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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

(Doctor of Science)

Generalization and use of analogy in the teaching of mathematics of V-VI grades

Speciality: 5801.01- Theory and methodology of teaching and education (methodology of teaching mathematics)

Field of science: Doctor of Philosophy in Pedagogy

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GENERAL CHARACTERISTICS OF RESEARCH

The relevance of the problem: The concept of modern education has made its priority to bring up an individual who can think independently and critically, can compare and analyze facts, can find various solutions to emerging problems and considering specific condition choose the most convenient one. This, in turn, puts the problem of improving the education system and the quality of education at the forefront.

The training on generalizations and analogies is not new, but has a long history of pedagogical practice. Any analogy and generalization is connected. This connection is presented as an inheritance in methodological literature. Connection, in other words, is beyond the ability to conduct analogies without inheritance. From this point of view it is necessary to clarify a number of issues concerning the essence of the principle of inheritance.

One of the challenges facing modern education is to provide continuous education. For this reason, the principle of inheritance is of great importance. This means that the past, present and future of the training are closely linked.

In order to be well-informed about the contents of the principle of succession or sequence, it is necessary to know the methodological basis of it. First of all, it is necessary to pay attention to the philosophical nature of the principle of inheritance. There is a historical dialectical approach by Hegel to the concept of "succession" in philosophy. His famous denial law explains that the old one is not complete, some of its elements are new to themselves, and these elements are the basis of future development. Old and new knowledge is combined (generalized) and they form a whole system.

The scale of the mistakes made by students on "analogies" in a number of sources indicates that this priori has not yet yielded the expected results. Thus, it is obvious that there is a need to improve the methodology on analogies. Therefore, the main purpose of our research is to fill in the gaps in research in this area. It also helps students to consciously engage in learning activities.

Analogy combines a number of compositional operations. Analysis, selection of comparative objects, comparative process, the extent to which the objects under consideration are aligned, the resulting conclusions, proof of its validity and error, and so on. For all these, there is a need to develop a succession method for the formation of analogies, taking into account intellectual abilities.

In our research, the analogy is manifested in two aspects: both as a research object (a procedural aspect) and as a learning tool for a schoolboy (content aspect). In this case, the first aspect is of priority because it directly leads to the problem of inheritance. Of the many types of analogies, we chose two for research purposes: paradigm analogy and conformity analogy. The analogy of conformity can, in turn, be subdivided into two subspecies: sequence and cause analogy.

Thus, the main task is to develop a methodology capable of unlocking the potential of the analogue method.

Teaching math, like any other subject, can also be built using a variety of training options. The most effective of them is to give analogies in mathematics teaching as a generalized method of action. The methodology used in teaching mathematics in primary and secondary schools is not extensive at this time, and the impact of the analogy is not deepened. In the textbooks, there are no assignments directly aimed at development of this method. One of our main tasks has been to develop this type of workflow and experiment it.

Finally, the relevance of our research is due to the following:

1) The need for purposeful mastering of analogies as a teaching method, especially in developing learning environments, and the use of analogies as procedural learning movements;

2) The absence of sufficient methodology for this method;

3) Inadequate method of inheritance training on analogies in elementary and high school;

4) Low level of students' ability to use the analogue method independently.

The object of the research is the process of teaching mathematics in secondary schools.

The subject of the research is generalization and analogy in

mathematics courses of V-VI grades of secondary special schools and the tools used in their application.

The purpose of the research. The purpose of the research is to build students' math knowledge, skills and abilities using generalization and analogy in math courses of V-VI grades of secondary schools.

Research hypothesis: If we define the application of analogy and generalization to different types of training in accordance with the learning environment, it will enable us to identify and realize the succession line in the formulation of the analogy method. This, in turn, will enable students to master this method and thus ensure the effectiveness of the learning process.

Research Objectives: The following research methods have been used to fulfill the assigned tasks and to test the accuracy of the hypothesis:

- Analysis of methodological literature (psychological, didactic, pedagogical, methodical, textbook and teaching materials);
- Analysis of pupils' thinking ability to use analogies in teaching math to high school students;
- Modeling of operational composition of various forms of analogues;
- Methodological analysis of the methodology used to realize the succession of the analogue method;
- An experiment with students of the V-VI grades of secondary school.

