AZERBAIJAN REPUBLIC

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The system of work on the application of descriptive methods of the algorithm in teaching mathematics in the V-IXth grades.

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

Field of science: Pedagogy

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ABSTRACT

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GENERAL CHARACTERISTICS OF THE RESEARCH

The urgency of the problem and the degree of work: Our independent Republic is in great need of specialists with excellent mathematical training and advanced thinking, and this need will increase over time. The foundation for the training of such young specialists is laid in the secondary schools of the Republic. The "Curriculum" reforms have expanded the content of mathematics education in secondary schools, among other subjects. It would be wrong to say that the reform of mathematical education is over with the introduction of a subject curriculum and new mathematics textbooks in mathematics. This is because, firstly, the curriculum and mathematics textbooks are currently being improved from time to time, and this has become a necessity. Second, the reform has so far focused on the content of teaching, but the methods of teaching mathematics have not been sufficiently covered. Improving teaching methods is one of the key challenges facing modern education. Unlike traditional teaching methods, modern teaching methods are aimed at organizing student activities for the independent acquisition of new knowledge in the acquisition of ready knowledge. We know that it is impossible to develop mental activity "in vain" without any knowledge.

Taking into account the main traditions of the practice of using modern computer technology in the teaching of mathematics in modern conditions, one of the main conditions is to strengthen the direction of the application of algorithmic skills in students and its successful implementation. The concept of algorithms has gained special practical significance due to the widespread use of program-driven learning technologies.

The most diverse management processes of practice are widely implemented through algorithms. It should be noted that along with modeling, algorithmization is one of the main methods of cybernetics, which is the most common science of control.

Thus, the training of the ability to consistently and correctly compile algorithmic commands is called algorithmic training. Along

with other simple concepts of data organization and processing under the influence of scientific and technical progress, the formation of students' initial ideas about algorithmic methods has seriously influenced the content of general school education. The following cases open up a wide range of possibilities for this statement:

a) the growing importance and general importance of this field of knowledge in general education;

b) that a number of important issues in this area are understandable for school learning.

We believe that over time, the collection and processing of data related to the initial ideas about algorithms will be more important and valuable than the traditional sections of school mathematics that are still relevant today.

The most vividly expressed area of human activity is programming for modern computer technology, which is the essence of this algorithmization. That is why programming for computers has become an important and useful area in which algorithmics have penetrated intensively into the content of school education. There are great opportunities and conditions for the systematic formation of algorithmic skills in the school mathematics course itself. Because the expression, description, study and application of algorithms is one of the most important components of school mathematics teaching. On the other hand, the effective implementation of the line of algorithms in training creates the best and most effective conditions for the acquisition of mathematical knowledge and their application in practice.

The general education and applied tasks of the school mathematics course include the identification of the main mathematical methods that lead to the construction of rational and efficient calculation algorithms. In this case, its table form or block diagrams can be shown as a language that can be visually demonstrated and the specific mathematical methods are clearly defined for the writing of suitable algorithms for use in modern computer technology. The construction of block diagrams is convenient and visual for better understanding by students. The skills

and habits acquired by students in the development of algorithms in the block diagram language are sufficient for the formation of students' initial mathematical ideas about the automatic processing of information in modern computer technology. The concept of automatic information processing is organically related to such concepts as "information" (writing, storing and retrieving information), "algorithm" (forms of writing algorithms), "automatic information processing algorithms (concept of software for modern computer technology). It is very useful to understand the basic idea of the widespread use of modern computer technology; machines can replace humans only in areas of human activity that can be expressed by an accurate and one-size-fits-all algorithm. can recognize different objects, translate from one language to another, solve non-computational problems such as mathematical game problems, etc. The main difficulty in solving mathematical problems shown in modern computer technology is is the correct development of the process execution algorithm.

