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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

POSSIBILITIES AND WAYS OF USING NEW INFORMATION SYSTEMS IN TEACHING COMPUTER SCIENCES (BASED ON MATERIALS FROM GRADES V-IX)

Specialty: 5801.01- Theory of education and upbringing and methodology (computer science teaching methodology)

Field of science: Pedagogical sciences

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GENERAL CHARACTERISTICS OF THE STUDY

Relevance and degree of completion of the topic. The financial situation of people in any country in the world largely depends on the level of education in that country. The reason is clear: the XXI century is the century of technology. Azerbaijan's oil strategy has been able to ensure rapid economic development. Although we have a lot of assets now, it is wrong to stop at this, because in the future, hydrocarbon reserves will decrease and it will be difficult to ensure stable economic growth rates. It is for this reason that our State has prepared a plan of preventive measures.

The Azerbaijani state has set a specific task for schools, because our state considers itself very responsible to society. In the context of informatization of the secondary education system, there is an increasing need for methodological foundations for the use of information technologies for the development of educational competencies of students in the learning process. To this end, the Cabinet of Ministers of the Republic of Azerbaijan has decided to establish the Department of Informatization of the Economic Education System under the Ministry of Science and Education of the Republic of Azerbaijan.

The main goal of improving the methods used by schoolchildren in the field of obtaining information is so that the student can think not only through images, speech, printed words and letters, but also through a computer.

The teacher should be assigned tasks in such a way that he can not only instill in students knowledge, skills and abilities from information and communication technologies, but also give certain competencies - qualities necessary for the implementation of educational activities. For this reason, it is necessary to think about such means so that the student can decide his fate, acquire independent knowledge, get acquainted with the cultural and historical achievements of a person. Tools also form a personal attitude towards objects and information about them. This, in turn, eliminates indifference to the content of education, in which the element of personal importance is especially highlighted.

It is the development of market relations that makes the civilized world rich. This often causes a person to get into situations from which a person can only get out thanks to his personal intuition. In such situations, the creation and improvement of a knowledge system becomes a necessary requirement of the day and plays the role of a key to solving problems. All these processes are mainly based on the use of new information technologies in education. The selection, systematization and assimilation of the necessary information at a high level are within the competence of each student. Today, education is conducted on the basis of a self-education system, and the teacher does not teach, but explains to the student how to learn, only helps him and mediates. Instilling students with the ability to think creatively is the main activity of the Azerbaijani state. It is for this reason that the Decree on the "State Strategy for the Development of Education in the Republic of Azerbaijan", signed by the President of the country on October 24, 2013, deserves special attention.[1] This order is an expression of a completely new vision of our country's education system. The State Strategy notes that education is connected with life and is aimed at training personnel capable of withstanding competition in the labor market.

On the other hand, by Decree of the President of the Republic of Azerbaijan Ilham Aliyev No. 2815 dated March 28, 2013, 2013 was declared the "Year of Information and Communication Technologies". This clearly defines the position of the state in education policy.

One of the main issues is the quality of information received by people and the formation of a knowledge system. The search for new tools for the formation of students' knowledge system is one of the urgent problems of our time, since information technologies are constantly developing and improving. From this point of view, instrumental software that serves to form a knowledge system is brought to the fore.

Various aspects of the modernization of education are reflected in the works of I.P.Smirnov, E.V.Tkachenko and V.A.Fedorov. A

[1] The State Strategy for the development of education in the Republic of Azerbaijan // Baku, October 24, 2013. No. 13. https://president.az/articles/9779@4

number of scientists (N.P.Gress, M.N.Shardakov) investigated the problems associated with the formation of the students' knowledge system. Various solutions were found and a plan for studying the structural units of knowledge was summarized. In these works, the peculiarities of the mental activity of schoolchildren were studied. Well-known ideas were further developed in the scientific works of L.V.Zorina and A.V.Usova. The students' study of the knowledge system based on the structural model of science is reflected in the scientific works of P.G.Moskalenko, L.Y.Zorina.

Selected issues of the problem of using computer technologies in teaching various subjects in secondary schools of our republic S.S.Hamidov, A.G.Palangov, I.N.Ismailov, N.A.Abishov, S.A.Hamidova, S.Ch.Tagieva, H.N.Tagiev, S.A.Zamanova and a number of methodologists were studied in their works.

Despite the fact that there are enough scientific papers, a complete study of the problem has not been completed, and many cases have yet to be studied on this issue. Undoubtedly, this is due to the fact that information systems are a broad concept, and it takes time to study them thoroughly. Therefore, do not think that our study will be the last.

There are a number of problems with the use of information systems as a tool for expanding students' knowledge. These are the following:

The discrepancy between the developed demand of society and the level of education;

- the discrepancy between the level of education and the requirements of the labor market;
- the discrepancy between the desire of students to master the entire knowledge system and the amount of funds needed to implement it;
- the lack of evidence-based programs with a large number of different educational programs.
- lack of practical training in the programming section when teaching computer science in secondary educational institutions;

- lack of practical skills among students in the field of programming;
- It is the presence of these problems that makes the topic of the dissertation an urgent problem of our time.

Purpose and objectives of the study. It is the process of studying the field of programming that serves to form a knowledge system in grades V-IX of secondary schools. The purpose of the study defines its subject – the methodology of teaching programming in computer science education in secondary school.

The goals and objectives of the study. The purpose of the research is to develop, implement and develop instrumental program examples that serve to form cognitive knowledge among students.

In order to achieve this goal, the following tasks are expected to be solved in the course of the study:

1. To deeply study and analyze the scientific literature on an urgent problem and interpret the application of pedagogical theory in practice.

2. To reveal and substantiate the theoretical significance of instrumental programs aimed at teaching students.

3. On the basis of certain theoretical provisions, prepare instrumental examples of programs.

4. Conduct an experiment to check the quality of the information system received by students.

5. Processing of the obtained results and conducting an analysis on them.

Object and methods of research. The research methods are as follows:

- analyze the theory of cognition, artificial intelligence and the theory of information delivery using a computer on a philosophical level;

- to determine the theoretical rules of the student information system at the psychological and pedagogical level;

- to prepare a methodology for teaching individual sections of programming languages (Python);

- to organize theoretical and practical computer science classes using the developed methodology;

- to monitor the educational activities of students, to give them advice in this process;

Main provisions to be submitted for defense:

- The systematic nature and internal features of the information intended for students are shown, according to which scheme knowledge will be acquired. Information is considered systemic only when its constituent elements are logically and functionally related to each other. The process of forming and understanding system concepts is combined into a single process and as a result is called the student's information system. Only those volumes of information have a systemic quality so that they can be raised to a level understandable to the student. Thus, the student acquires the ability to understand the new information system.
- The formation of an information system for students occurs when they acquire a certain set of knowledge in a series of sequences and through an electronic education system.
- Theoretically and practically substantiate the importance of programming in the formation of the students' information system.
- By creating independent software tools in the Python programming language, instilling competencies that form students' special knowledge, skills and habits and develop their logical thinking.

