, as well as identify and eliminate any problems ahead of time. One of the most pressing issues facing modern education is the organization of special tasks intended at strengthening students' theoretical thinking components such as analysis, planning, and reflection.

Students should be motivated and have greater cognitive interest in order for them to learn at the level of their abilities. The level of self-esteem and self-confidence of students has a direct impact on learning success.

Students' cognitive interests are stimulated, developed, and strengthened by the teacher's pedagogical mastery. Using his pedagogical skills, the teacher enhances, deepens, and makes the subject material engaging for the students. Because of this, students attend class with enthusiasm and engage in creative and productive cognitive activity.

The third chapter of the dissertation called **"Experimental study of theoretical thinking in young schoolchildren"** is devoted to the description, analysis and interpretation of the scientific research conducted by the author. The first paragraph of the third chapter called "Principles of classification of research methods" describes the methods used in the research process. In this study, four methods were used to determine the development of theoretical thinking in young schoolchildren: L.I.Arshavina's "Strip" method, L.I.Arshavina's "Find the figure" method, A.Z.Zak's "Anagram" method, J.C.Raven's "Progressive Matrices" method.

The second paragraph of the third chapter is entitled "Interpretation of the obtained results". In this paragraph, the results of the study are analyzed. Processing of the research results was carried out in several stages: 1) in the first stage, descriptive statistics of the involved sample was conducted both as a whole and separately for groups; 2) in the second stage, the results obtained using different methods were interpreted.

Through our observation method, we first studied the manifestations of the theoretical thinking of primary school students and its development dynamics. The research was conducted in two stages. In the first stage, we studied individual differences among students of III-IV grades in the field of theoretical thinking. For this purpose, we observed the thinking characteristics of 76 students in grades III-IV of secondary schools No. 39 and No. 43 in Ganja city. In the second stage of the research, we focused not only on individual differences in the domains of independence and criticality in III-IV grades, but also on the development characteristics of theoretical thinking in young school-age children. It should be mentioned that the primary objective of the research at this point was to ascertain the dynamics of theoretical thinking's development.

Students who were relatively equally successful in their classes participated in the experiment. The selected students from each class were divided into 3 groups according to their success in class - good and excellent students (6 people), average students (6 people) and weak students (6 people). The purpose of such a division was to investigate the relationship between the students' success in learning and their intellectual independence and criticality.

At the identification stage, it is aimed at determining the level of development of children's mental activity.

The diagnostics was carried out using the following methods: L.A. Venger "Perceptual Modeling", S.K. Ivankova "Sequential explanatory pictures", S.Y. Subotin "Color the figures" and V.M. Kogan's test. Here, the primary objective was to determine the level of analytical and synthesis development among younger schoolchildren, as well as the level of theoretical thinking development based on its indicators.

The level of progress in analytical and synthesis skills

Table 1.

Levels	Quantitative indexes per groups	Percentage
High	28.12	37%
Medium	36.48	48%
Low	11.4	15%

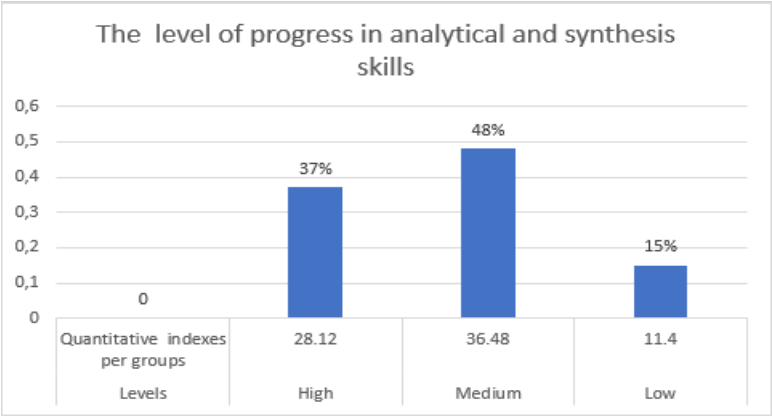

Figure 1. The level of progress in analytical and synthesis skills

Thus, the level of progress of analysis and synthesis among young schoolchildren is as follows: high level - 37%, medium - 48%, low - 15%. The issue is that students who completed only three tasks were labeled as low level since they did not meet the requirements for average level. Children who finished the suggested task in its entirety received a high level rating. Those who completed more than 50% of the task were considered average.