The methodological basis of the research is the general scientific methodology. Scientific methodology requires that objects and events be examined in interrelationships and interdependencies; considers systematic approach to the development of training methodologies; requires analysis of the use of operational content for students' intellectual activity; refers to the concept of activity.

Research methods: theoretical analysis, observation, interview, document study, questionnaire survey, pedagogical experiment, mathematical statistical methods, etc.

The novelty of the research is that theoretical bases of teaching analogies in the V-VI grades of the secondary school have been de-

veloped. The application of the analogy method shows the need for a differential approach, depending on the type and conditions of the method.

The theoretical significance of the research is that:

- Operational composition of different types of analogues in mathematics teaching. It was concluded that the variability of the analogue method is determined by its operational composition;
- Changing learning conditions in mathematics teaching requires the use of different forms of analogy;
- Theoretical foundations of the principle of inheritance in the formation of analogue method in teaching mathematics to elementary and middle school students were identified;
- It has been established that the mimicry of various forms of analogy in teaching mathematics requires different methods of using them in teaching practice.

The practical significance of the research is that the methodology for using different forms of analogy and a system of work have been developed so that teachers can use it in teaching math in high school as well as in higher education institutions. The training on analogies in grades V-VI shows specific ways of succession.

Provisions submitted for defense:

- Changing learning conditions in mathematics teaching requires the use of various forms of analogy. These forms have different operational components. Various methodological training is also required;

- The inheritance of analogies in teaching mathematics should be carried out on the following lines:

a) Generalization of knowledge obtained in the primary grades;

b) Performing the same training task;

c) Mastering analogy as a learning tool for students.

Explaining analogy as a learning activity enables differential approaches to the formation of different types of teaching.

Approval of the research: Dissertation work was done at the Department of General Mathematics of the GSU. In connection with the content of the dissertation, the following articles were published in

periodicals recommended by the HAC, reports were made at international and republican scientific and methodological conferences:

Structure of the dissertation work. The dissertation consists of an introduction, two chapters, a pedagogical experiment, results and proposals, a list of used literature and appendices.

MAIN CONTENT OF THE DISSERTATION

The thesis **introduces** the relevance of the topic, introduces the object, subject, purpose, hypothesis, tasks, research methods, problem solving, scientific novelty, theoretical significance of the research, practical significance of the research, *the provisions of the defense are explained and a brief summary of the application of the results is provided.*

The first chapter of the dissertation is entitled "***Theoretical Basis of Generalization and the Use of Analogy in Teaching V-VI Grades of Mathematics***" and is explained in six subchapters.

The first subchapter, titled ***"The Principle of Generalization in the Teaching of Mathematics and the Use of Analogs"*** explores the theoretical issues of generalization and the use of analogies in the teaching of mathematics. It has been concluded that it is impossible to improve the level of training without clarifying the principle of inheritance, relying on previous knowledge and creating analogies.

The special didactic definition of the category of succession is reflected in the principles of systematicity and consistency of didactics. The interrelationship of the principle of systematicity and succession is still widely understood in classical pedagogy. In reviewing the process of assimilation of knowledge, K. D. Ushinski believed that assimilation should occur on a gradual, systematic and sequential basis.

B.Q. Ananyev presented the problem of succession in the training in a full, multidisciplinary way. Another researcher, S. A. Qanel's succession studies at a general theoretical level. He believes succession is a tool that can guide the learning process.

Traditionally, succession in learning comes from the interaction of the method and content of the training. These were handled by the

teacher in one of the programs, textbooks, methodical instructions, and on the other hand, in the approach to the problem of inheritance.

The study shows that proper succession in the teaching and upbringing process has a positive effect on the quality of the student's personality, development of his mental and physical abilities, life experience and behavior. As a result, succession is viewed as a common didactic principle in pedagogy and presents itself as a manifestation of the principle of systematicity and consistency.

In mathematics teaching, succession is interpreted from primary school to secondary, from secondary to high school, and from there to higher education.

The second subchapter of chapter I discusses ***"Types and forms of using generalizations and analogies in the teaching of mathematics".***

Teaching mathematics now requires a comprehensive approach to the use of analogies.

Experience shows that the forms of analogies are ignored. However, different types of analogies differ from each other in their application forms and methods used in teaching. Taking into account this aspect, it is necessary to have broad information not only about analogies but also about their forms.