Scientific novelty of the research. As a result of the conducted research, the following scientific innovations were obtained:

- The relationship between the stages of the information system and the process of understanding is determined.
- It has been proven that instrumental programs are very useful for providing students with information systems.
- The content of the theoretical and practical components of programming in computer science teaching has been developed and the construction of a methodology for teaching a practical component in a certain sequence has been carried out.

Theoretical and practical significance of the study:

1. The content of the concepts of "student's information system" and "student's knowledge system" has been clarified when

working with electronic tool programs; according to which scheme knowledge acquisition will develop;

2. The concept of "formation of an information system" is explained. Based on this, it is assumed that electronic means will participate in the assimilation of mixed processes by students.

3. The conditions for using the methodology of teaching programming in grades VII-IX of basic education are defined.

4. In order to strengthen teaching methods, new lesson models have been developed and recommended to students. The research work was practically carried out in schools No. 193 and 285 in Baku and No. 19 and 20 in Ganja..

Approbation and application of work. The results obtained during the implementation of the dissertation work "Mathematics and ICT application areas. New teaching technologies", Ganja State University, International scientific conference (2014); "Modernization of the Continuous Imaging System" Materials of the VI International Scientific-Practical Conference (Makhachkala, DSPU, 2014), "Methodology of teaching the topic "Programming in python" in the computer science course of grade 9" (Copenhagen, Denmark, 2024) was presented at international scientific conferences and reflected in its materials. 7 articles (including 3 abroad), 4 international conference materials (2 abroad) were published on the subject.

The name of the organization in which the dissertation work was performed. The dissertation work was performed at the Department of Computer Science of the Azerbaijan State Pedagogical University..

The total volume of the dissertation, indicating the volume of the structural sections of the dissertation separately. The dissertation consists of an introduction (15779 characters), 9 paragraphs, 2 chapters (chapter 1 – 88082 characters, chapter 2 – 93121 characters), a conclusion (4140 characters), - total 201114 characters, a list of references and appendices. The total volume of the dissertation is approximately 230769 characters.

CONTENT OF THE WORK

In the introduction, the relevance of the topic, the problem statement and the general characteristics of the dissertation are given.

First chapter. is called **"Scientific and theoretical problems of forming a system of knowledge of students through modern educational programs."** This chapter consists of 5 paragraphs.

The first paragraph is called "Philosophical foundations and psychological aspects of the formation of students' cognitive knowledge." Here Plato, I.V.Blauberg, L.Y.Zorin, M.N.Skatkin, V.V.Kraevsky, scientists of cognitive theory. P.G.Moskalenko, A.Y.Tsofnas, B.G.Yudin and others. The ideas were interpreted, the concept of "Student knowledge system" was considered from the point of view of kinesiology and systemology. It also analyzes the role of models in understanding knowledge, understanding concepts such as modeling in a philosophical sense, and the relationship between the knowledge system in the student's mind and his understanding[2].

The second paragraph provides an interpretation of the terms "competence" and "competence", called "Pedagogical aspects of the formation of a student's knowledge system", their internal relationships and classification, the views of N.Chomsky. It is concluded that competence is the ability necessary to carry out certain linguistic activities, mainly in the native language[3]. Competence is characterized by language proficiency at a certain level. In addition, the classification of competencies and a number of issues are reflected here.

Thus, we classify educational competencies as follows:

1. Competencies in terms of values and goals. It's about the values of students, seeing and understanding their surroundings, heading in the right direction in this world, where to see their role in the future, and demonstrating purposeful behavior for their actions and steps. and make independent decisions. The existing competence provides a mechanism

[2] Tsofnas, A.Yu. Theory of systems and theory of cognition / A.Yu.Tsofnas. – Odessa: Astroprint, 1999. – 308 p.

[3]Chomsky, N. Introduction to the formal analysis of natural languages / N.Chomsky, J.Miller, Translated from English by E.V.Paducheva, – M.: Unified URSS, – 2003. – 62 p.

for self-determination of students in teaching and other activities. The individual educational trajectory of the student and the program of his life as a whole depend on this competence.

2. Socio-cultural competencies. To understand national and universal culture; the study of the moral foundations of human life, the foundations of family, social and social events are the main components of this competence. This competence also includes students' assimilation of the worldview, its understanding in the form of a cultural and universal level.

3. Understanding the competencies related to the learning process. This is a competence reflecting the totality of the student's activities in the field of independent understanding. This includes organizational methods, planning, analysis, reflexes, and self-assessment. In relation to the studied objects, the student demonstrates creative abilities, receives knowledge directly from the outside world, learns the mechanism of understanding problems related to learning, makes the right, calculated step in non-standard situations. Functional literacy requirements are implemented through these competencies. Students are able to distinguish facts from probabilities, acquire measurement skills, use statistical and other methods of understanding.

4. Information competencies.

These are habits of activity related to information in the world around the student, fields of education and academic subjects. These include modern information media (television, tape recorder, telephone, fax, computer, printer, modem, copier, etc.) and information technologies (audio-video recording, e-mail, mass media, Internet). The search, analysis and selection of necessary information, its revival, storage and transmission are elements of information competencies.

5. Communication competencies.

These competencies include knowledge of several languages, the ability to interact with events and people around and far away, the ability to work in a group and team, and the ability to perform various social roles. The student should be able to introduce himself, write letters, questionnaires and statements, ask questions, and conduct discussions. In order to possess these competencies, the relevant topics are reflected in the educational standards of the Republic of Azerbaijan.

There are different types of practical writing in high school programs. However, it is important to say that there is a definite drawback here. For example. Modern practical types of writing, such as filling out a siv (personal questionnaire), are not taught. This type of letter is especially important because a professional must be able to present his personality during the hiring process.

6. Social and labor competencies. These competencies relate to the student's willingness to fulfill the roles of citizen, observer, voter, representative, consumer, buyer, buyer, employee and family member. Knowledge of one's rights in law and economics, and the exercise of independent choice in the professional sphere are important elements of social and labor competencies. This competence also includes the analysis of the situation on the labor market, the ability to take steps for their own well-being and the well-being of society.

7. Improving personal competencies. Mastering methods of physical, spiritual and intellectual development, competencies of emotional self-regulation and self-defense. The student should be able to avoid situations that may harm his personal interests by referring to his mental qualities and culture of thinking. Personal hygiene, taking care of one's own health, literacy in the field of sex education, internal environmental culture, safe living – all these are among the personal competencies being improved[4].

The analysis of scientific and methodological literature related to the problem posed in the third paragraph entitled "Analysis of scientific and methodological literature in the formation of the students' knowledge system" is given. Here, first, studies conducted abroad that are close to the problem were analyzed, and then studies conducted in our republic noted the positive advantages, missed cases and causes, as well as ways to eliminate them.

In recent years, many research papers have been conducted that are close to this research work. For example, Ch.O.Nabieva "The use of computer technology as a means of activating students", R.Ch.Gadzhieva "Methods of teaching computer science and information

[4] Orujeva, E.M. Educational competencies and their classification, // – Baku: ADPU, News, 2014. No. 2, pp. 369-372.

technology in relation to other subjects", G.Z.Verdieva "Mathematics of primary classes" Methods of using elements of computer science in education", S.R.Badiev "The use of information technology in the development of creative abilities of students", H.T.Novruzova "The use of a computer in solving problems of stereometry using vector algebra", consider G.I.Bashirova's PhD thesis "The use of computers as a means of increasing the cognitive activity of students in mathematics lessons of grades V-VII of secondary school" as a research work close to our research.

