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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

**A SYSTEM OF WORK ON THE IMPLEMENTATION OF
ICT IN IMPROVING THE PROFESSIONAL TRAINING OF
STUDENTS**

Specialty: 5801.01 – Theory and methodology of training and
education (Methodology of teaching
Informatics)

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GENERAL CHARACTERISTICS OF THE RESEARCH

Relevance and development of the topic. The initial point of view in explaining the concept and essence of information technologies, the conditions of successful application of students in the educational process, consists of the content completion of the main categories in the problem-pedagogical aspect. Thus, even in ancient times, Jean Amos Comenius (1592-1670) tried to find a general training procedure that would be carried out according to the laws of human nature. Attempts to "technologicalize" the educational process were made by Bogdan Navrochinsky (1882-1974), Celestin Frene (1896-1966), Peter Halperin (1901-1987) and other scientists and educators. In general, there is a special "technological" approach to the construction of education. The mentioned technology of pedagogical methods, in other words, the technology of building the educational and training process appeared. This change will allow to determine the appropriate relations between the concepts of "pedagogical technologies", "educational technologies" and "information technologies". In the works of didactic scientists and innovative teachers, a precise technological system has been prepared for increasing the efficiency of the educational process in the teaching process (Y.K.Babansky); technological process of gradual formation of mental activity (N.F.Talyzina); basic technological methods for strengthening didactic units for the development of mathematical teaching material (P.M. Erdniyev); reference sheets (V.F.Shatalov); management of educational process (Lipetsk experience S.N.Lysenkova) etc. At the same time, the issue of appropriateness of the use of the term "technology" applied to the teaching of humanitarian and socio-economic sciences has become the target of intensive discussion among educators. The subject of pedagogical technology is the design of educational systems: the goals and construction of the educational process, the verification, approval and dissemination of the effectiveness of the new educational systems. Educational technology includes both theoretical knowledge and concrete applied knowledge: concrete forms of the educational process, educational methods adequate to educational strategies, pedagogical procedures for the transformation of the knowledge that students should receive. By means of pedagogical technologies, the content of education is realized, the

practical composition of students' activity, its structure and development a set of purposeful pedagogical procedures is implemented. In other words, the system of educational activity of teachers and students is applied in the process of designing training technology. Training technology is aimed at achieving high results in the didactic application of scientific knowledge, scientific organization of the teaching process, and development of the student as a personality, taking into account the empirical innovations of teachers. It includes the management of the educational process, which includes two interrelated processes, such as the organization of the student's activity and the management of this activity. These processes constantly interact: the control result affects the content of management activity, changes the future organization of activities. Therefore, each technological procedure, each technological method takes a special place in solving the problems of optimizing the educational process, in the implementation of the educational strategy. These structural components of pedagogical technology manifest themselves at different levels during the design and implementation of a certain technology in the educational process.

At the same time, the development of teaching methods and computer technology leads to the improvement of the quality of teaching. In addition, the creation of new forms of computer training, the use of new educational tools in principle are often unsystematic, and the use of new educational technologies does not reflect the problems of universities. In order to overcome the problems, the Ministry of Education pays special attention to new educational technologies and considers them an important source for increasing the efficiency of professional training in higher education institutions. In addition, it is reflected in solving the issues mentioned in the "Computerization of Education", "Systematic Higher Education", "Pedagogical Innovations", "Improving Creative Work" and "Development of Education in Azerbaijan" programs. A number of interuniversity and international programs solve the problem of creating an educational database. At the same time, the fragmentation of many studies gives a weak impetus to the study of teaching methods of certain subjects. The development of individual methods and methods, individual teaching aids, the development of educational technologies, requires a radical restructuring of the educational process. The importance of this work is

determined by the financial costs and the price of high-level computer technology. Majoring in computer science determined the necessity of conducting research in universities, the complexity and multidimensionality of the problem. It is intended to provide a process that provides high technical education, based on pedagogical software tools and pedagogical experience, on a systematic, scientific basis.

Trends in the development of higher education encourage changes in the status of educational institutions in Azerbaijan. Changes in the content of education and teaching methods in all fields require the search for new approaches to improve specialist training in Azerbaijani universities. This is especially important for the education of university students, which is closely related to the use of information and communication technologies, as well as the application of information and analytical technologies. In this sense, the increasing level of effectiveness of the composition, forms and methods of the future general and special education of universities should be studied. The requirements for raising the qualification and the quality of education in universities have created a number of contradictions in the traditional organization of the educational process. The most important contradictions are mainly the following:

- irregularity in the sequence of work of specialists working using new technologies and the process of formation of their qualifications;
- Violation of the use and use process of modern computer technologies in universities;
- non-adaptation of interdisciplinary integration in reality at different stages of the professional training of existing students;
- weak specialization of students in higher education institutions;
- the necessity of using computer technologies in the teaching of university students and the lack of systematic content of students according to their specialty;
- lack of control system for psychological and pedagogical prediction of individual development;
- the weakness of my personality-oriented approach, which provides a different approach in the use of computer technologies at the university;
- specialization of university teaching staff and their education increasing the level of requirements for the traditional assessment of

activities.