The most common forms of distribution of analogies are analogues of properties and proportions. An explanation of these forms can be found in researches of B. Vorobyov, A.A. Ivina, A.A. Starchenko, A.I. Uemova. The results of analogs on properties and proportions are classified according to the model and prototype used. When looking at similar objects, it is explained that the choice of model and prototype only occurs during the reflection process.

It is noted that depending on the nature of the outcome, the following analogies can be identified: real analogy (based on the proportions of things), attributive analogies (based on the proportions of attributes), and relativistic (relationship ratios).

If it is necessary to look for an analogy based on the existing identity in mathematics, then it is shown that it is possible to identify 6 main types of it in mathematics.

- Application analog,

- Generalization analogy,
- Contact analog,
- An ultimate limit analogue,
- Derivative analogue,
- Trivial (ordinary) analogy.

The subchapter notes that the methodology is based on the following criteria for identifying types of analogies:

1) Due to the nature of the sign transferred;

2) By the nature of the results obtained;

3) For the degree of proximity of the objects to be compared;

4) For the degree of abstraction;

5) The degree of accuracy of the objects being compared to each other;

6) For the integrity of the complex of comparable features;

For completeness of the set of operations performed.

Among the identified forms of analogy, only those that characterize the process of analogy are mentioned. These include paradigm analogy, relativity analogy, sequence analogy, and causal analogy.

Sometimes it is based on the logical value of knowledge when determining the types of analogies. In this case, the division is linked to the regularity of the results of the analogies.

It is shown that elemental analysis is required to establish a paradigm analogue. Through this analysis, the object is divided into separate parts (traits). Possibility of division depends on the structure of the training material, the didactic objectives and the objectives of the training.

The third subchapter of chapter I of the dissertation is titled ***"Using analogies in teaching mathematical concepts at school".*** It is noted that in the unintended application of analogies, the following controls should be formed in order to reduce the number of wrong results. It is necessary to look not only for general (similar) features of the model and original, but also for different characteristics. Through this training movement, the framework for the application of analogies is laid out. It was noted that analogy is not only fully reflected in original information when examining models, but is more evident in the transition from model to original, in the process of transitioning

from the initial situation to the application of analogies, that is, during the formation of a new understanding based on a known base. Therefore, we emphasize once again that broadcasting is very important. During its implementation, a complex of similar concepts is formed in the imagination of students. The formed knowledge and skills become more complete and generalized, and therefore become natural and sustainable. The ability to transfer that knowledge and skills to new situations is created. They use the analogy method competently, with fewer mistakes, as a whole form of mental activity.

Control and broadcasting tasks of a training nature were given in the subchapter. The general model of training and scientific understanding is considered. This is important not only for teaching mathematics in secondary schools, but also in universities. The subchapter shows the relevant work techniques and explains them in the example of numerous studies.

The fourth subchapter of the first chapter. It is called ***"The role of analogies in the developmental teaching of mathematics."*** Speaking of analogies, the existence of comparable objects is absolute, that is, there is no analogy without the original and the model, so it is impossible to acquire new knowledge. This means that analogies are a determinant of developmental learning. The history of developmental training is ancient. This still finds its theoretical basis in the works of I.Q.Pestalozzi, F.A.Disterveg and K.D.Ushinsky. The scientific basis of developmental training was laid by L.S. Vygotsky. It is shown that developmental training is the effective implementation of the principle of preventive development of training. The term "developmental training" originally belonged to V.V.Davidov. Developmental training is defined as a new active method (type) of training. This replaces the explanatory-demonstrative method. This training considers and uses the laws of development, takes into account the level of the individual and adapts to his abilities. It is shown that developmental training takes place in the immediate developmental zone of the child, through which the potential of the person is taken into account, and the learning process is directed in this direction. It focuses on students' physical, cognitive, and moral abilities using their potential.

The subchapter also explains that there are some disadvantages of using analogy. In training, analogy is the name of various functions: coaching function, explanatory function, search function, systematization function, demonstration function, and so on.

The subchapter shows the main characteristics of developmental training.

The fifth subchapter of Chapter I, ***"Analogy as both an object of study and a means of teaching,"*** has been studied.