The fourth paragraph is called "Classification of information systems, management functions in the learning process."

Here, the classification of the data processing information system is presented as follows:

Automated Control System (AIS)

1. An automated management system is used in commercial enterprises to manage all processes, from finance, reporting and documentation to technological processes in production and production assets. Usually, a system that automates technological processes contains passport data of deliveries, events and information about the operation of use, i.e. inspection and repair, the results of measurements and tests are reflected. All of these factors are among the factors affecting the management of a production facility. The automated system consists of several subsystems.

2. The geographic information system (GIS) stores information about target objects in the form of spatial data in the form of electronic maps. GIS makes it possible to work with objects through spatial queries.

3. The dispatching (connected) management system allows the relevant personnel of the enterprise to monitor and manage the production assets of the enterprise remotely. At the same time, emergencies and accidents can be monitored using this system.

4. Computer-aided design system (ASP).

It is the main tool of the personnel engaged in engineering activities. Systems of this type are used to prepare drawings of project objects in electronic form in two or three-dimensional projections with the required standards and accuracy.

When providing information about information systems, the essence and problems of distance education and open (transparent) education are shown. In addition, it was shown which elements should be included in the educational function and the organizational function of management in the educational process:

This paragraph also explains the following widespread forms of information systems:

- case technology;
- TV technologies;
- network learning technology.

In addition, it was noted that from a functional point of view, information systems can be divided into two main categories: non-interactive technologies and interactive technologies that create interaction between teacher and student. The facts prove that the higher the interactivity in education, the higher its quality.

Case technologies are technologies that include a complete set of scientific and methodological materials and the delivery of these kits to students. When working with these technologies, the following types of educational and methodological materials are used:

- printing material;
- materials on audio and video media;
- training and testing of computer packages.

The delivery of materials and the creation of relationships between participants in the educational process can be ensured through traditional communication..

Television technologies are technologies used on the basis of terrestrial, cable and space television systems. Currently, television technologies are not widely used in the education system of Azerbaijan.

It is shown that network technologies are technologies used on the basis of the Internet, local and global networks. Network technologies have many possibilities. Thanks to it, it is possible to present educational materials to students in the form of an electronic library in a single format and with an appropriate interface in accordance with current educational standards. The advantage of these technologies is that all forms of teacher-student interaction can be used. For example:

- educational and methodological materials for students'

independent work;

- it is possible to communicate via the network and consult with the teacher personally;

The network can also organize a virtual meeting of student groups and these groups with the teacher. It is also called training conferences.

It is shown here that a new aspect appears when using information technology and telecommunications tools. This refers to the purpose and content of training, the form and methods of organizing the training process. Specific forms of learning through information systems are explained by classification[5].

The fifth paragraph is called "Types of Internet resources, stages of group classes in education and current problems of information security." It explains the concepts of media competence, media competence and media culture, and also proves that information and information resources are an important part of public life. Then the general issues of the rules for working with network resources and technologies were explained.

The specificity of modern educational information and communication programs lies in the fact that they open up unlimited opportunities that help students develop critical thinking, self-study skills, and conduct independent research. The teacher should not miss all these opportunities. In our practice, the following types of Internet resources have been developed to date:

1. Materials from unified collections of digital educational resources.

2. Presentations on educational websites.

A unified collection of digital educational resources or digital educational resources (RTR), represented by video clips, literary information, illustrations, audio fragments, interactive tasks. To work with RTR, research tasks are required in the following version:

- Preparation by students of an information project based on RTR materials; tasks of this type educate students in the skills of searching,

[5] Orujova, E.M. Description of the methodology for using e-learning technology in the study of the subject "Informatics"// Bulletin of Science and Practice / Bulletin of Science and Practice, 2021, No.9, pp.586-594. https://doi.org/10.33619/2414-2948/70/61

processing, classifying, systematizing and presenting information;

- turning to sources beyond the school curriculum to solve the problem; as a result, interdisciplinary, integrated knowledge will arise, critical views will be formed, a different view of the world will be formed;

Computer technologies and Internet resources combine the potential that carries valuable information in the learning process. This, in turn, plays a serious role in increasing motivation in the classroom.

The rules of working with the information of the subject of education are one of the most important elements. It is based on the information competence of the subject. This competence is formed not only in computer science, but also in other disciplines, even the humanities.

Media education is also aimed at developing students' knowledge of information systems. According to experienced teachers and educators, for the development of the educational information environment, serious changes must occur in the information culture of participants in the educational process (teachers, students and parents). Therefore, the first plan includes the development of an information culture that uses the resources of the environment at the tactical and practical level in various fields of educational activity. Media education involves the development of not only intellectual abilities (thinking, knowledge, skills), but also the moral culture of the subjects of education. Spiritual culture is an important issue that characterizes the qualitative aspects of personality and is able to adapt educational subjects to an ever-changing information environment.

From the above it is clear that media competence refers to the information competence of the subject, and media culture refers to the culture of the information system.

One of the important elements of computer culture is the development of a culture of information and computer security. This development is carried out on the basis of information – law, subculture, ethics of relations in the computer sphere..

The second chapter consists of 4 paragraphs and is called **"Possibilities and ways of using information systems."**

The first paragraph of the second chapter is called

"Characteristics and principles of information systems and new information technologies". Two forms of creating information systems (separately or within a system), the concept, principles, query languages, and tools are explained in detail here[6]. It is noted that concepts such as norm, norm, technological process, technological operation used in the field of material production can also be used in information technology. Before defining these concepts in each technology, it is necessary to define the purpose. Then, in order to achieve this goal, it is necessary to try to structure all the work ahead and select the necessary software tools.

The second paragraph is called "Possibilities and software for using computers in the educational process." It talks about the importance of searching for Internet resource addresses for the subject, searching for necessary information, downloading and other operations..

The importance of involving students in this process and the controlling function of the teacher in this process is classified.

Currently, the possibilities of using computers in the education system, including in the teaching and learning processes, are constantly expanding. The process of virtualization of real education depends entirely on the level of development and application of the computer and its components in the educational system. In the process of learning computer science, a computer and its components should be used as follows:

First of all, it is necessary to ensure elementary computer literacy of students.Of course, this knowledge is given in elementary grades. If, for one reason or another, students do not have basic computer literacy or it is unsatisfactory, then the subject teacher should solve this problem through additional classes.

The knowledge that students can gain in primary school can be classified as follows:

- necessary knowledge about the computer and its devices;
- learning the basic concepts of the operating system (file,

[6] Orujeva, E.M. Information systems, their role and importance in the education system // Areas of application of mathematics and ICT, New educational technologies. International Conference, GSU, Ganja: 05-06 June 2014, pp. 156-159

directory, path);

- Teaching information about the organization of operational information search via the Internet;

- Performing various operations in standard programs.