The solution of these contradictions is possible only with the justification and development of the scientific support system for the efficient use of new information technologies in specialist training at universities.

The object of the study is the process of teaching content line subjects in order to increase the efficiency of professional training in higher education institutions, to improve teaching using ICT in professional training.

The subject of the research is to realize the application, efficiency and its application in various fields using ICT opportunities in the process of professional training of students.

The purpose of the study is to develop a related system for updating the content and adapting it to the specialty for the efficient use of new information technologies in the computer science majors of universities, in the process of students' professional training. Here, it is envisaged to teach the components of mutual coordination, evaluation and prediction of new pedagogical technologies.

Depending on the purpose of the research, it is necessary to solve the following tasks:

- to analyze the existing system of professional training in Azerbaijani universities and to identify and justify promising directions for its improvement;
- purposefully combine pedagogical and psychological technologies in the field of computer science into a single system;
- prepare a general form of interdisciplinary relations that ensures effective use of new information technologies in higher education;
- justify recommendations for problem-based learning, computer technologies and automated training, as well as for the effective use of other training methods;
- to prepare didactic methods to substantiate the principles of problem-based training;
- justify the principles and methods of computer diagnosis of mastery according to the content of the subject;
- the student's socio-psychological, individual psychological, personal and professional to determine the psychological factors of their qualities by including their indicators;

- developing algorithms, as well as predicting the effectiveness of learning computer technologies, ensuring the effective use of information technologies in the educational process;

- to direct the pedagogical skills of teachers to the effective use of new computer technologies, and at the same time to conduct a multi-directional analysis for the theoretical analysis of the problem of specialization of pedagogical activities of university teachers;

- on the basis of the proposed concept, form the motivation of students that ensures the efficient use of new computer technologies in their future activities;

- to prepare the recommendations of a unified scientific support system for the effective use of new information technologies in the educational process of all universities of Azerbaijan.

Research methods. The choice of research methods to obtain the main scientific results is related to the multifacetedness of the investigated problems. The general research strategy is determined by an integrated and systematic approach to the solution of the scientific problem posed in the dissertation. The following types of empirical methods were used to solve various specific problems: individual observation, interactive, explanatory interpretation, project, various psycho-diagnostic methods in the form of tests, self-assessment, pedagogical experiment. Interview methodology, conversation, biographical method and methods of analysis of performance results.

Main clauses defended:

- adapting the application of newly created information technologies and pedagogical methods to the educational process of universities will increase the quality of specialist education;

- during the introduction of problematic modular educational technologies into the teaching process, the efficiency of the professional training of university students will increase;

- will increase opportunities for forecasting and monitoring of students' professional and personal development;

- a creative approach to the use of computer technologies in universities will increase the professional and pedagogical knowledge of teachers will improve their skills;

- to analyze the current system of professional training in Azerbaijani universities and to identify and justify promising directions

for its improvement;

- purposefully combine pedagogical and psychological technologies in the field of computer science into a single system;
- prepare a general form of interdisciplinary relations that ensures the effective use of new information technologies in higher education;
- justify recommendations for problem-based learning, computer technologies and automated training, as well as for the effective use of other training methods;
- to prepare didactic methods to substantiate the principles of problem-based training;
- to justify the principles and methods of computer diagnostics of mastering according to the content of the subject;
- to determine the psychological factors of the student's qualities, including socio-psychological, individual psychological, personal and professional indicators;
- developing algorithms, as well as predicting the effectiveness of learning computer technologies, ensuring the effective use of information technologies in the educational process;
- to direct the pedagogical skills of teachers to the effective use of new computer technologies, and at the same time to conduct a multi-directional analysis for the theoretical analysis of the problem of specialization of pedagogical activities of university teachers;
- on the basis of the proposed concept, form the motivation of students that ensures the effective use of new computer technologies in their future activities;
- to prepare the recommendations of a unified scientific support system for the effective use of new information technologies in the educational process of all universities of Azerbaijan.