In addition, Kogan's test was used to determine the level of classification ability development. The goal here is to assess the level of development of classification ability. The child gets 1 point for each correct answer, 0 points for wrong answer or no answer. So, the maximum score a student can get is 25 points. Based on this, we determined the levels. High: 23 – 25 points; Medium: 16 – 22 points; Low: 15 points.

The level of development of classification ability

Table 2.

Levels	Quantity Asssesment N=76	Percentage
High	38	50%
Medium	26	34.21%
Low	12	15.79 %

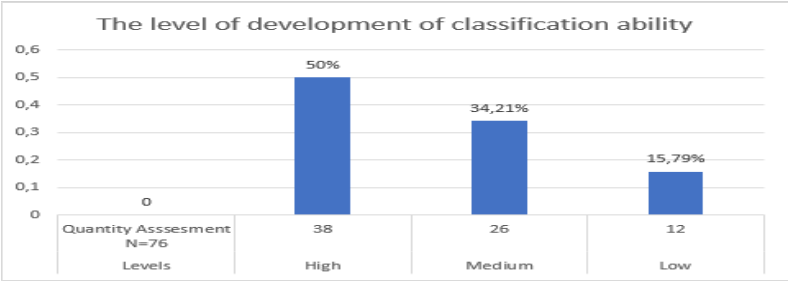

Figure 2. The level of development of classification ability

Thus, the development of classification ability was manifested in students at different levels: high level - 50%, medium - 34.21%, low - 15.79%. Furthermore, the methodology of "Sequential explanatory design" was analyzed. Determining the degree of generalization development and exposing the levels of theoretical thinking development are the objectives here. Here, students must arrange the cards in such a way that the sequence is apparent.

Indicators of formation of generalization ability

Table 3.

Levels	Quantitative Assessment	Percentage
High	19	25%
Medium	47	61.84%
Low	10	13.16%

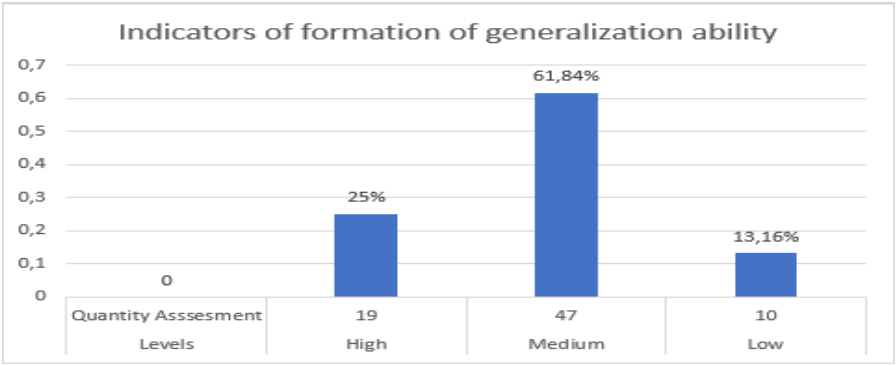

Figure 3. Indicators of formation of generalization ability

Thus, the development of the ability to generalize demonstrated among students at different levels: high level - 25%, medium - 61.84%, low - 13.16%. After summarizing the data, we come to the conclusion that more students have a medium level. Only nineteen students successfully completed the assignment, ten students had a low level of generalization, and the rest were classified as having a medium level of generalization. Also, the "Color the figures" test was used to determine the students' executive functioning ability using analogies.

Indicators of the level of development of the ability of executive functioning using analogies

Table 4.

Levels	Quantitative assessment N=76	Percentage
High	56	73.68%
Medium	12	15.78%
Low	8	10.54 %