Searching for the addresses of Internet resources for the subject, searching for necessary information, downloading and conducting other practices should be known both to teachers teaching the subject and to students. Currently, the organization of a digital local library in computer memory and consumption using special programs will significantly increase the learning opportunities of the subject. More important is the participation of students in this process, the teacher performs the function of a supervisor in the process.

1. Students can freely convert information in any language into their native language using computer translation programs (Dilmanc, Polyglot, Lingvo, Google Translator, Bing Translation Systems, etc.). Gets used to using things. The teacher should be a leading figure in the effective organization of this work, first he should involve students in this work, he should support them at the beginning, and then he should benefit from their abilities in the learning process.

2. The exchange of information on the subject is widely used in the modern education system. There are two ways to perform this exchange over the Internet:

- Creation of a statistical or operational resource related to the subject and teaching of the subject – a website. You can create such a resource without spending money, using the capabilities of a free domain, hosting, SMS (Site Manager System). Basic computer knowledge is enough to use modern SMS systems. This site contains information related to the subject, for example, educational and methodological materials, articles and free works on selected topics, links to available resources, etc. can be placed. This information can be used by teachers and students of educational institutions in the regions and in any part of the republic. If such resources function normally, that is, if it is updated from time to time, if it is enriched with new information, then other schools will also use this resource.

Dialogical Internet resources on this topic. Forums, audio/video conferences can be used to organize live discussions of people involved

in the topic, regardless of distance and time. In addition, it is possible to conduct virtual classes, seminars, quizzes /Olympiads, open classes with online video images. Access to these resources through special client applications (ICQ, Skype, PalTalk, MsMessenger, etc.) may be more profitable. Also, the use of these tools does not require special training. Anyone with basic computer skills can use these tools.

3. If the subject is taught in a room with computers, then the computers must have office software. Obviously, to work with these programs, teachers and students must have the necessary basic knowledge.

4. If only the teacher has a computer when teaching a subject, if students do not have a computer in the classroom, then a projector must be provided along with the software.

5. Providing computer devices such as printers, scanners, graphics tablets and Internet access in the room where the subject is taught, within the capabilities of the school, will help to conduct the educational process more effectively.

The third paragraph is called the Classification of high-level programming languages and simple examples of programs. Below are examples of creating new software tools in the Java, C++ and Python programming languages[7].

It should be noted that many educational institutions around the world use Python to teach the basics of programming. This paragraph consists of 3 paragraphs. These paragraphs present the methodology of teaching the topics "Programming in Python", "Conditional If-Else operators" and "Circular Operators" in the ninth grade computer science course.

It is known that high school students have enough theoretical knowledge about Python. However, it is difficult for them to apply this theoretical knowledge in practice. There are many reasons for this, the most important of which is that this knowledge is not systematically taught either in higher pedagogical schools or in secondary schools. As

[7] Free Software Promotion/ Azerbaijan
https://www.neansoft.com/kitablar-proqramlasdirma-dilleri.html

a result, most of the teachers teaching the subject either have very superficial knowledge in this area, or do not know this line of content at all. Considering all these disadvantages, we propose a completely different approach and method. The methodology we propose is based on the parallel teaching of the theoretical part of the taught material with practice and experimental verification.

Thus, the following sequence is presented in a systematic form for the theoretical and practical study of the Python programming language.

1. General information about the Python programming language and its loading into memory.

2. The basic operators of the Python programming language.

3. Drawing up a program of practical questions and conducting an experiment.

After certain knowledge about the syntax and semantics of the language has been formed, simple examples of Python programs are shown. In these examples of programs, the essence of using conditional operators and point operators is fully conveyed to students.

Using the given examples of programs from simple to complex, students successfully create free software tools.

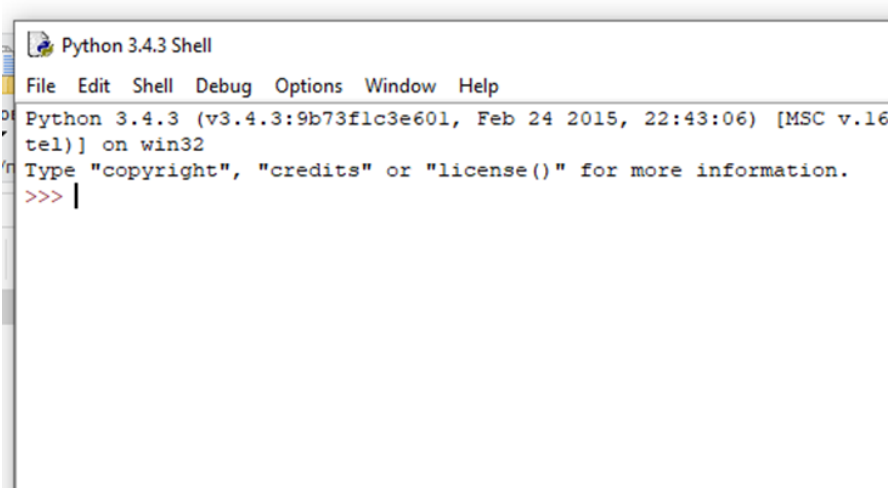
It should be noted that since 2015, this language has been included in the curriculum of secondary schools in order to teach the structure of programming[8].

In order to implement written programs on a computer, you must first install an interpreter on the computer. Therefore, you need to download a version compatible with your system, with http://python.org . The Python interpreter is available for Windows, UNIX, OS, etc. The Windows platform is mainly considered here, and the Windows platform is selected from the Download section.Special attention is paid to the Python programming language in the direction of Python 2x and Python 3x.If you look at the versions, you can see that the Python 3x implementation has a special meaning. That is, after downloading the python-3.4.3.msi file, it is easier to execute it. The result is obtained

[8] Mahmudzade, R. Informatics: textbook for the 9th grade of a secondary school / R. Mahmudzade, I.Sadigov, N.Isayeva. - Baku: Baku edition, - 2016. – p. 128.

after activating the keyword Next.After receiving the result, we complete the process by clicking Done.

Python is an IDLE shell environment that opens first after the program is loaded. IDLE is an integrated Python programming environment. First, we call the IDLE Python Shell interactively.



Picture 1. Python Shell Application Shell

On the next line, the characters ">>>" appear, called a call. To start the program, you need to type commands after the specified character and press the enter key. Writing programs in command mode is carried out in the specified order. Writing programs in files is the second method.

If we use the second method, that is, if we write a program in a file, then we will get the same result on the screen (monitor).