Scientific novelty of the research. Related to defining new content for computer science majors of universities and applying new tools and methods for mastering that content is to build a system. For this purpose, it is to compile creative tasks related to the development of a system based on the latest information about the world's digital technologies, problems and their solution methods.

A number of specific concepts can be developed within the framework of the proposed dissertation research concept:

- the concept of step-by-step pedagogical use of learning

technologies;

- computer diagnostics of mastering learning content, structuring the problem module of the training;

- scientific-methodical support and conception of students based on didactic approaches that ensure the implementation of principles and methods;

- the concept of intellectual support for students and teachers as active participants in the educational process in higher education institutions.

In addition to the above-mentioned scientific results, another innovation is the criterion for evaluating the efficiency of using computer technologies in the educational process of a certain university.

The theoretical importance of the research consists of several directions. First of all, research in the form of interdisciplinary scientific support can be considered as a solution to the problem of increasing the efficiency of organizing the educational process in universities and using new information and pedagogical technologies in the professional training of specialists. The proposed solution to this problem opens wide prospects for the development of theoretical and scientific research programs in the fields of related informatics, psychology and pedagogy in higher education institutions, in addition to expanding the possibilities of pedagogical application of many sciences. The general concept proposed in the research and the special concepts and technologies obtained on its basis have a great contribution to the development and enrichment of management theory and pedagogical and psychological theory in order to increase the efficiency of the use of information and communication technologies (ICT) in the teaching process in universities. will contribute.

The practical importance of research is determined by the possibility of using the obtained scientific results for various applied purposes. Thus, the proposed concept of scientific support and a comprehensive program for its implementation can be fully or partially included in new research and pedagogical-organizational projects. The scientific and practical tools created by the author (independently and in cooperation with other workers) both for research purposes and used in the process of professional training of students are of special importance. The scientific and practical basis of using advanced technologies and

computer systems, information exchange and teaching methods can be used in different parts or in full when training other qualified specialists. As an individual work, the following was performed:

- we developed the concept, content and empirical justification of scientific support for the effective use of Computer Science education in higher educational institutions;

- in order to ensure the effective use of computer technologies, a comprehensive program was developed and implemented, showing the role of programming in the use of modern teaching and information technologies;

- based on the proposed concept, to use algorithms and programming in order to ensure the effective use of computer technologies in the teaching process of universities;

- evaluation of the effectiveness of using new pedagogical and computer technologies in the training of higher education specialists;

- the theoretical analysis of the used literature was conducted and the experimental phase of the research was organized, the results were summarized;

- training programs on problematic and automated pedagogical technologies were created and implemented with the author's participation;

Approbation and application of research: 13 scientific works have been published on the subject of the dissertation. Of them, 8 articles (including 3 foreign ones) were published in scientific journals, 3 theses, and presentation materials at 2 international conferences. 3 textbooks have been printed.

Dissertation work was completed at Ganja State University.

The total volume of the dissertation with a mark, noting the volume of the structural sections of the dissertation separately. The dissertation consists of an introduction (16222 signs), two chapters (Chapter I (83741 signs), Chapter II (97909 signs)), ten paragraphs, a conclusion (2137 signs), a list of used literature and appendices.

THE MAIN CONTENT OF THE RESEARCH

In the introduction, the relevance of the topic is justified, the object, subject, purpose, tasks, stages, scientific, theoretical and practical importance of the research are indicated, the provisions presented to the defense are given, the application and approval of the research results are explained.

Chapter I is called **"Scientific-pedagogical basis of using information and communication technology (ICT) in higher schools"**. This chapter consists of five paragraphs. The first paragraph is entitled **"Computer technologies and their role in carrying out reforms in the field of higher education"**. Here, the structural divisions of Informatics are analyzed and the application rules are specified. It is known that the main goal of the higher education system is the function of education. That is, to prepare specialists with individual development and qualification level.

The types of teaching at different stages are as follows:

- university, academy, institute, college level of education;
- different period and level of education (incomplete university, main university (bachelor));
- completely higher level of education (Master's degree);

In universities all over the world, they focus on the solution of important issues related to the increase in the cost of performing basic functions, that is, the issues of investigating the problems.

The second paragraph is called **"The main contradictions of the system regarding ICT preparation of high school students"**. In one of the important components of the intensification of modern education, information technologies and the wide use of information technologies that meet modern requirements in education.

For this, appropriate scientific support is needed, and the teaching process in universities should be changed at a level that can meet new requirements. In this sense, it would be correct to examine the current situation in the educational process of higher schools and identify its contradictions.