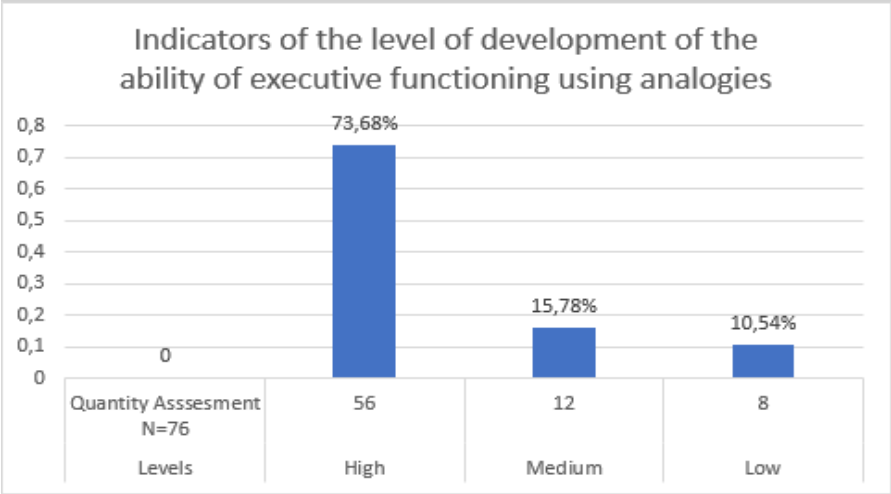

Figure 4. Indicators of the level of development of the ability of executive functioning using analogies

Table 4 shows that, by analogy, three levels of executive functioning ability were identified. High level: 56 students - 76.68%, medium level 12 students - 15.78%, low level 8 students - 10.54%. These facts show that in the development of theoretical thinking, the ability of executive functioning by analogy is also the basis in accordance with other components, and their development lays the foundation for the development of theoretical thinking. In order to confirm these facts, in the second stage of the study, educational work was carried out and the results were revised.

Using the same technique, we compared the results obtained from L.A. Venger's "Perceptual Modeling", S.K. Ivankova's "Sequential explanatory design", S.Y. Subotin's "Color the figures" and V.M. Kogan's "Methodology for determining the development dynamics of mental activity". Analyzing the data of the educational experiment, results were obtained regarding the formation of the theoretical thinking of the experimental class.

Formation of theoretical thinking at the learning stage

Table 5.

Levels	Quantitative assessment N=76	Percentage
High	60	78.94%
Medium	10	13.16%
Low	6	7. 90%

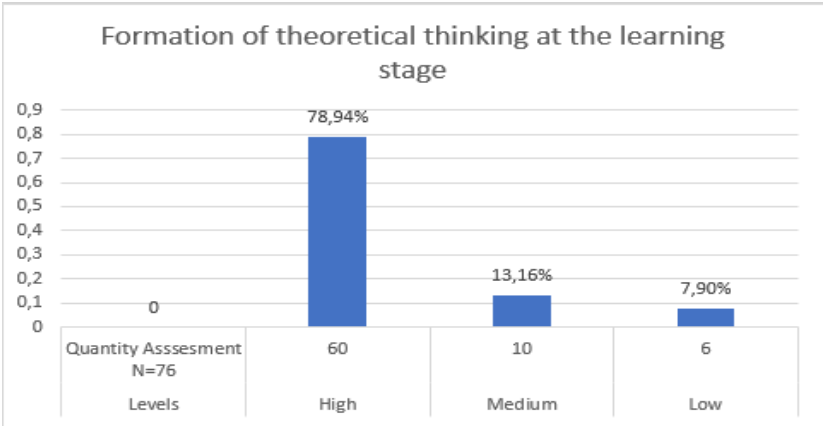

Figure 5. Formation of theoretical thinking at the learning stage

As can be seen from Table 5, the level of development of theoretical thinking among students in the learning stage has increased compared to the identification stage. This fact confirms that it is possible to develop theoretical thinking by using various development tools, and has proven itself in practice.

The level of development of analysis and synthesis at the stage of learning

Table 6.

Levels	Quantitative Assessment N=76	Percentage
High	64	84.21%
Medium	9	11.84%
Low	3	3.95 %