Given the prospects for the development of modern computer technology and Automatic Control Systems (AIS), Academician A.N.Kolmogorov wrote: *"Our young people will still need to speak a lot of artificial languages to interlocutors such as computers and control systems. cannot be given.* "[1]

The introduction of computers in the V-IX grades of school mathematics has made it very important for students to master algorithmic skills. Algorithmization is an important stage in solving problems related to mathematics, physics and other subjects in secondary schools. With this in mind, psychologists, educators and Methodist scientists continue to pay attention to the problems of applying algorithms in training. Researchers from foreign countries

1 - Kolmogorov, A.N. Dialogue about mathematics - Teacher's newspaper, 1974. January 12

V.M.Monakhov, M.P.Lapchik, A.P.Yershov, N.F.Tamzina, I.P.Gabovich, B.S.Kaplan, K.K.Ruzin, T.V.Robert, A.A.Stolyar, P.I.Makhanov Thein and others, as well as Azerbaijani scientists A.G.Palangov, A.M.Aliyeva, A.S.Adigozalov, M.Alishov, I.B.Ahmadov, R.Y.Shukurov, S.A.Zamanova, T.M.Aliyeva, T.A.Mammadov, I.M.Ibrahimov, S.C-J.Taghiyeva, F.Q.Safaraliyeva, R.Z.Humbataliyev and others have conducted research on the problem we are looking at, ie on improving the quality and efficiency of teaching mathematics using the means of description of algorithms , or have developed valuable scientific and methodological tools on computerization and programming. In their works, they have extensively and comprehensively studied the application of computers and calculators to mathematics.

The study of advanced school experience, analysis of scientific and methodological literature, research of dissertations written in this field so far allow us to conclude that not enough research has been done on the application of the algorithmic approach in mathematics teaching. Although some research has been devoted to the study of the problem, its full and detailed study has not been carried out directly. The dissertation of S.C.-Tagiyeva, defended in 1999 for the degree of Doctor of Philosophy in Pedagogy, entitled "Improving the quality of teaching mathematics by algorithms (grades 7-11)" is dedicated to the teaching of mathematics in the upper grades of school. Also, this research work is based on the programs and textbooks of previous years. Our research is in accordance with modern textbooks and methodological ideas developed on the basis of the curriculum, taking into account the scientific and methodological research of recent years, and it differs significantly from previous works in this area in terms of content and objectives.

The object of the research is the organization of mathematics training in V-IX grades of the school.

The subject of the research is the ways of studying the means of description of algorithms in mathematics lessons of V-IX grades.

The purpose of the research is development of a methodical system that reveals the possibilities of improving the quality of

teaching and linking with computer technology through the use of algorithm descriptive methods in grades V-IX and identifies ways to apply it in the learning process.

Research goals:

1) To study the state of mathematics teaching in V-IX grades in terms of the studied problem;
2) Study, analysis of existing scientific-methodical literature on problem solving, drawing conclusions and development of a new methodical system;
3) A broad description of the formation and gradual development of mathematical concepts;
4) To pay attention to the terminological aspects of new mathematical concepts, to fully clarify the pedagogical and especially mathematical terms included in our speech in connection with innovations;
5) Extensive analysis of the formation of the culture of independent mathematical thinking, elements of educational activity in students with the application of methods and techniques of teaching mathematics used in V-IX grades;
6) Use of information and communication technologies, visual illustrative materials in the transfer of knowledge, skills and habits on the subject of mathematics;

Research methods: observation, comparison, generalization, pedagogical experiment, statistics, analysis, synthesis, induction and deduction, questionnaire, interactive (active) training and other teaching methods were used in the research.

Historical, comparative, mathematical-statistical and other methods and techniques were widely used in the dissertation.

These include:

- Analysis of the scientific literature on the problem and identification and recording of facts necessary for the pedagogical process;
- Analysis of scientific, educational-methodical literature related to the mathematics course of V-IX grades;

- Study of the work system of mathematics teachers of V-IX grades - acquaintance with methodical documents, as well as educational documents of students;
- Observation and analysis of lessons of V-IX grade mathematics teachers in schools;
- Carrying out of pedagogical experiment in three stages: defining, teaching and checking stages in a wide and comprehensive way;
- Concretization, analysis and generalization of the results of the pedagogical experiment carried out in the schools and classes determined in connection with the scientific research on the basis of mathematical statistical elements.

The main provisions of the dissertation:

- The application of descriptive methods of algorithms in the teaching of mathematics prepares students for the training of programming;
- There are effective ways and means to improve the quality of teaching mathematics based on the application of various methods of description of algorithms;
- When the descriptive methods of the algorithm are applied, students develop intellectual activity, play an important role in the formation of cognitive processes, and their interest in the study of mathematics increases.