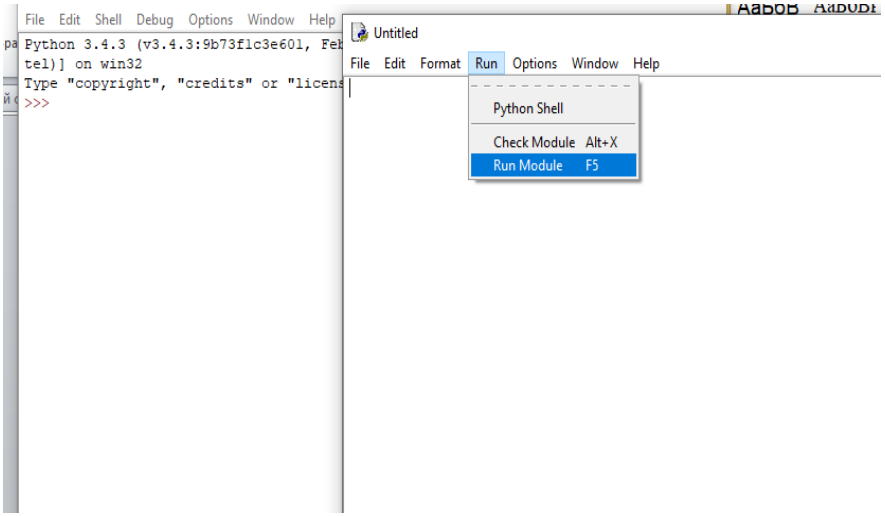
Let's write a sequence of operations to perform what we mentioned:

Select "File" → "New file" in the main menu in the IDLE environment;

A specific command is entered in the editor window;

Save the program from the menu by selecting "File" → "Save".

If we run the program by selecting the command "Run" → "Run module" in the menu, the result will be in command mode. The program files written here are called scripts in the Python "language". Extensions are written as .py or .pyw..

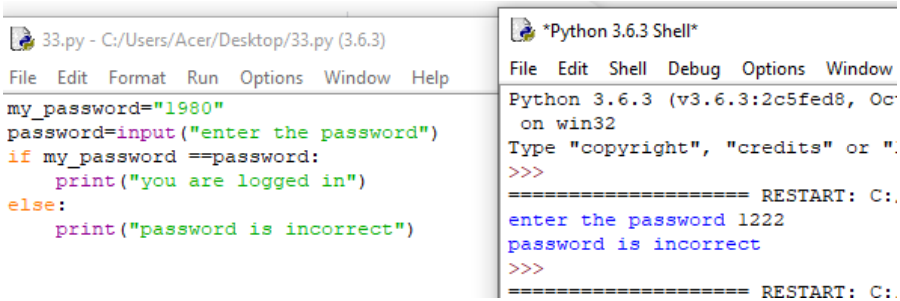


Picture 2

This paragraph explains some points about the syntax of the Python language. Also, students are introduced to the table of mathematical symbols and logical operations in the Python language. Functions in Python, their use and various operations on lists are explained to students on examples.

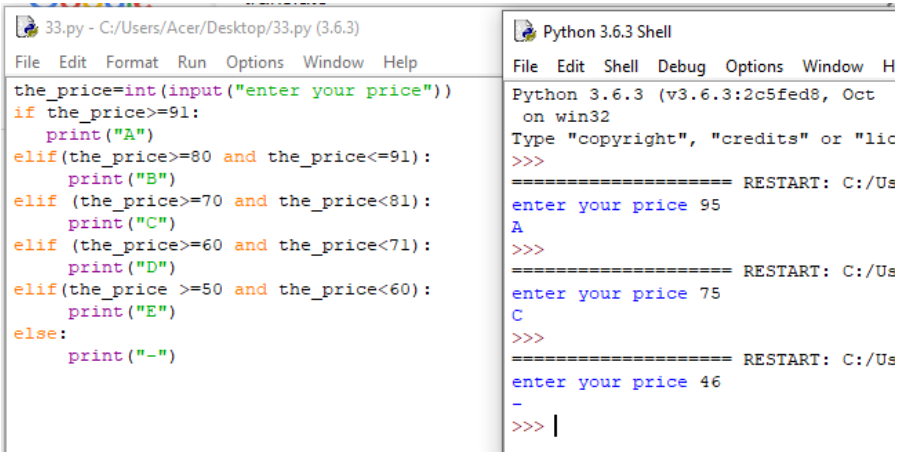
In accordance with **the 3rd paragraph** of the 3rd point, the examples of programs that I have prepared for students are placed in the methodology of teaching the operators of the condition and period of the Python programming language.

Example 1. Create a program that verifies the correctness of the specified password to log in to any system.



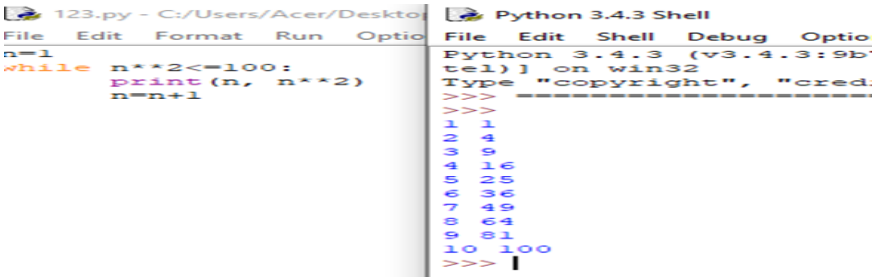
Picture 3

Example 2. Build a program that expresses the score you received according to the evaluation criteria.



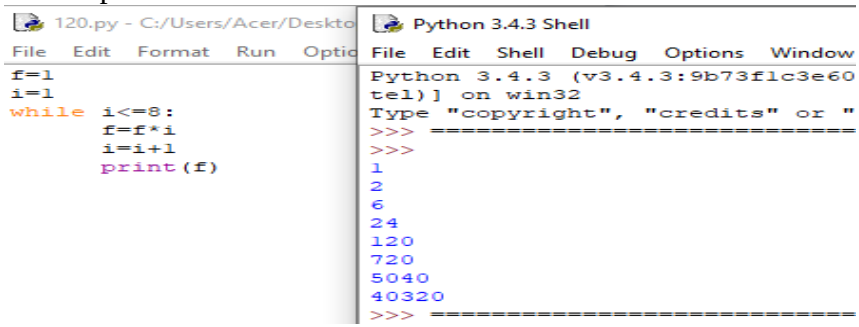
Picture 4

Example 3. Write a program that displays natural numbers whose squares are not greater than 100 and their squares using the while operator.



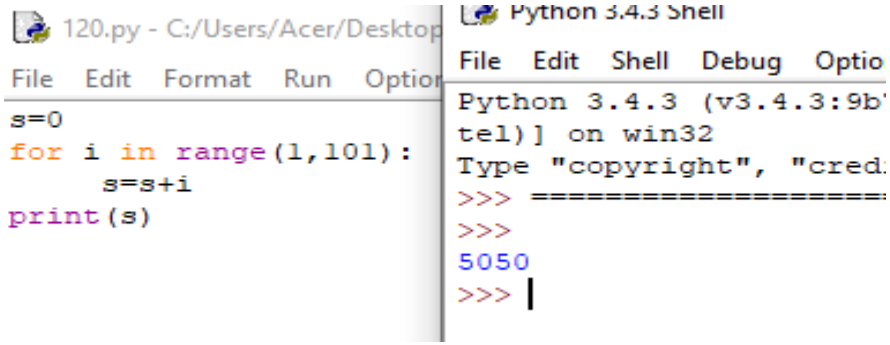
Picture 5

Example 6. Write a program to calculate 8!(factorial) using the while operator.