It should be taken into account that the radical changes in the structure of production require the changing of the essence of the issues, the system of specialized education and its structure, which are solved

by modern technical experts. In this regard, the methods and content of the training of specialists in the field of computer science are one of the main issues. One of the main directions of the development of technology and production in modern conditions requires the training of qualified personnel and the correct selection of its use. The scale and diversity of trainings conducted at the university is determined by the profile of training specialists. Modern universities have a large number of specialties that reflect different production needs. Professional education in higher education is a multifunctional, dialectically effective system and includes all educational methods, types and forms aimed at the theoretical and practical preparation of students by the teaching staff.

The multi-level educational model can be used in new types of educational and research complexes. Such complexes will be able to combine all levels of education into a system based on a single ideology and educational structure. It will adapt them to the goals, content and technology of pedagogical activity. The positive aspects of the modern educational process, the formation of a strong, pedagogical and scientific teaching staff, are noticeable. In connection with the structure of the teaching and research complex, other departments are included in the information-analytical, educational and practical center.

The development of a multi-level model for training and efficient work of technical specialists is excellent with methodical and scientific support. In this regard, it is necessary to search for and develop a scientific support system in the form of three integrated (interaction and common goal) components of the teaching process as a single system in universities. Individual and professional development of students, specialist information, pedagogical and psychological software tools are one of the important factors.

The introduction of uniform state standards and training programs for specialists in higher schools contributed to the creation of a uniform system for the training of technical specialists.

At present, the Ministry of Education and Scientific departments pay attention to the quality of education in the activity of universities.

The third paragraph is called **"The importance of modeling in raising the level of specialization."**

When students used models, they used both abstract concepts and real objects. The concept of model is widely used in various fields. The

concept of a model is information that is understood in a certain sense:

- any model of the place - a photo copy of the landscape, in the form of a geographical map;
- are mathematical models of the processes described in the algorithms expressing the recurrent calculation given in the form of formulas.

There are basically 3 forms of models:

1. Models in physical form;
2. Models in schematic form;
3. Mathematical models.

The modeling process includes three components:

1. The studied object;
2. Subject researcher;
3. The modeled object.

The modeling process includes four main stages. The construction of a model of any issue is understood after the completion of the following stages:

1. Design the algorithm of the problem in a natural form;
2. Designing the algorithm in a graphic form in the second stage;
3. Writing the program in the third stage programming language;
4. To implement the program designed in the fourth stage on the computer.

Example 1. Let's note the computer model of the product of even numbers from 1 to n among natural numbers.

1. The beginning of the matter
2. Let's evaluate n from the input device
3. P=1, x=2 values to adopt
4. P=P. to calculate x
5. Calculate $x=x+2$ step by step
6. If n x, then perform the calculation in step 4
7. Printing of the received result (P).
8. the end.

Program Model 1;

Uses crt;

Var n, d, t:integer;

Begin

Readln(n);

```

t:=1;
for d:=1 to n do begin
if d mod 2 <> 0 then t:=t*d ;
end;
writeln('t=',t)
end.

```

After editing the program, it is practically implemented on the computer. The program written on the basis of the initial values of the variables should be executed on the computer and the result should be obtained. This eliminates the problem of solving the given problem in a short time.

In modern times, the possibilities of information and communication technology are mainly taken into account in the creation of the teaching model. In this sense, let's perform a computer model of several examples.

The fourth paragraph of this chapter is called "**Pedagogical issues of using information technologies**". Here, information technology in the higher education system is not for the study of important scientific and practical problems, but for the objective of the informatization of higher education. Objects in this context are didactic units of the educational process.

The following excellent ideas complete the pedagogical views related to the characteristics of information technologies we can emphasize.

Thus, I.B.Ahmadov defines modern and new information technologies. According to him, only the conditions were changed. At one stage, an accepted name was replaced by another name.

S.S.Hamidov calls computer technologies information technologies. That is, the issue of learning local and foreign experiences in the field of using information technologies, especially computers, is reflected. M.A.Ismayilov and others classify CDs as technologies in education. However, these are not technologies, they are only information carriers.

In our opinion, information and telecommunication technologies are characterized by the environment in which they are used and the components they are made of:

- technological environment (the technology mainly used to solve

training tasks);

- programming environment (software for the application of new information technologies in education);
- the place of use of subjects (specific subject area of knowledge, science, technology);
- methodological environment (instructions, rules of use, performance evaluation, etc.).

Based on the analysis of literary sources related to this issue, the following general characteristics of information and telecommunication technologies were determined:

- the existence of information arrays that are carefully organized with the help of information and computer technologies and are fully integrated and accessible to them;
- automatic data registration;
- transfer of information within the pedagogical system without using educators;
- participating in the educational process many times and obtaining information in a large volume and no-menclature;
- technically provided and computerized workplaces, automated management systems, support of training and teaching process.