The scientific novelty of the research: is that the methodological possibilities of descriptive methods of algorithms (tables, words, block diagrams, etc.) in the teaching of mathematics in V-IX grades revealed ways and means to improve the quality of teaching, their effectiveness has been scientifically substantiated in detail. The scientific novelty of the research in this regard is the creation of a new methodological system to increase the effectiveness of mathematics teaching in grades V-IX, based on the application of modern computer technology in accordance with the requirements of the time, referring to tried and tested traditional learning technologies**.**

Theoretical significance of the research. The possibilities, ways and means of applying different descriptive languages to

algorithms in the teaching of mathematics will enrich the theory of learning to some extent. The presented scientific-methodical system can be used in the development of existing mathematics programs, textbooks and teaching aids for V-IX grades, methodical aids and recommendations for teachers.

The use of the ideas and thoughts of various pedagogical scholars dealing with this problem in recent years in the dissertation is also of great theoretical importance.

The practical significance of the research As a preparatory stage for programming, students will acquire certain skills related to the methods of describing algorithms in the teaching of mathematics in grades V-IX, and will use them successfully in solving problems related to other subjects, which will provide ample opportunities to strengthen the application of mathematics. The methodological system created in accordance with all the components of the new training system: consists of having a suitable teaching aid for mathematics teachers teaching in grades V-IX. The material can and should be widely used to improve the content of mathematics teaching in grades V-IX, to compile textbooks on mathematics, to prepare methodological guidelines and recommendations for teachers, to compile didactic materials and visual aids.

Approbation and application of the research: The dissertation work was carried out at the "General Mathematics" department of Ganja State University. In connection with the research work, reports were made at different times at the "General Mathematics" department of Ganja State University, at various scientific seminars, at national and international scientific conferences. In connection with the content of the dissertation, 8 scientific articles, reports from 4 scientific conferences of national and international importance were published in the scientific publications recommended by the Higher Attestation Commission, including 2 abroad.

The published recommendations related to the scientific-methodical research were used during the pedagogical experiments, the obtained scientific-methodical results were improved and

corrected in the process of work, were added to the new recommendations and delivered to the mathematics teachers.

The structure and scope of the dissertation consists of an introduction justifying the relevance and methodological apparatus of the research, two chapters, a pedagogical experiment, new results and suggestions, and a list of references.

The plan of the dissertation is prepared in a logical sequence and covers the essence of the problem completely and comprehensively. In the dissertation, the content of scientifically and practically important provisions is characterized in the form of internal unity, and the logical sequence is fully expected here.

The dissertation consists of: title (504 i.s.), introduction (13810 i.s.), two chapters together (205693 i.s.), results and proposals (10397 i.s.) including a total of 232715 characters

THE MAIN CONTENT OF THE DISSERTATION

In the introductory part of the dissertation the relevance of the topic is substantiated, the object, subject, purpose, hypothesis, tasks, research methods, solution of the problems, scientific novelty of the research, theoretical significance of the research, practical significance of the research are presented. brief information on the application of the results.

The first chapter of the thesis is called **"Scientific and methodological foundations of the application of descriptive methods of algorithms in teaching mathematics"** and consists of five subchapters.

The first subchapter, entitled ***"The Essence and Basic Elements of Algorithmic Culture"***, addresses the following issues. It is noted that algorithmic culture is understood as a set of certain algorithmic ideas, skills and habits that form part of the general culture of each person at the present stage of society development and, of course, determine the purposeful component of general school education.

In recent years, two ideas have become clear in modern mathematics:

For our research, the actualization of the interactions between the sections of modern mathematics is of greater interest; In this section there is a connection between discrete elements and the nature and principles of their operation in modern electronic computers, as well as the existing discrete nature. Thus, modern computer technology accepts only two specific "yes" and "no" values for each element. All the work of modern computer technology is based on this discreteness.

The second subchapter of the first chapter of the thesis is called ***"Methodological analysis of the description of algorithms of mathematical operations in mathematics textbooks of V-IX grades."*** The subchapter allows you to systematize a set of algorithms used to solve certain types of problems, helps to increase the computational culture and logical literacy of students. In addition, it develops the ability to compile verbal descriptions of algorithms that allow students to develop an algorithmic culture.

It should be noted that we are not talking about changing the structure of the rules in textbooks, but, first of all, about the methodology of the teacher's work with different rules in the classroom.