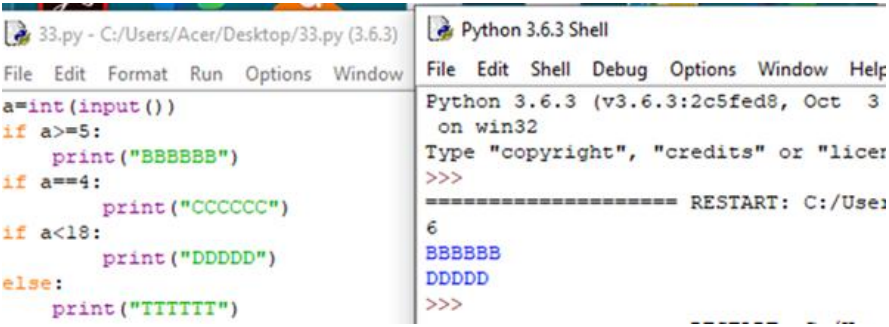
Picture 6

Example 7. Build a program that calculates the sum of numbers from 1 to 100 using the counter period operator.

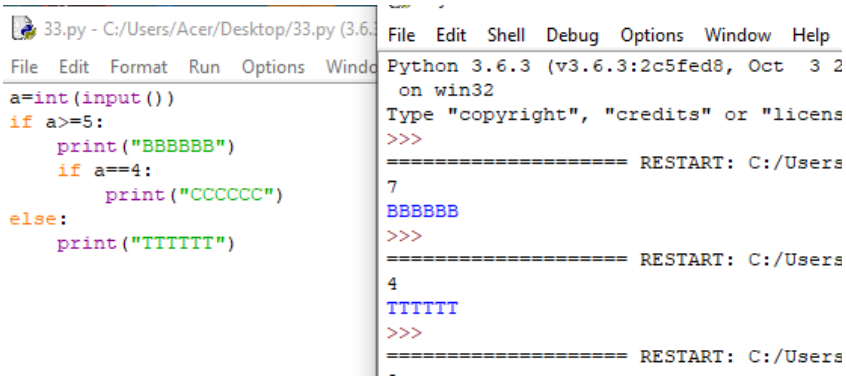


Picture 7

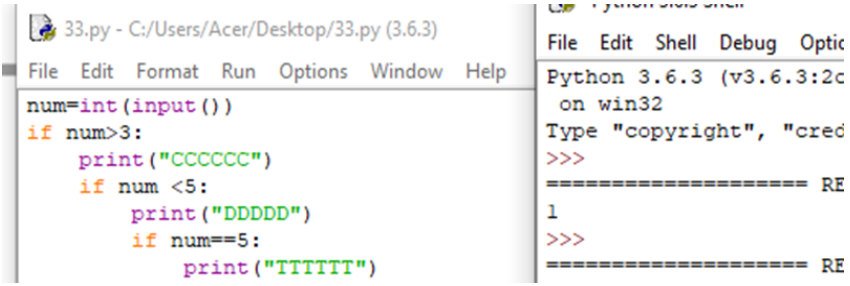
In the 2nd point of this paragraph, the parts of the working principle of if-else conditional operators in the Python programming language that are not given and not explained in high school textbooks are conveyed to students with clearer and practical examples. The writing positions of these operators, i.e., the examples of programs used both with a shift (with a probe) and without a shift (without a probe) are viewed. It is also widely explained to the students that the results of these operands change depending on the writing position.



Picture 8



Picture 9



Picture 10

In the 3rd point of the paragraph, in the method of teaching period operators, the rules of operation of operators are explained to the students in the lesson. Using the prepared sample programs, the topic is mastered more deeply.

The fourth paragraph is called "The pedagogical experiment and its results." This experiment was conducted in three stages. In the classrooms where experiments are planned, a new methodological system for teaching programming has been developed, based on effective software tools and their application, different from textbooks. During the experiment, the teachers working in these classes were informed about the considerations and specific ways of the teaching system and teaching methods we teach. The teachers of the control classes were informed about the purpose of the experiment, but no additional information about the study was provided to them.

The pedagogical experiment was conducted in schools No. 193 of Narimanov district, Surakhani district, No. 285 of Ganja city, No. 19 and No. 20. When defining the experimental and control classes, it was assumed that the classes would have the same level.

At the second stage of the pedagogical experiment, which is called educational, electronic learning tools, instrumental programs, textbooks, educational documents, as well as the basics of a methodological system developed for their use in teaching computer science subjects in classes are being developed. VII-IX, have been studied. Thus, it consists in developing a methodology for using ICT tools for programming and systematization of computer science classes,

familiarization with the content and methodology of teachers of experimental classes, conducting an educational experiment using a new system developed by me in experimental classes.

Table 1

Results of the initial inspection

Schools	By classes	Number of puples	Score				5 and 4%	In check mastery in %	Numerical average price
			5	4	3	2			
Baku . № 193	Experimental -VII	20	3	4	7	6	35	70	3,2
	Control -VII	21	4	5	5	7	43	58	3,3
	Experimental VIII	21	3	5	8	5	38	86	3,25
	Control-VIII	20	3	7	6	4	50	80	3,45
	Experimental-IX	22	4	6	8	4	45	82	3,45
	Control-IX	19	4	6	7	2	53	89	3,65
Baku . № 285	Experimental-VII	22	4	5	7	6	41	73	3,3
	Control-VII	21	3	6	8	4	43	86	3,4
	Experimental-VIII	22	4	5	6	7	45	73	3,25
	Control-VIII	20	4	4	8	4	40	80	3,4
	Experimental- IX	20	3	5	6	6	40	70	3,25
	Control- IX	21	3	9	5	4	57	81	3,5
Ganja . №19	Experimental-VII	21	3	5	7	6	38	71	3,25
	Control-VII	20	5	4	6	5	45	75	3,45
	Experimental-VIII	20	3	6	4	7	45	65	3,25
	Control-VIII	19	4	6	5	4	53	79	3,5
	Experimental-IX	21	5	9	4	3	67	86	3,8
	Control-IX	21	5	9	4	3	67	86	3,8
Ganja .№ 20	Experimental-VII	19	3	6	5	5	47	74	3,4
	Control-VII	19	3	6	6	4	47	79	3,6
	Experimental-VIII	18	5	5	3	5	56	72	3,6
	Control-VIII	18	5	6	4	3	61	72	3,7
	Experimental-IX	16	4	5	5	2	56	88	3,7
	Control-IX	17	5	5	3	4	59	77	3,6

In the checking phase of the experiment (table 1), five intermediate checks were first conducted, their results were checked and analyzed. At the end, a final inspection was carried out and the result was analyzed (table 2).