It is known that information technologies are fundamentally new allows solving didactic problems:

- learning modeling processes within complex systems;
- timely presentation of various social, biological, chemical and physical processes that occur in reality. Information and communication technologies help organizations gain an advantage and stay competitive. Information processing technologies can be divided into 2 groups:

- 1) information reception and processing technology;
- 2) technology used in management, based on information provision. The application of such systems and information technologies increases the labor productivity of the management team.

The following issues related to information processing are resolved:

- processing of data about operations performed by the enterprise;

- preparation of periodic control reports and information about the status of work in the organization.

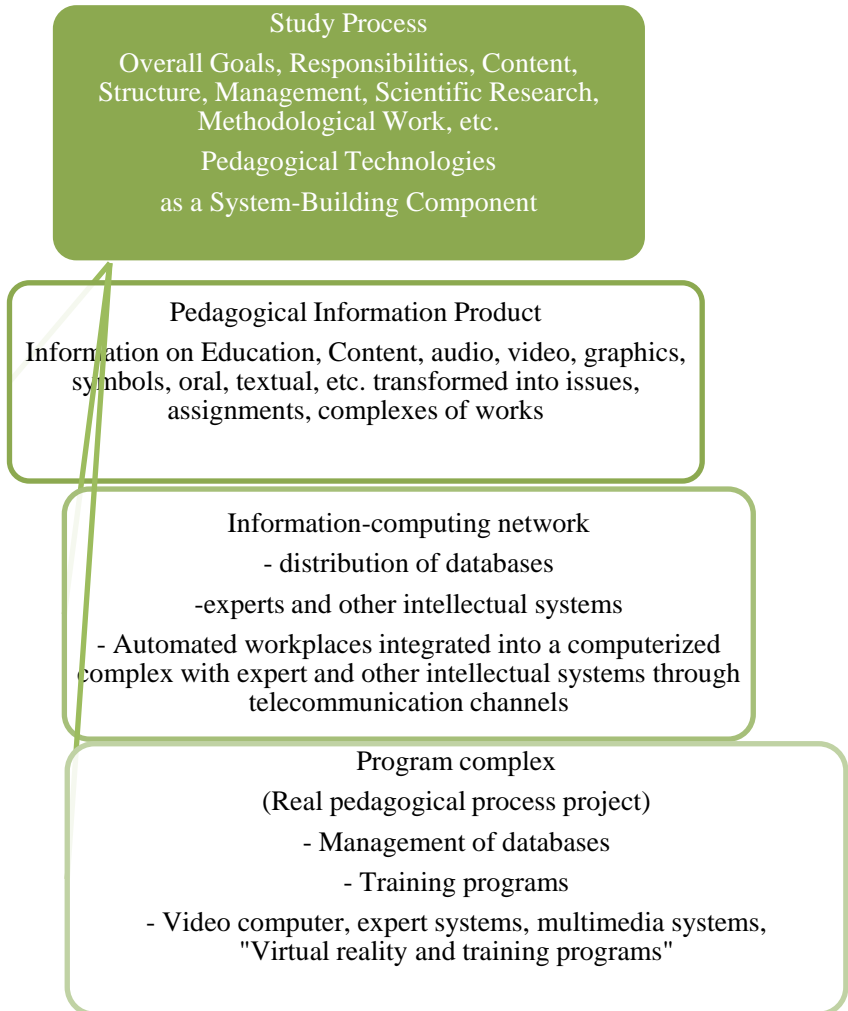


Figure 1. Technological foundations of information technologies

The application of such systems and information technologies increases the labor productivity of the management team.

The 2nd chapter called "**Preparation and use of material suitable for university students' speciality**" consists of five paragraphs. The first paragraph is called "**Classification and features of programming taught in higher education institutions**", and here, the characteristic features of programming languages and the method of programming is interpreted.

Example: Let's write a program using the counter period operator to calculate the product of numbers from 5 to 105 in natural numbers.

```
>>> p = 1
>>>for i in range (5, 105):
P = p * i
>>>print ( p )
>>>
```

In this sequence, all the characteristics of the language are taught on the basis of examples and problems. Thus, the sequence method of teaching and teaching operators of the Python programming language has been fulfilled.

During this training, the tasks should be grouped in the following form:

- tasks for external action algorithms;
- tasks according to instructions;
- independent work to demonstrate knowledge;
- independent work related to application of knowledge in practice.

At this time, the elements of traditional software technology are as follows:

1. Software.
2. Self-preparation for programming (repetition of material).
3. Learning new material in a programmed state.