Analysis of the use of various tools for describing algorithms makes it possible to single out some types of work. They can be purposefully used by the teacher to complete the work according to the textbook:

1. "Incomplete" exercises applied to a part of the algorithm for performing the introduced operations.
2. Exercises with "extra" data to separate the steps of the algorithm.
3. Exercises on re-expression of rules related to the type of algorithmic instructions with an exact sequence of elementary operations.
4. Exercises to convert descriptions of algorithms from one type to another.
5. Exercises related to the recognition of belonging to one of the existing collections of examples.

The third subsection of the first chapter is called ***"Methodological analysis of school algebraic materials from the point of view of the use of algorithmic operations".*** Here a special place is given to the study of various procedures (methods) on the algebraic material of the school mathematics course. This includes not only algebraic operations assigned to different sets, such as multiplication of polynomials, addition and subtraction of fractional-rational functions, but also their importance in operations, for example, a number of other operations can be performed in the solution of a system of two-variable linear equations, such as a sequence of steps, reduction of algebraic fractions, reduction of expressions for logarithmization.

The fourth subchapter of the first chapter is ***called "Algorithms - as a means of managing students' intellectual activity in the process of solving problems."*** This chapter covers the following.

In the process of problem solving, the pedagogical management of students' intellectual activity should refer to the laws of detail and be related to the formation of mental activity techniques. In this case, one of the leading provisions of psychology on the unity of knowledge and action should be referred to in the process of formation of generalizations in students.

Research by psychologists and school practice show that the pedagogical management of students' intellectual activity in the teaching of problem-solving methods and techniques is effective in the context of algorithmic training and the widespread use of modeling in the teaching process.

Linking learning algorithms with a problem-based approach facilitates and accelerates the learning of program material, thereby reducing students' stress for intuition and creative activity in solving non-standard problems. The better the student's intuition and the faster it develops, the more it will remember the methods and techniques of solving different types of problems.

The fifth subchapter of the first chapter is entitled ***"The structure of the line of algorithms in teaching school mathematics, the use***

and development of language and concepts of algorithms". This chapter covers the following topics.

School mathematics training should be designed in such a way that, starting from the small stages of training, students are constantly formed ideas about the methods of mathematics and their algorithmic applications in practice. This means that in a particular case, as a "product" of the solution of the problem, depending on its nature or practical task, the student can determine the final result or numbers, figures, and so on. can take the form of. It, in turn, can be presented either in the traditional "analytical" language (formula) of mathematics or in any other analytical language. For example, the result of solving problems related to the school mathematics course can be a block diagram of the algorithm or a program for modern computer technology written in any algorithmic language.

In the process of teaching mathematics, students should develop an understanding of algorithms (intuitive) and develop the skills of constructing and justifying algorithms. A wide variety of algorithmic representations (from primitive to formal languages) should serve this purpose.

Carrying out an algorithmic line in school mathematics teaching, in general, does not require a radical change in the content of mathematics teaching.

The second chapter of the thesis is called ***"Directions for the application of algorithmic methods in the teaching of mathematics"*** and this chapter is explained in detail and in full in 4 paragraphs.

The first subchapter of this chapter is titled ***"A math curriculum as a tool for students to master algorithms on their own."*** Here, an analysis of the content of a course in mathematics in basic school shows that the study of any part of it includes algorithmic learning. In particular, the same transformations of rational algebraic expressions, methods for solving linear and quadratic equations and their systems play an important role in this course.

An algorithm is a rule in which the content of an algebraic operation with a certain sequence of actions (steps) is clearly defined,

and the exact implementation of this rule leads to the solution of many problems. If the student is able to apply the algorithm easily and quickly enough to solve specific examples, then he is considered to have mastered the algorithm.

Here we want to show how the material interpretation system should influence the successful independent activity of students in mastering algorithms in linear education programs.

In this regard, the training programs on "Algebraic fractions" and "System of two unknown equations" will be analyzed as illustrations.

The complexity of mastering new algorithms in educational programs is that, on the one hand, the student needs to master a new system of operations of algorithmic actions, in this case, the student is shown only the source of knowledge, on the other hand, it is necessary to move some knowledge. Therefore, the conditions for the successful mastering of new algorithmic rules are knowledge of factual material already known from algebra, as well as independent work with educational programs.

The system of teaching materials in educational programs is such that the student's independent work will be successful only if the student begins to seriously and consistently carry out all the work offered to him. Therefore, the gradual nature of the work and the degree of complexity depending on the strength of the students are important.