In our research, we aim to use analogies and generalizations as a teaching tool, thus, we focus more on analogy as a learning movement. However, it is impossible to use the analogy as a learning tool without understanding the operating systems, without knowing how it relates to mental processes. To use analogies as a learning tool, you need to know its mechanism, otherwise it can lead to erroneous results. The system of philosophical, mental, logical views on analogies is interpreted as its object of study. The result by analogy is always an important part of the analogy method. Success in the application of analogies depends on how children perceive similar symptoms. In many cases, it is not enough to transfer the intended simple sign. This often suggests that there is a link between similar symptoms and a transfer sign. It is important to open this connection at the expense of additional analysis, and then it is necessary to ensure the emergence of new symptoms. These symptoms can be transmitted as the same symptoms. In this case, an analogy of conformity occurs.

First of all, the application of this or that type of analogy depends on the following factors:

- from the didactic purpose of the training material and lesson;
- the level of students' perception of methods;
- the nature of the method;
- functions of analogy at different stages of training;
- taking into account the requirements of didactic principles;
- from the teacher's methodological skills.

The sixth subchapter of the first chapter. It is called ***"Rules for creating didactic conditions when using different forms of analogy."***

This subchapter explains that didactic conditions should form stu-

dents' imagination and concepts, certain motives, emotional-volitional qualities, develop their abilities, strengthen self-management skills and beliefs. At the same time, any system of didactic conditions must be precise and address a range of issues.

It is indicated that the task of forming the training activity can be fulfilled if it is possible to determine the didactic conditions that can implement the established system of didactic bases in the training practice. When determining the conditions for the implementation of the intended didactic basis, it is impossible to ignore the features of the learning activities formed in students, which are obtained at the expense of these didactic conditions. The main purpose of involving students in learning activities is to ensure the quality of their future work. Training activities should be purposeful, positive, thoughtful, planned, independent, distinguished by their generalized quality.

It is noted that the established didactic basis for the formation of learning activities is a system. A similar requirement is also important for didactic conditions. They should also complement each other and be systematic and influence learning activities in this way. The explanation of what is said is explained on the examples.

Chapter II of the dissertation. It is called ***"Methodology of inheritance organization in the formation of analogy"*** and is explained in 6 subchapters.

The subchapter of chapter II, entitled ***"General characteristics of the system of exercises"*** shows that there is a need to pay more attention to the final knowledge and skills of students in mathematics courses of V-VI grades, the general characteristics of the content of this course, the main results of the study, the formation of a scientific worldview in the teaching process, the development of thinking, general labor skills and habits. It is required to use the opportunities of the course, such as observation, determination of conformity to the law, generalization, making similar judgments in the process of teaching mathematics. In order to do this, it is recommended to make certain changes in the study of functions, the same transformations, equations and inequalities. The system of presented exercises is aimed at solving the latest general training tasks.

We referred to the general principles of the system while building the system of exercises: integrity, structure, interdependence.

- integrity: fundamental incompatibility of the features of the system with the characteristics of its elements;
- structure: the existence of internal connections and relationships between the elements of the system;
- interdependence: interdependence between the created system and its upper and lower systems.

The second subchapter of the chapter II of the dissertation is called ***" Formation methods of the" core" of analogies."***

The structure of the results of analogies is invariant in relation to these types of actions, which is why it is interpreted that all the types of analogies under consideration determine the "core". It is expedient to begin the study of different types of analogies with the formation of the "core". This is done in preparation process. The learning task to be solved at this stage is for students to master the basic intellectual operations that define the "core" of analogy: mental analysis, operational analysis, comparison, contrast. Accordingly, in the preparatory phase, we have identified two phases of training: the formation of the ability to contrast the features that are important in the current situation, and the formation of the ability to contrast the features in question.

Exercises on the formation of mental analysis are not presented as a separate group, but are included in the study of the formation of confrontational actions, as one of the main operations when comparing objects is analysis. It is the analysis that identifies the features of the objects under consideration. However, in this case, in addition to the selection of various appropriate features (concepts), later in the research process, this difference must be eliminated when any transformation occurs, and it has been shown that the search for this transformation requires not only mental but also operational analysis.

The preparatory phase of this subchapter also includes work on students' mastery of specific intellectual operations that are part of the causal analogy. Examples of types of work learned in primary school and in mathematical materials are shown. In the formation

phase of the object comparison operation, examples of formation of operations on comparison of objects, examples of comparison and mastery of the directions of confrontation, examples of the formation of special intellectual operations that are part of the causal analogy are given.