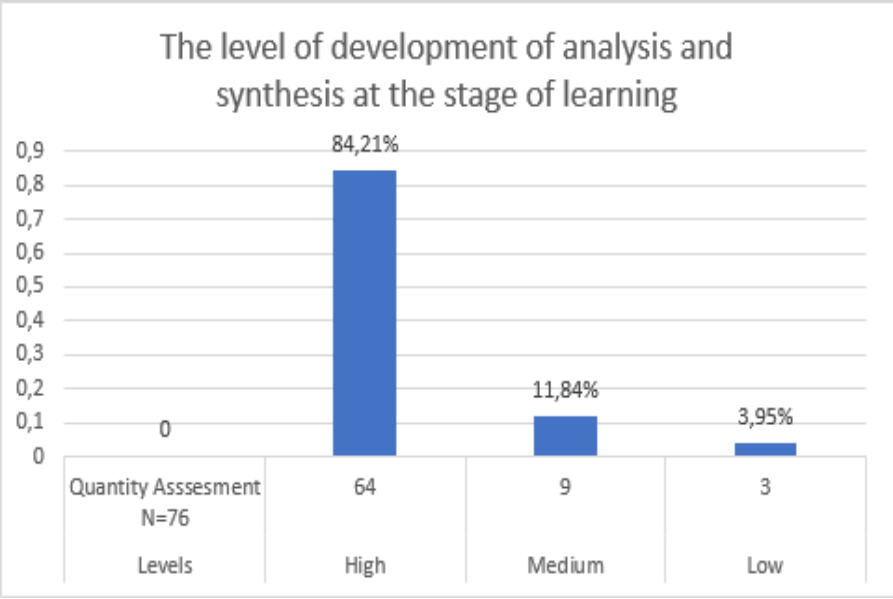

Figure 6. The level of development of analysis and synthesis at the stage of learning

Table data showed that after the learning stage of the experiment, 64 students (84.21%) had a high level, 9 students (11.84%) had

a medium level, and 3 students (3.95%) had a low level. This fact confirms that the development work carried out has yielded results. The percentages are higher than in the deterministic experiment.

The level of development of generalization ability after the educational experiment

Table 7.

Levels	Quantitative Assessment	Percentage
High	58	76.31%
Medium	13	17.11%
Low	5	6.58%

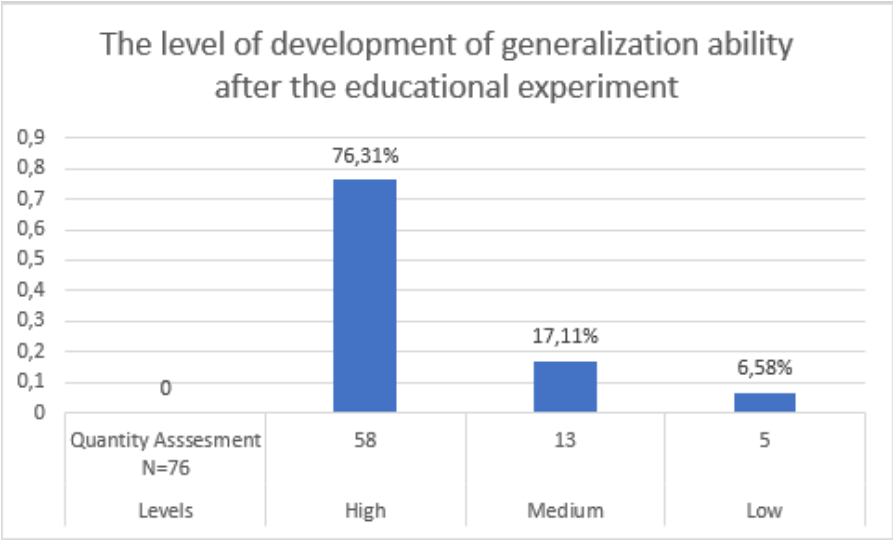

Figure 7. The level of development of generalization ability after the educational experiment

According to the table data, 58 students (76.31%) had a high level of generalization during the measurements conducted following the learning stage, 13 students (17.11%) had a medium level, and 5 students (6.58%) had a low level. The high level has increased, but the

low and medium levels have decreased as compared to the initial parameters. A comparative analysis of the development of the ability to generalize has shown that the developmental work undertaken to improve this ability in students can yield results.

The level of development of classification ability after the educational experiment

Table 8.

Levels	Quantitative Assessment	Percentage
High	48	63.15%
Medium	18	23.68%
Low	10	13.17 %