The second subchapter of the second chapter examines ***"Features of the formation of algorithmic ideas in school algebraic materials."***

Most of the content-methodological lines presented for the methodological study of school algebraic materials correspond to each other in a number of respects. The most important of the common features is the early division of the concept (or group of concepts) in each line and the duration of its development in the course as a subject of study; formation of a system of concepts that reveal the content of this line; establishing multifaceted relationships within this system.

None of the modern classes of algebra known to us has the functions listed above that implement the algorithmic line. This is reflected in the characteristics of his condition in school algebra. An important concept of the algorithmic line is the algorithm, which is highlighted at the end of the course and, in fact, is the only one (flowcharts perform only the function of illustration, ideas about the program and the algorithmic language are given in the introductory plan). The concept of an algorithm does not take long as a subject of study. It is mainly used as a term that combines several synonyms: rule, sequence of actions, and etc.

The third subchapter of the second chapter of the dissertation is called ***"Application of algorithmic means of description in the teaching of geometric materials of V-IX grades."***

There are great opportunities for the formation of important elements of algorithmic culture in the teaching of geometric materials for grades V-IX. Proof of theorems is, in essence, finding a chain of propositions based on the application of already known theorems (or axioms); The solution to the setup problem is to find and follow the chain of operations. Both in these and in other cases, the search for suitable chains can be considered as building a certain algorithm, implementing a solution to the problem. At the same time, it is difficult to assess the role and importance of students' logical thinking skills.

A special symbolism, used in combination with a minimum number of words and combinations of the spoken language, that allows to make any geometric writing short and uniform has been adopted long ago. Such writings are another step towards full standardization in order to give them a "real" algorithmic form. The methodological benefit of such an introduction is obvious: the teacher can quickly check the solution of the problem (utilitarian benefit), and the students, in turn, without any pressure will learn the "spirit" of the algorithmic language, which will naturally increase their algorithmic culture.

When compiling a description of an algorithm for solving a complex design problem, a student usually does not try to separate

each operation, but uses previously known algorithms. It follows that the operations performed by the student in the process of describing the algorithm for solving the construction problem are not completely the same due to the complexity.

In the fourth paragraph of the second chapter of the dissertation, the issues of ***"Strengthening the algorithmic activities of students in the solution of equations and inequalities"*** are studied in detail.

Let's introduce the following algorithmic training methods:

Introduction of algorithms (actualization of knowledge in mastering algorithms). To teach students algorithmic learning methods (block diagrams, tables, words, etc.) under the guidance of the teacher.

Assimilation (algorithm and the operation of carrying out the sequences included in it).

Application of the algorithm (training of algorithms in known and unknown situations) In this section we show the solutions of various linear inequalities on concrete examples. A block diagram algorithm is built for the solution of each example, or each solution is expressed in an algorithmic sequence.

“Conducting a pedagogical experiment and analyzing the results” is noted in the end of the dissertation.

The purpose of the pedagogical experiment was to test the feasibility and expediency of the methodology we have developed to ensure the formation of an algorithmic culture of students in the process of mastering the means of description of algorithms. A pedagogical experiment was organized to test how the algorithms helped students in grades V-IX to master mathematics more deeply and consciously, to improve their knowledge, and to develop their cognitive interests. Schools 2, 4, 5, 6 and 16 were selected for the experiment:

The pedagogical experiment covering 2014-2017 was conducted in three stages:

1. **Definitive pedagogical experiment** - to determine the level of knowledge and skills of students in the classrooms in accordance with our idea;

2. Educational pedagogical experiment - application, teaching of the methodological system developed by us in experimental classes;

The pedagogical experiment was conducted in 2014-2017 in three stages. The purpose of the first (defining) experiment, carried out in 2014-2015, was to study the situation of students using algorithmic skills in school practice when teaching mathematics courses in grades V-IX, searching for theoretical and methodological foundations for solving the research problem. At this stage, a working hypothesis of the research is formed and expressed. Favorable conditions have been created for organizing the experiment, schools for experiments have been identified, and experimental and control classes have been selected. At the same time, we tried to keep the level of knowledge and skills of students and teachers in those classes approximately equal. The level of students' knowledge and skills related to the problem was examined in writing and orally.