Table 2

Results of the final inspection

Schools	By classes	Number of puples	Score				5 and 4%	In check mastery in %	Numerical average price
			5	4	3	2			
Baku . № 193	Experimental -VII	20	3	7	7	3	50	85	3,5
	Control -VII	21	3	5	7	6	38	71	3,25
	Experimental VIII	21	6	6	5	4	57	81	3,65
	Control-VIII	20	4	7	5	4	55	80	3,55
	Experimental-IX	22	7	8	5	2	68	91	3,9
	Control-IX	19	3	6	5	5	47	74	3,35
Baku . № 285	Experimental-VII	22	6	5	6	5	50	77	3,55
	Control-VII	21	3	4	8	6	33	71	3,2
	Experimental-VIII	22	7	9	4	2	73	91	3,95
	Control-VIII	20	4	4	8	4	40	80	3,4
	Experimental- IX	20	7	9	3	1	80	95	4.1
	Control- IX	21	3	4	9	5	35	75	3,25
Ganja . №19	Experimental-VII	21	6	7	4	4	62	81	3,8
	Control-VII	20	3	4	7	6	35	70	3,2
	Experimental-VIII	20	6	5	8	1	55	95	3,8
	Control-VIII	19	3	3	8	5	32	74	3,2
	Experimental-IX	21	5	7	7	2	57	90	3,7
	Control-IX	21	3	8	6	4	52	81	3,48
Ganja .№ 20	Experimental-VII	20	6	7	4	3	65	85	3,8
	Control-VII	22	3	5	7	7	36	68	3,2
	Experimental-VIII	19	6	4	8	1	53	95	4
	Control-VIII	20	3	3	9	5	30	75	3,2
	Experimental-IX	20	5	6	7	2	55	90	3,7
	Control-IX	18	3	6	5	4	50	78	3,44

The results obtained at each stage of the pedagogical experiment were analyzed using a statistical method. The statistical analysis of the results was carried out in the following way: The first results of the inspection are called K_i, the result of the I inspection - K_1, the result of the II inspection - K_2, etc. and we named the final result - K_y. With K's, we have indicated the ratio of the results of the experiment and the results of the control classes for each check. We also calculated the numerical average of mastery in school as the numerical average of the average grades obtained by classes.

Table 3

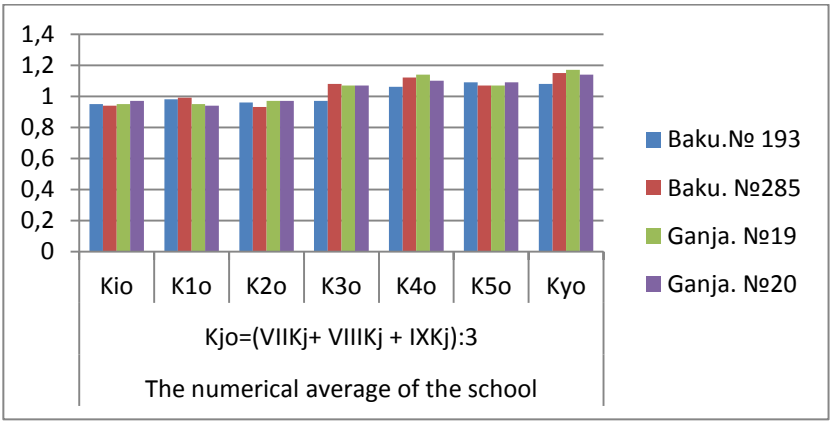
Ratio of results of experimental and control classes

Schools	By classes	Ratio of results of experimental and control classes						
		K_i	K_1	K_2	K_3	K_4	K_5	Ky
Baku. № 193	VII	0,97	0,91	1,0	0,94	1,12	1,09	1,07
	VIII	0,94	0,97	0,88	1,02	1,02	1,09	1,02
	IX	0,94	1,0	0,86	0,96	1,06	1,1	1,16
Baku. №285	VII	0,97	0,98	0,97	1,01	1,16	1,01	1,19
	VIII	0,95	1,06	0,92	1,04	1,01	1,04	1,14
	IX	0,92	0,94	0,91	1,10	1,10	1,10	1,14
Ganja №19	VII	0,94	0,94	0,94	1,12	1,09	1,12	1.10
	VIII	0,92	0,98	0,91	1,07	1,10	1,07	1,16
	IX	1,0	0,95	1,0	1,04	1,25	1,04	1,26
Ganja №20	VII	1,0	0,97	1,0	1,02	1,11	1,02	1,18
	VIII	0,94	0,94	0,97	1,12	1,09	1,12	1,18
	IX	0,98	0,92	0,96	1,09	1,10	1,09	1,07

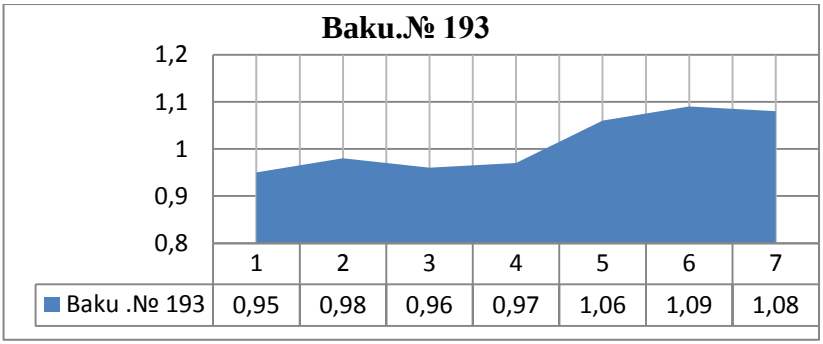
Tab 4

Numerical average of acquisition by schools

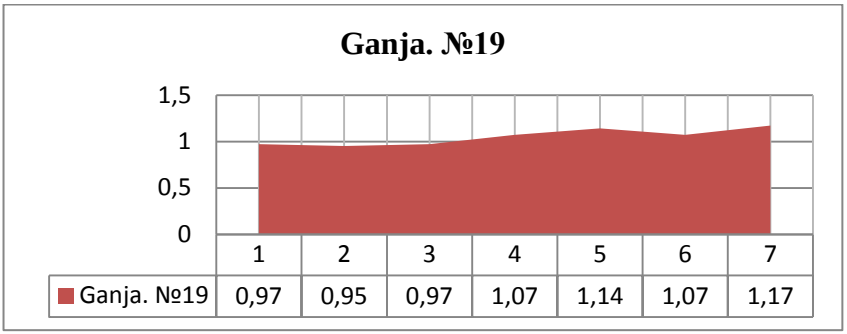
Schools	The numerical average of the school $K_{jo}=(VII_{Kj}+ VIII_{Kj} + IX_{Kj}):3$						
	K_{io}	K_{1o}	K_{2o}	K_{3o}	K_{4o}	K_{5o}	K_{yo}
Baku.№ 193	0,95	0,98	0,96	0,97	1,06	1,09	1,08
Baku. №285	0,94	0,99	0,93	1,08	1,12	1,07	1,15
Ganja. №19	0,95	0,95	0,97	1,07	1,14	1,07	1,17
Ganja №20	0,97	0,94	0,97	1,07	1,10	1,09	1,14



Picture 11



Picture 12



Picture 13

It is known from Table 4 and Figure 8 (9.10) that the relative average value of the skill level in grades VII-IX of school No. 193 in Baku ranges from 0.95 to 1.08 under conditions of continuous experiments. from 0.94 to 1.15 in school No. 285 in Baku, from 0.97 to 1.17 in school No. 19 in Ganja, from 0.97 to 1.14 in school No. 20 in Ganja increases to

During the experiment, it was also found that:

a) knowledge aimed at building information systems develops students' logical thinking, forms their knowledge of computer science, and creates interest in computer science;

b) all students actively participate in the learning process on a daily basis, their knowledge is promptly and objectively evaluated at the end of each lesson;

c) regular information is received about each of the students, which allows you to track the overall dynamics of class learning and make the necessary adjustments;

d) as students study the previous topics sequentially, the shortcomings in their knowledge are gradually eliminated, they become more prepared to understand the following topics, it is easier to understand new topics;

e) time is effectively used in the learning process, knowledge is transferred to more students in less time, students' downtime in lessons is reduced, they are constantly engaged in creative activities.