The teacher can also lead group learning through a curriculum given to each student using a computer program or a tool. The possibilities of the "Teacher - one student" model are implemented in the form of education and the shortcomings of group education forms are eliminated to a certain extent.

The second paragraph is called "**Problem-based learning technology and its application in the educational process of higher schools**" Here, in order to understand the essence of cognitive activity as a creative activity, its main features are considered:

- the ability to adapt knowledge, skills and habits to work in a new non-standard situation;
- the ability to see the structure of the studied object;
- the ability to see alternative solutions;
- the ability to combine previously known solutions with a new method and create new algorithms for solving problems.

A key measure of the quality of problem-based learning is the student's ability to draw reasoned conclusions. However, according to some authors, this criterion cannot be considered completely accurate and universal, and the system of criteria will be improved as educational psychology develops.

Advanced education of students is possible only through active, diverse educational and practical activities. The external conditions of the student's educational activity are the teacher's ability to be interested in activities (modeling, design, etc.) that develop the specialty and personal qualities. One of the important ways to increase the efficiency of specialization and formation of university students is to use problematic teaching methods.

There are different classifications of problem teaching methods. In this case, the problem can be of closed and open type. Closed (productive-algorithmic) problems contain all the basic information needed to solve them.

Problem teaching technology is a didactic system characterized by special methods and organizational forms that determine the development of students' thinking and cognitive abilities. The organization of problem-oriented learning technology should be based on the principle of search. Student-teacher leadership actively works on problem solving using various logical methods and begins to explore the solution of the problem.

When the student is faced with a psychologically problematic situation and is unable to resolve the contradictions that arise, the way starts searching. In general, conflict situations that require a

solution based on existing knowledge and experience with the help of logical operations in the mind are called problems.

The third paragraph is called "**Automated systems of specialty training and methods of its use**".

One of the main directions of the development of new technologies of higher education and its organization is the computerization of the teaching process.

Numerous studies have been conducted on the use of ICT in the educational process in higher education institutions. At the same time, the computerization of teaching processes in universities has undoubtedly formed a fundamentally changed educational content both at the system level of the teaching process and on the basis of the unified concept of retraining and professional development of teachers.

Currently, computer science universities are entering a new phase of equipment quality. This allows the application of new information and communication technologies.

A systematic approach to creating a pedagogical concept of computerization of the educational process, a comprehensive review of all its components, is determined by the characteristics of a certain educational institution. This allows you to create connections between patterns and features. ICT serves the following purposes:

- improving the quality of educational content, ensuring the required level of information culture, as well as forms and methods of teaching;
- increasing the quality of the educational process;
- integration of educational, scientific and management activities within the framework of a single methodology aimed at improving the educational process;
- integration of activities of all universities for effective use of automated training systems and complexes in the educational process;
- to provide experts at the appropriate level in the field of informatics along with the entire teaching staff.

The fourth paragraph of the chapter "**Automated adaptive training systems and their quality control**" is called. Here, the concept of static adaptation is broadly interpreted. The degree of

adaptation of a student or the level of stability of his cognitive activity is determined by the duration of exposure to various environmental factors. Depending on their individual characteristics, the degree of adaptation of students [81, 120] can be divided into:

- students with a high degree of adaptation;
- students with a low level of adaptation;
- full adaptation;
- partial adaptation;
- partial adjustment;
- full tuning etc.

The concept of dynamic adaptation reflects the process of changing individual characteristics of a student.

In the fifth paragraph "**Organization and results of the research experiment**" the conducted pedagogical experiment and its results are explained. According to the hypothesis and provisions of the research work, it was decided to direct it to the experiment. This work was carried out in three stages from 2017 to the spring session of the 2021 academic year: identification, search and formulation.

The participants of the pedagogical experiment are:

- More than 257 students studying computer science;
- More than 21 technical workers and additional education workers;
- more than 47 teachers of higher education institutions.

Azerbaijan Technical University was chosen as the main research base. The number of students involved in the experiment in this university was 65. In addition, more than 170 teaching staff and teachers of Lankaran State University and Cooperation University participated in the implementation of the experiment. Taleh Shirinov at Azerbaijan Technical University, Hidayet Tagiyev at Azerbaijan Cooperation University, Araste Hashimov at LSU were the leaders of these universities.

Experimental work in the process of teaching specialization subjects Information systems, Programming languages, Information technologies in education, Automation, Microprocessor technology, Automated It was conducted on tasks prepared on automated systems, programming of microcontrollers in scientific and technical creativity, electronic education, modern problems of science and

other topics.