At the second (educational) stage of the pedagogical experiment, conducted in 2015-2016, educational and research work was carried out with the aim of studying the methodological system developed by us for the use of algorithmic descriptive tools in teaching mathematics educational material for 5-9 grades. It consisted in developing a methodology for enhancing the application of various descriptive tools of the algorithm to teaching mathematics in secondary schools, familiarizing teachers of mathematics in experimental classes with this content and methodology, and conducting a teaching experiment using a new methodological system developed in experimental classes. In the teaching phase of the experiment, examples of classroom lessons were prepared, discussed and refined to implement the research objectives. The influence of the developed methodological system on increasing the activity of students in learning has been studied.

3. Testing pedagogical experiment - testing the knowledge and skills acquired by students using the new methodology.

Experimental and control classes have been established in schools to conduct pedagogical experiments. According to the results of the descriptive experiment, the level of mathematical preparation of students in those classes was basically the same. We conducted a formative experiment in experimental classes. In this case, the ideas of the proposed methodological system, the provisions on the methodology of teaching the subject were conveyed to the teachers who will work in those classes, and the necessary teaching materials were provided. Although the teachers of the control classes were informed about the purpose of the experiment, they were not given any additional information about the research.

Special instructions for the experiment have been prepared for the teachers who will conduct the experiment:

1. Comment on the material according to our recommendations;
2. Determine the time spent on teaching the material;
3. Carry out inspection tasks according to the scheme we provide;
4. Fill in report forms and sheets;
5. Record all adjustments made during the course;
6. The teacher conducting the experiment should write down his / her personal opinions and opinions on the results of mastering the material according to our proposed methodology.

During the experiment, teachers monitored the implementation of these instructions.

The results of the experiment were determined by means of tests, individual conversations with students, questionnaires with teachers and conversations.

Before lessons, every small question about their progress was discussed in detail with the teachers. The results of the lessons were regularly discussed and corrections were made in accordance with the course of the experiment. During the experiment, we received information about the intelligibility of the interpreted material and the effectiveness of its assimilation.

The purpose of the pedagogical experiment was to confirm the hypothesis put forward in the dissertation. To achieve this goal, the following tasks have been set:

1. Analysis of the state of algorithmic training of students in the process of teaching mathematics in grades 5-9.
2. In the process of teaching mathematics, one should not develop a methodology for teaching students various means of describing an algorithm.
3. To determine the impact of the developed methodology on the formation of students' readiness to apply the acquired knowledge and skills.

In the first stage of the experiment, the following tasks were performed:

Table 2.4.1.

Class	Subject	Question Number	Number of Students	Rated							
				**		***		****		*****	
				C	E	C	E	C	E	C	E
7 a, b	"Product of polynomials"	1	21	-	-	2	1	6	12	13	8
		2	21	4	1	6	2	7	11	4	7
		3	21	5	2	7	4	8	9	4	6
		4	21	6	3	8	9	4	4	3	5
		5	21	7	1	6	8	5	7	3	5
		6	21	2	1	8	6	7	6	4	8
		7	21	4	1	5	9	7	6	5	5
		8	21	4	1	8	8	7	5	2	7
		9	21	6	2	9	8	6	9	-	2
		10	21	9	3	8	9	4	7	-	2
Total				47	15	67	64	61	69	38	55

İf he answered the questions in the affirmative, the number of students in the class would be 210. Then the percentage of mastery in the control class is as follows:

- In the control class, mastery is 79%, quality is 47%.

The percentage of mastery of the experimental class is as follows:

- In the experimental class, the mastery is 89.5%, the quality is 57%.

Table 2.4.2.

Class	Subject	Question Number	Number of Students	Rated							
				**		***		****		*****	
				C	E	C	E	C	E	C	E
7 a, b	"Finding the number of solutions of a system of two-line equations with two variables"	1	24	3	-	3	2	3	4	15	18
		2	24	6	2	4	2	6	2	8	18
		3	24	3	-	5	1	10	5	6	18
		4	24	4	-	7	2	8	9	5	13
		5	24	5	-	8	1	7	8	4	15
		6	24	4	2	3	1	6	7	11	14
		7	24	3	4	2	1	8	8	11	11
		8	24	2	1	4	3	12	11	6	9
		9	24	6	3	9	7	5	7	4	7
		10	24	7	2	8	7	6	5	3	10
Total				43	14	53	27	71	66	73	133

The percentage of mastery in the control class is 82%, the quality is 60%.

The percentage of mastery in the experimental class is as follows:

- So, in the experimental class, the mastery is 95.8%, the quality is 82.9%.

All methodological calculations show that mastery in both experimental classes. but the quality was higher than the control classes. This proves that the research hypothesis is correct.