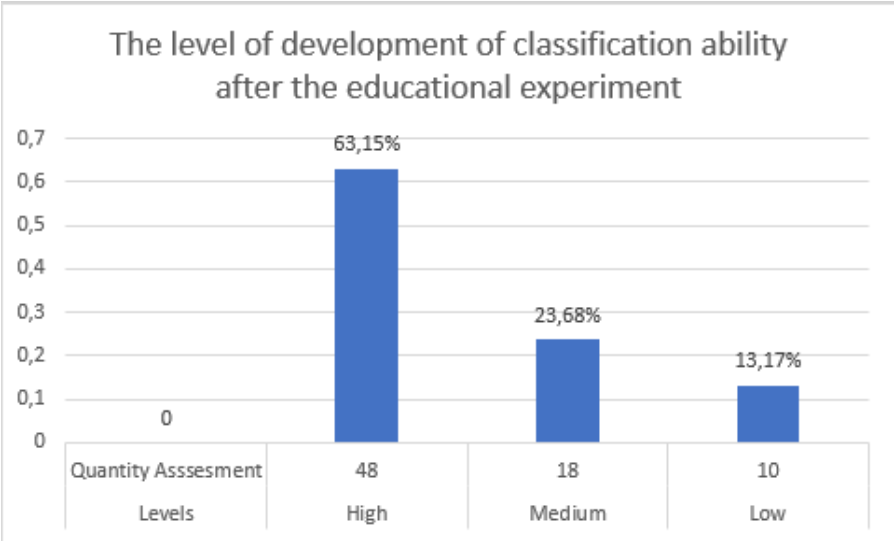

Figure 8. The level of development of classification ability after the educational experiment

Table data show that after the learning stage, 48 students are at a high level of development of classification ability, which is 63.15% of those studied. There are 18 students in the middle level, that is, 23.68% and 10 students in the low level, that is, 13.17%.

The level of development of the ability related to analogy in the monitoring stage

Table 9.

Levels	Quantitative assessment	Percentage
High	42	55.26%
Medium	26	34.21%
Low	8	10.53 %

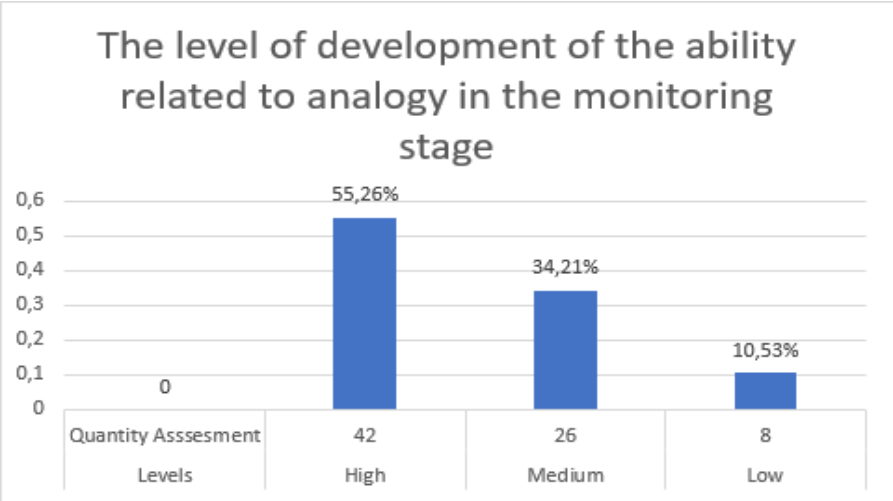

Figure 9. The level of development of the ability related to analogy in the monitoring stage

Table data showed that after the learning stage, 42 students (55.26%) in the experimental class had a high level, 26 students (34.21%) had an a medium level, and only 8 students (10.53%) had a low level.

In the course of the study, as a result of the measurements after the educational experiment, we observe the positive dynamics of changes in the level of formation of the ability of executive finctioning on analogies among the students. Thanks to the formative stage of the

experience, students in grades 3-4 have increased their level from medium to high.

After analyzing the data of the confirmatory experiment, conclusions were made about the maturity of the mental activity of the experimental class.

Indicators of development of mental abilities

Table 10.

Levels	Quantitative Assessment N=76	Percentage
High	47	61.84%
Medium	22	28.94%
Low	7	9.22%