It is noted in the in the third subchapter of Chapter ***II of the dissertation, entitled "Methods of forming analogies in V and VI grades"*** that the process of formation of operations that constitute analogy continues in grades V-VI. Thus, succession goes along the line of solving a single learning task: mastering actions and operations by analogy as a whole by students.

Exercises were carried out in the formation phase of the comparison operation and in the phase of formation of object-facing operations.

Experience shows that the analogy is used by students intuitively, without special organization of the learning process. Yet, many aspects of it remain unnoticed by students, as there is very little effort in textbooks and teaching aids to perform appropriate mental operations to detect these features. However, these features are possible only by making judgments by analogy. Such judgments are made always and purposeful.

It has been shown that in mastering the operations that form the "core" of the analogy, inheritance is carried out using the study and learning tasks presented in the process of solving mathematical problems aimed at solving appropriate small learning tasks.

The fourth subchapter of chapter II of thedissertation.It is entitled***"Methods of forming different types of analogy in students."***

Among the analogies, we distinguished three types: paradigm analogy, compatibility analogy, and cause analogy. The formation of each of them is significantly different from each other.

It is noted that students are clearly acquainted with the method of analogy and are able to select several types. The goal is to be able to compare different sequences of mental operations while achieving one or other result. These are studies on paradigm and conformity analogies, methods of conformity and causal analogy.

Exercises are implemented after getting acquainted with the analogy and some of its types,. The questions of the exercises require the use of analogy and the sequence of judgments.

The fifth subchapter of the chapter II of the dissertation**.** It is titled ***"The use of analogy and generalization in mathematics lessons as a means of developing students' mathematical skills."***

It is noted in this subchapter that the formation of the analogy method is aimed at understanding it as a teaching method and using it by students in different learning situations. The analogy method has a wide range as a training tool. In order to form specific mathematical skills using analogy, ie to use analogy as a learning tool, it is necessary to take into account a number of features of training.

The subchapter considers cases when analogy can be applied.

1) similar issues with similar external features (objects of the same quality related by close analogy). 2) different issues with similar external signs. 3) similar issues with different external features (objects associated with distant analogy).

It is noted that when solving any mathematical problem, the main learning task is to master the condition of the problem and the correspondence that connects the question with its solution. This is a generalized mathematical activity. The use of the analogy of conformity is intended to do just that, because in this case the formed conformity is clearly functioning. It was noted that when solving any type of problem, the training process should also include the opposite issues, ie there should be issues that actualize the opposite. By analogy, the formation of succession should be carried out in three stages: preparation, main and final stage.

Methodological tools such as specially selected exercises and appropriate training tasks are used to implement all these stages.

"Pedagogical experiment and analysis of its results" is the last subchapter of chapter II.

The problem of the dissertation is related to determining the effect of generalization and the use of analogy on the quality of students' mastery in the teaching of mathematics in V-VI grades

A pedagogical experiment covering 2015-2018 was conducted in

stages to test the validity of the hypothesis put forward in the dissertation and to determine the effectiveness of the proposed methodology in order to increase the cognitive activity of students using generalizations and analogies in mathematics teaching of V-VI grades.

During the research, a pedagogical experiment was conducted as a defining, teaching and testing phase. In the first stage, called the descriptive experiment, the purpose of the study was to study students' knowledge and skills in the process of teaching mathematics, to determine the theoretical and methodological basis for solving the facing problem, to formulate and express a working hypothesis, to choose experimental and supervised classes, ensuring that the levels of students and teachers in those classes are approximately equal, written and oral study of the level of classes in terms of the research topic consisted of questionnaires and interviews to identify difficulties faced by teachers in solving the problem of generalization and use of analogy in mathematics teaching of V-VI grades.

In the second stage of the pedagogical experiment, called teaching, educational and research work was conducted on studying and mastering the methodological system developed for the use of generalization and analogy in the teaching of mathematics of V-VI grades. In this case, the aim is to develop a methodology for the use of generalization and analogy in the teaching of mathematics in grades V-VI, as well consisting of a development of a methodology aimed at eliminating the students' deficiencies, acquaintance of the teachers of the experimental groups with the content and methodology, conducting a teaching experiment on the new system prepared by the dissertation in the experimental groups, defining the methodology of the experiment.