Thus, the analysis of the results of the experiment shows that by encouraging students to build new information systems in computer science classes of grades VII-IX, they create interest in the subject, the tendency to help work increases, new knowledge in computer science is consolidated. formed. When comparing the level of knowledge of students in the experimental class and students in the control class, it turned out that the relative average value of the level of knowledge of students in experimental classes increased by about 9%. This proves the truth of the hypothesis put forward in the study.

Conclusion

All the tasks set during the study were completed, the experiments we set proved the effectiveness of the methodology we proposed.

The main results of the study and these generalizations made can be listed as follows.

The main results of the study and the generalizations made can be listed as follows.

1. The study of philosophical, psychological and pedagogical literature on research work has shown that mastering the knowledge system of students through educational and instrumental programs is an important and relevant requirement of our time and proceeds from the requirement of adapting Azerbaijani education to the educational concept of the civilized world. This means the search for new tools and the purposeful use of information and communication technologies for the successful completion of the educational process[5].

2. Various similar philosophical and pedagogical approaches to the problem led to the fact that we were forced to understand the concepts of "knowledge system" and "systematics of knowledge" as follows.

The consistency of students' knowledge is a characteristic of their knowledge. This is a high level of a set of certain knowledge, which is characterized by its logical and functional connections and at the same time a set of knowledge that is still unknown in this field, which can be raised to the level of understanding. At this time, the

student acquires a new quality, as he gets used to a new system of knowledge. This, in turn, constitutes a system of knowledge [1].

3. The formation of the students' knowledge system is not a fragmented and fragmented process. If we are talking about mutual relations, then these relations have a certain logical order, and if this order is violated, then there is no point in talking about systematic knowledge. The main means of forming a knowledge system are: the introduction of methodological knowledge, the requirements necessary for mastering theoretical knowledge; the organization of educational material that demonstrates to students the structure of deductive theory; the inclusion of a structural and logical scheme in the educational material [10].

4. The formation of the above-mentioned knowledge system can be realized only through electronic and instrumental programs based on the knowledge information system. The formation of a knowledge system from this position means that students master the information system in the form of interaction with electronic and instrumental programs [4].

5. The electronic educational and instrumental program is such a complex educational and software system that ensures the continuity and integrity of the educational process. This didactic material also provides control of educational activities and the level of knowledge [7].

6. The content of education can be presented in the form of a computer model of the knowledge system in an electronic educational and instrumental program. The systematic transfer of knowledge is the main purpose of this work. This is an effective method of introducing scientific concepts, as well as a system of scientific concepts that introduces them gradually, based on the requirements of the curriculum. The requirements of the curriculum make it easy to adjust the content of education or perform a reverse operation [6].

7. The result of the experiment showed that the use of programming in information technology lessons of grades VII-IX develops students' logical thinking, creates the opportunity to build new information systems, increases interest in the subject [8], [9].

8. A software lesson script has been prepared for grades VII-IX on the subject of "Computer Science".

9. Samples of the instrumental program developed by us have been applied in the educational process, its effectiveness as a means of forming a system of knowledge of students has been confirmed experimentally. We have carefully studied the process of forming students' knowledge when working with electronic educational and instrumental programs based on the relevant rules.

These programs, which serve to create information systems, were used in exercises at each relevant computer science lesson throughout the year. The training was conducted directly through electronic and instrumental programs. The students worked individually, and the teacher could control their work. The main task of each student is to gain knowledge at the level of state standards. The assessment of the formation of students' knowledge was carried out directly through electronic and instrumental programs. It includes various types of test tasks. As a result of the conducted experimental work, the students' knowledge system has been significantly formed. This was significantly higher than the level at the beginning of the experimental work. Thus, the results of the proposed hypothesis are positive and show that the set goals have been achieved, that is, electronic educational and instrumental programs are the most effective means of forming a system of knowledge of students.

10. Samples of programs have been systematically prepared and used, which teachers and students can freely use in the computer science course.

The main results and provisions of the dissertation are reflected in the following published articles and materials of conferences:

1. Orujova, E.M. Psychological aspects of the formation of the students' information knowledge system // Baku: ADPU, ICT in Education, 2014, No. 1, pp. 26-29.

2. Orujova, E.M. Educational competencies and their classification // Baku: ADPU, Bulletin of the Pedagogical University, 2014, No. 2, pp. 369-372.

3. Orujova E.M., Palengov A.K. From the experience of information systems and their use // Areas of application of mathematics and ICT. New learning technologies. International Conference, GSU, Ganja: June 05-06, 2014, pp. 14-17.

4. Orujova E.M. Information systems, their role and importance in the education system // Areas of application of mathematics and ICT, New educational technologies. International Conference, GSU, Ganja: 05-06 June 2014, pp. 156-159.

5. Orujova E.M. Pedagogical aspects of the theory of systems // Nakhchivan: News of Nakhchivan Pedagogical Institute, 2014, No. 2, pp. 45-49.

6. Orujova, E.M., Palangov A.G. Activation of cognitive activity of students in the educational process // Modernization of the system of continuing education. VI International Scientific and Practical Conference, Moscow. Makhachkala: DGPU, 2014, pp. 458-460.

7. Orujova, E.M. Approaches to the classification of university graduates' competencies and assessment of their formation // Bulletin of the University, GUU Moscow, 2014, pp. 266-269.

8. Orujova, E.M. Methods of teaching the subject IF and CASE selection operators in the course of computer science of the 9th grade // Baku: Takhsida ICT, Scientific and Methodological journal, 2016, p.41.

9. Orujova, E.M. Methods of teaching the subject "Chain operators" in the course of computer science// Berlin: Time The spirit - 2020, № 2 (26), - p.3.

10. Orujova, E.M. Description of the methodology and technology of e-learning in teaching premedka "Information" // Bulletins of Science and Practice, 2021, No.9, pp.586-594. https://doi.org/10.33619/2414-2948/70/61

11. Orujeva, E.M. Methodology of teaching the topic “Programming in python” in the computer science course of grade 9 // Modern aspects of modernization of science: status, problems, development trends**.** Materials of the 46th International Scientific and Practical Conference// Copenhagen, Denmark, − 2024,− p. 63-66.

The defense of the dissertation will be held on 01 November 2024, at 14:00 at the meeting of the Dissertation council FD 2.15 of Supreme Attestation Commission under the President of the Republic of Azerbaijan operating at Azerbaijan State Pedagogical University.

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