Table 1 presents the individual goals and tasks of the pedagogical experiment, the general characteristics of the methods and tools as a result of the research.

Table 1

General characteristics of the pedagogical experiment

Stages	Location of participants	Purpose, tasks	Methods	Result
1	2	3	4	5
2017-2018 definition	Azerbaijan Technical University	The composition of the analysis of the problem under study: 1. Studying the methodological approach of teachers to the study of modern digital technologies. 2. Studying the attitude of teachers to teaching technologies and new technologies. 3. To study the knowledge of teachers on technology and the level of knowledge of students on digital technology. 4. Determine the next path and direction of research.	Interview university professors and students. Analysis of the professional activities of teachers by technology.	The relevance of the thesis is confirmed.

Continuation of Table 1

1	2	3	4	5
Search stages 2018-2020	Lankaran State University	Development of the concept and scenario of the methodological system of ad- vanced ex- perience of the teacher of infor- matics in the field of digital technologies.	Analyze the student achievement table.	The direction of scientific research has been clarified.
Formalization stages 2020-2021	Azerbaijan, city of Ganja, GSU. Computer science teachers and students	1. Creation of a methodological system, including the content of teacher training technology, selection and development of teaching aids.	• Determine the dynamics of the level of knowledge of students and teachers on digital technologies. Analysis of the results of the methodological system. Evaluation of experimental results.	The research hypothesis was confirmed.

The identification phase of the pedagogical experiment covers 2017, but some of the necessary information at this stage has already been identified by 2017. The main goal of this stage is to analyze the state of the research problem and substantiate its relevance.

At the identification stage, the following tasks were solved:

1. Train informatics teachers in modern methodological approaches to working with modern digital technologies.

2. To study the attitude of teachers and students of informatics, future teachers of informatics to the renewal of education, including

modern digital technologies.

3. Determination of the level of training of teachers of informatics and students in the field of digital technologies.

4. Identify ways to conduct additional research.

At this stage, we conducted a survey of the staff of the Department of Informatics and informatics teachers, analyzed basic vocational education programs for their preparation, student questionnaires, and studied the level of digital information knowledge of students. In one 2017 study, we asked teachers to scale some expressions: yes; no, not soon, soon yes; Some of the survey results are shown in diagram 1.

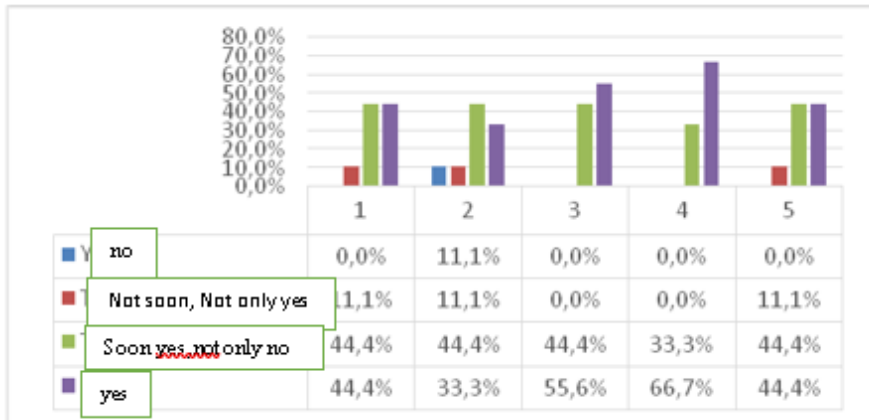


Diagram 1. The value of modern technologies in the training of future teachers based on the results of an expert survey

The search stage of the pedagogical experiment was carried out in 2018-2019. The goal was to clarify the developed concept and find ways to build a methodological system that would provide advanced pedagogical education. To achieve this goal, it was necessary to solve a number of tasks:

1. To update the content of the teacher training technology, to develop teaching aids, to indicate the elements of the system being created.

2. Development of a methodology based on approbation and evaluation of the developed methodology in the educational process.

3. Development and testing of diagnostic tools for identification.

In our experiments, we used the following methods:

- Content modeling, forms, methods and application of the methodological system;
- Observation of the educational process of future teachers of informatics;
- Analysis of individual training;
- Summarize the research results obtained in the pedagogical course;
- Experimental testing of the elements of the methodological system, preparation of future teachers of informatics for digital technologies;
- Survey of students to determine motivation and professional qualities.

The construction of the elements of the methodological system is based on certain principles. Here, such characteristics as professionalism, scientific character, accessibility, integration, prospects, functionality, interactivity are checked.

At this stage of the pedagogical experiment, the expert methodology is assessed by confirming the correctness of the chosen principles.