During the experiment, comments on the content and teaching methodology proposed by the author were conveyed to the teachers working in those classes, who were provided with the necessary teaching materials. Teachers working in supervised classrooms were told the purpose of the experiment, but were not given any additional information about the study.

The educational experiment was conducted in 2016-2017 in

grades V-VI of middle schools. One supervised and one experimental class were selected in each school where the experiment was conducted.

The testing stage of the pedagogical experiment covers years of 2017-2018. At this stage, the main goal was to identify and reveal the effectiveness of the proposed methodology for the use of generalization and analogy in the teaching of mathematics. For this purpose, after studying and completing the program material involved in the experiment, the test material was identified, and a system of exercises and tests were given in accordance with the program material in both experimental and supervised classes.

The results obtained at each phase of the pedagogical experiment were analyzed by the statistical method given in the methodological literature. In this case, the research method consists of conducting a test on the basis of the same material in both experimental and supervised classes at a certain stage of training, comparative study of students.

The results of the tests performed during the diagnostic experiment are given in Table 1. Analysis of the results shows that at the beginning of the experiment, students both in the experimental and supervised class had approximately the same level of knowledge and skills. 309 students in experimental classes and 265 students in supervised classes took part in our written tests in V-VI grades.

Practical training allowed students to make significant progress in their learning opportunities. This is evidenced by the quantitative and qualitative changes in the experimental classes. The results of the tests performed during the test experiment are given in Table 2.

Table 1.

Schools	Grades		Number of students	Results (based on levels)			
				I	II	III	IV
Morullu village school, Shamkir region	Supervised	V	17	1(5,88%)	3(17,7%)	6(35%)	7(41,2%)
		VI	15	-	2(13,3%)	5(33,3%)	8(53,3%)
Qabaqtepe village school, Dashkesen region		V	14	-	2(14,2%)	7(50%)	5(35,8%)
		VI	16	1(6,3%)	3(18,7%)	6(37,5%)	6(37,5%)
School №9, Ganja city	Experimental	V	27	3(11,1%)	4(14,3%)	8(27,6%)	12(44%)
		VI	25	1(4%)	3(12%)	7(28%)	14(56%)
		V	26	2(7,6%)	3(11,5%)	7(26,9%)	14(53,8)
		VI	23	1(4,35%)	4(17,2%)	6(25,8%)	12(52,2 %)
School №12, Ganja city	Supervised	V	20	1(5%)	3(15%)	7(35%)	9(45%)
		VI	18	1(5,6%)	3(16,7%)	6(33%)	9(50%)
		VI	16	-	4(25%)	5(31%)	7(43,8%)
Ibrahim Hajili village school, Tovuz region	Experimental	V	18	1(5,5%)	4(22%)	4(22%)	9(50%)
Uchtepe village school, Goy-Gol region		VI	16	-	3(18,8%)	4(25%)	9(56,3%)
		VI	14	-	4(29%)	4(29%)	6(43%)

Table 2.

Supervised and experimental classes

Schools	Grades		Number of students	Results (based on level)			
				I	II	III	IV
Morullu village school, Shamkir region	Supervised	V	19	1(5,3%)	4(21%)	6(32%)	8(42%)
		VI	17	1(5,9%)	2(11,8%)	7(41,2%)	7(41,2%)
Qabaqtepe village school, Dashkesen region		V	16	1(6,9%)	2(12,5%)	8(50%)	5(31%)
		VI	14	-	1(7,1%)	5(35,7%)	8(57,1%)
School №9, Ganja city	Experimental	V	21	6(28%)	7(33%)	6(28%)	2(9,5%)
		VI	27	8(29%)	8(29%)	8(30%)	3(11%)
		V	18	6(33%)	6(33%)	5(27,7%)	1(5,5%)
		VI	26	9(35%)	9(35%)	7(27%)	1(3,8%)
School №12, Ganja city	Supervised	V	24	2(8,3%)	5(20,8%)	13(54,4%)	4(16,7%)
		VI	20	1(5%)	4(20%)	12(60%)	3(15%)
		VI	21	2(9,5%)	6(28,6%)	9(43%)	4(19%)
		V	18	1(5,6%)	5(27,8%)	9(50%)	3(16,7%)
Ibrahim Hajili village school, Tovuz region	Experimenta	VI	20	4(20%)	8(40%)	6(30%)	2(10%)
Uchtepe village school, Goy-Gol region		VI	18	3(16,7%)	6(33,3%)	8(44,4%)	1(5,6%)
		V	16	3(18,8%)	5(31%)	7(44%)	1(6,3%)
		VI	14	3(21,4%)	5(36%)	5(30%)	1(7,1%)

Analysis of the results of the experiment shows that the proposed methodological system called generalization and the use of analogy in the teaching of mathematics in V-VI grades has been quite effective.