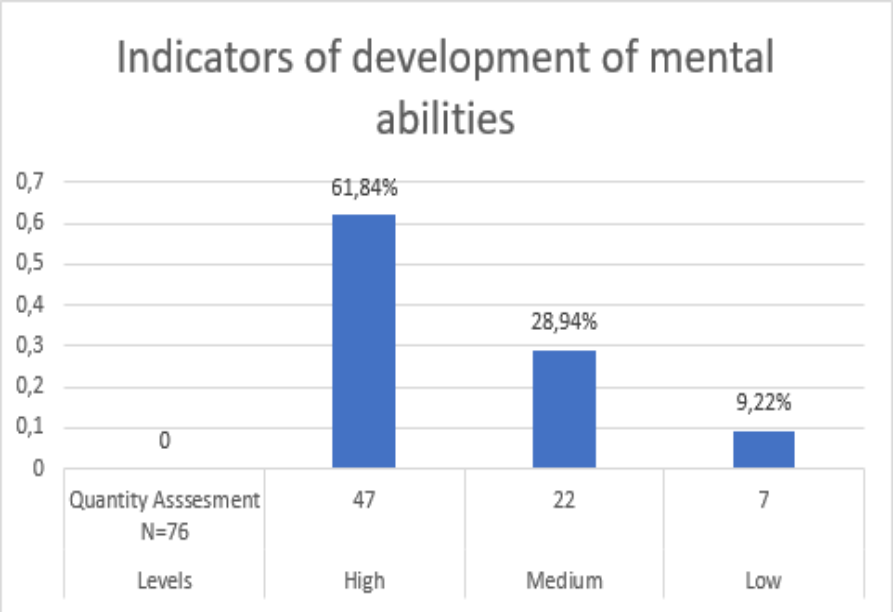

Figure 9. Indicators of development of mental abilities

Thus, the level of formation of mental activities in primary school students was as follows: high: 47 - 61.28%, medium: 22 - 28.94%, low: 7 -9.22%.

Distribution of students in regular and experimental classes of the school according to different methods of theoretical thinking (in %)

Table 11.

Number of lines	Problem solving form	Classes	Methods of theoretical thinking			
			Analytical		Reflexive	
			On educational programmes			
			Regular A	Exper. B	Regular A	Exper. B
1	Material-practical	3	58,8*	71,9*	33,1**	48,3**
2		4	74,7	83,8*	47,4*	59,1*
3	Figurative	3	39,7**	54,2**	19,7*	30,2*
4		4	59,9	65,3	35,2	42,5
5	Verbal-signs	3	29,9*	41,7*	11,8	20,2
6		4	45,8**	59,4**	27,8*	38,4*

Footnotes. ** - $p<0,01$; * - $p<0,05$ N=76

Our research showed that the development of theoretical thinking in young schoolchildren depends on students' planning, making analogies, analysis and synthesis, reflexive, analytical, summarizing abilities and creating a favorable educational environment. Developmental research and the development of logical

thinking ability play an important role in this process.

Research has shown that the ability to generalize is a fundamental basis for the development of theoretical thinking in grades 3-4, and this should be taken into account.

Our research and literature analysis allow us to come to the following conclusions:

- Researches show that theoretical thinking is a type of think ing based on the separation and analysis of the fundamental, primary contradiction in concrete circumstances or problem solving.
- It has been determined that concrete solutions to the problem are formed during the search for means of clarifying the initial conflict. Theoretical thinking is based on the analysis and generalization of the internal characteristics of the studied subject.
- As a result of the research, it becomes obvious that altering studied object and exposing its intrinsic characteristics might be accomplished through theoretical thinking. Theoretical thinking is based on substantive, theoretical generalization, as distinguished from empirical thinking, which generalizes perceptually.
- It was determined that the formation of theoretical thinking in young schoolchildren is not only carried out in mathematics classes. We approached this problem in a complex way. Not only in mathematics classes, but also in the throughout educational process, as well as in extracurricular activities, work was carried out in the direction of the formation of theoretical thinking, as a result of which a change was manifested in the development of individual components of theoretical thinking.
- In the course of our development work, the focus has shifted to the acceptability of complex tasks. Such tasks include tasks that form mental work, such as analysis, planning and

reflection, as well as didactic and board games, logical and mathematical tasks, puzzles-stories, and riddles-jokes.

- According to our research, young schoolchildren's examination phase exhibited favorable dynamics in the analysis activity formation: the children had both high and medium levels. The fact that students select theoretical approaches to problem solving without considering visualization serves as evidence of this. Children gradually moved from a material solution plan to a mental solution plan by the end of the study.
- The study shows that a comprehensive approach to the formation of theoretical thinking in young schoolchildren can be considered an effective tool, and that the process of creating cognitive conflicts leads to forming an optimal situation.
- As a result of the analysis of empirical facts and experimental materials, three levels of manifestation of theoretical thinking in students were determined. These levels are adjusted on the one hand by the organization of the educational process in secondary school, and on the other hand by the level of development of the individual himself. The content and form of the students' training activities must be altered in order to raise awareness of training optimization as a result of determining those levels. Thus, the three levels of manifestation of theoretical thinking in students differ from one another in terms of operational plan, content, and outcomes. Along with the current level of students' theoretical thinking, this section also reflects their zone of proximal development.

The main content of the dissertation work was published in the following scientific works:

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