The following results were obtained as a result of the research:

1. Theoretical analysis of the strengthening of the algorithmic line in the teaching of mathematics in grades V-IX of secondary schools showed that the developed new methodology allows to strengthen the algorithmic imagination, skills and habits of students.
2. As a didactically universal programming language, block diagram language serves as a tool to increase the efficiency and quality of mathematics teaching.
3. A system of exercises should be developed to serve a deeper understanding of the basic descriptive language of algorithms and to cover the main sections of the mathematics course for grades V-IX.
4. The teaching of mathematics in school should be organized in such a way that, starting from the lower grades, students are constantly formed on the algorithmic nature of the methods of mathematics and their application in practice. This means that, in a particular case, as a "product" of problem solving, depending on its nature or practical tasks, the student can obtain the final result either in the form of numbers, figures, etc., or in the traditional analytical language of mathematics (formulas), or any other in the form of algorithmic commands specified in the algorithmic language. Thus, the results of problem-solving skills obtained in a school mathematics course can be a block diagram of an algorithm or a program for modern computer technology.
5. The methodology of teaching mathematics at school, aimed at the formation of an algorithmic culture in students, should, as far as possible, consider the various elements of algorithmization in a particular strict language system. In this case, the use of visual algorithms of the algorithm must be methodologically justified.
6. In the process of teaching mathematics, students develop the concept of algorithms, the development of skills in building

algorithms and the ability to check the accuracy of such skills (intuitively). The most diverse means of writing algorithms should serve this purpose, from primitive forms to formed languages.

7. The concept of algorithms, languages for writing algorithms and methods of organizing these notations are not only didactic tools to increase the effectiveness of mathematics teaching, but also an important goal of training. This task must find its practical solution both consistently (in the teaching of the whole school mathematics course) in the education of algorithmic thinking, as well as in acquaintance with real methods of problem solving in modern computer technology. It is advisable to consider the study of the elements of practical programming at the final stage of training at school.

8. The inclusion of an algorithmic line in the teaching of school mathematics, in general, does not require a radical change in the content of mathematics teaching. The only exception here is the concept of "Algorithm" and its various writing methods, which include programming elements for modern computer technology.

9. The use of block diagram language helps students to clearly understand the sequence of solving mathematical problems, the logic of the computational process as a whole, regulates their intellectual activity and at the same time forms the main elements of modern mathematical culture. Extensive use of block diagrams helps to develop students' interest in mathematics, especially problem solving.

10. The description of algorithms in block diagrams is the most effective from the didactic point of view. When considering the development of complex algorithms, especially in writing a program in any formed language, they are always satisfied with block diagrams. Translating from one algorithmic language to another is a complex process, and block diagrams are universal and facilitate this conversion.

The main provisions of the dissertation are reflected in the following theses and articles, conference materials:

1. Gaybaliyeva, K.Y. Moving from planning to algorithms is a way to restructure the teaching of mathematics. Azerbaijan State Pedagogical University. ICT in education. Scientific-methodical journal, Baku, №2, 2016, p.59-63.
2. Gaybaliyeva, K.Y. Methodology for teaching the flowchart descriptive language of the algorithm in solving problems of school mathematics. Azerbaijan State Pedagogical University. ICT in education. Scientific-methodical magazine, Baku, №4, 2016, p.18-23.
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5. The need to expand knowledge about algorithms in modern conditions. Azerbaijan State Pedagogical University. ICT in education. Scientific-methodical journal, Baku ISBN-2522-4298. 2017, c-33, № 3, p.26-30
6. Gaybaliyeva, K.Y., Z.Kardashova. The role of algorithms in the study of general methods of solving some mathematical problems, ADPU., ICT in education. Scientific-methodical journal. Baku, 2017, №1, pp.119-125.
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Girls University, Scientific Works, Baku, 2017, №4 (32), p. 168-171.
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11. Gaybaliyeva, K.Y., Teaching programs for students in mathematics as a means of acquiring algorithm independently, LIX international correspondence scientific and practical confenence "European Research: Innovation in science, education and technology". London, Great Britain, 9-10 january 2020, p. 54-56.
12. Gaybaliyeva, K.Y. Forms of application of algorithims in school mathematics teaching. Scientific Bulletin of South Ukrainian National Pedagogical University named after K.D. Ushynsky Journal. №2(135)2021, Odesa, Ukraine. SUNPU named after K.D. Ushynsky

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