A comparative analysis of the experimental results showed that both the percentage of success and the percentage of quality in the

experimental classes with the quality of mastery were 15-18% higher than in the supervised classes.

The following ***results*** were obtained from the theoretical and experimental research:

1. Analogy is one of the most important methods of mental activity widely used in mathematics, as well as in other disciplines. Its importance is especially evident in developmental training at school.In this case, the analogy acts both as an object of learning and as a learning tool. In the literature, it is considered as the second aspect. The main task is to use the binary form of the analogy approach in training, ie to take into account both aspects. This is the essence of developmental training. In the procedural plan, analogy is intended as a training action aimed at determining the composition of the operation.
2. Analogy occurs in learning in different forms and in different functional possibilities, but it is not taken into account in school practice. it is impossible to complete the learning process properly without knowing it.
3. Different types of analogies have different operational components. This requires that the study of this method requires a different teaching method, and shows that a global approach is not sufficient in the use of analogy. The types that play a major role in mathematics are paradigm, compatibility, and causal analogy. The second chapter will cover these issues.
4. The use of analogy as an intuitive learning tool does not shape it as a learning method.
5. The proposed system of studies has been methodologically justified. It provides an inheritance for the formation of the analogy method in grades V-VI.
6. The proposed system of exercises for the formation of analogy is effective and plays a guarantor role in achieving the objectives of training. It focuses on the process of formation of the method of analogy.
7. A “global” approach to the use of analogies that characterizes

traditional teaching does not ensure the independent use of analogies as a tool.

8. It has been established that the effectiveness of the use of one or another type of analogy depends on the training conditions. They dictate a change in the operational composition and function of the analogy. All this must be taken into account in the methodology.
9. The procedural direction in the method of formation of analogy is the organization of succession in the formation of different types of analogy.
10. Consideration of the analogy in the concept of training actions has allowed to obtain new results, which are important for inheritance in the teaching of this method.
11. The proposed system of exercises can be used without wasting extra time when learning program questions.

The main provisions and content of the dissertation are reflected in the following published works.

1. Generalization in mathematics teaching. ADPU. Pedagogical University news. Baku, 2015 № 3 Pages 479-481 (Hamidov S.S)
2. Generalization and specification in the teaching of school mathematics. Baku Girls University. Scientific works, Baku, 2018. №2, Pages 199-201
3. The principle of succession in the use of generalization and analogy in the teaching of mathematics. Institute of Education of the Republic of Azerbaijan. Scientific works. vol 85, Baku 2018. №5 Pages 145-147
4. Elements of logic in the study of school mathematics. ISSN 2520-6990 Michdzyna-genus czasopismo naukowe. Colloquim journal. Crçsc 1. Warszawa, Polska 2018. №1 (12) p. 11-13
5. Application of analogies in the process of teaching mathematical concepts at school. Baku. Girls' University. Scientific works. Baku 2018. №4. p. 240-243
6. Rules for creating didactic conditions when using different forms of analogy. Institute of Education. Scientific works. Volume 85.

7. Methods of formation of analogs "nucleus". Ganja State University. III International Scientific Conference of Young Scientists. The conference is dedicated to the 80th anniversary of the university. October 17-18, Ganja 2018. p. 267-270.
8. The use of analogy and generalization in mathematics lessons as a means of forming mathematical skills in students. ADPU. Proceedings of the XXII Republican Scientific Conference of Doctoral Students and Young Researchers, Volume II. Baku 2019. pp. 338-339
9. The role of analogies in the development of mathematics. Collection of articles on the material of the XXVII international scientific-practical conference. Pedagogy and psychology in the modern world: theoretical and practical research. (28). Moscow 2019. №10. pp.17-20
10. Karaeva, V.M. Using the method of analogy and generalization in teaching mathematics in grades 5-6. // Pedagogy and psychology. Scientific and methodical journal. - Almaty: - 2021, No. 2 (47). pp. 198 - 202.

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