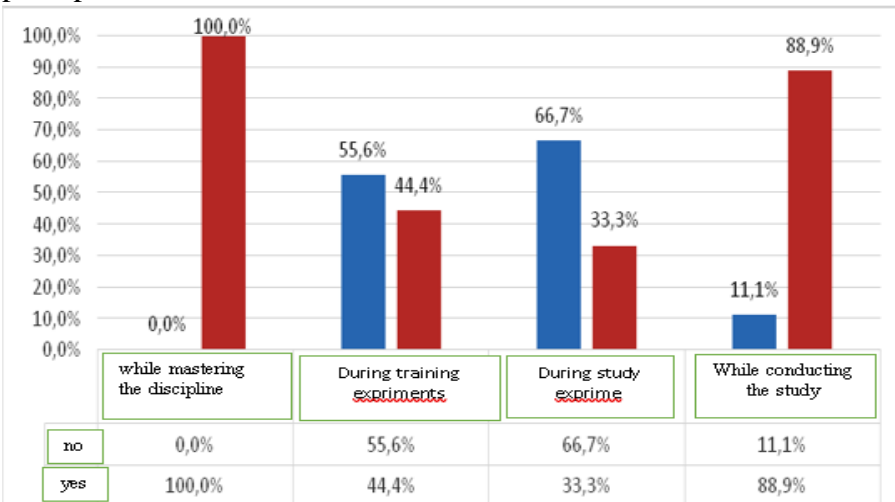


Diagram 2. The results of the selection of specialists on didactic principles for the construction of educational programs

This example shows that e-learning technology is the supreme value of the accessibility principle. These principles are supported by 75% to 65% of the total number of respondents. 59% of experts emphasize the need for science, and 53% emphasize the need to link these theories with practice, however, some differences are still there. A third of the respondents, 35%, also support the principle of interactivity. It is generally believed that digital technologies are, in fact, interactive technologies. Because digital technology can think (artificial intelligence), assimilate our requests and respond to requests. The last stage of the experiment was carried out in the 2020/2021 academic year. The purpose of this stage was to test the hypothesis of the study. In practice, the Pitirim Sorokin principle is taken as a model.

In both experimental groups, tests were prepared on the same topics. Of the groups participating in the experiment, we traditionally call the test classes (EQ) and the groups that teach our new content and methods Experimental Groups (EQ).

To ensure the accuracy of the data, the sampling operations were performed in accordance with the large Bernoulli law and the dependence of the probability or reliability of the results on the degree of P and the limit of c. As a result, the minimum sample size was determined by setting the initial values $P = 0.95$ and $e = 0.05$.

During the internship, students of the test and practice groups take an automatic test, which includes the necessary questions at the end of the lesson. The test results are presented in tables 2 and 3.

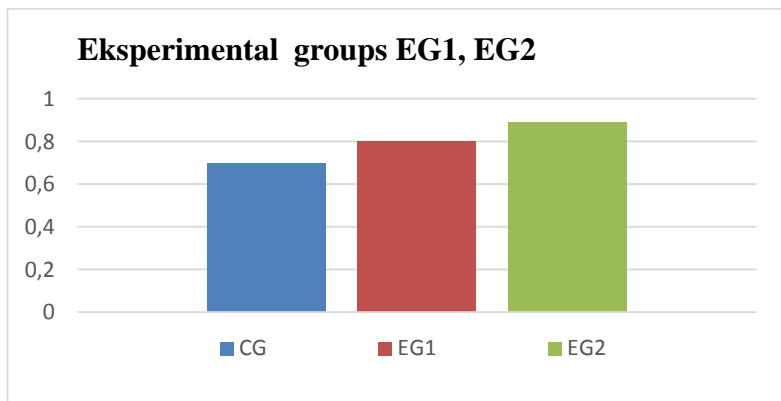
Table 2

Automatic control of the assimilation of knowledge by 3rd year students at the end of the lesson (%)

Grade	Number of grades		
	CG	EG1	EG2
Excellent (A)	2.4	8.6	8.8
Very good (B)	2.5	12.4	25.8
Good (C)	32.5	31.2	32.3
Satisfy (D)	23.6	23.3	16.3
From. Satisfied (E)	34.6	24.5	16.8
No satisfied (F)	4.4	-	-
Assimilation factor	0,61	0,74	0,82

Table 3**Automated results of 4th year students, control of knowledge assimilation, at the end of the lesson (%)**

Grade	Number of grades		
	CG	EG1	EG2
Excellent (A)	4.8	16.6	22.2
Very good (B)	18.8	22.3	24.6
Good (C)	19.2	22.1	25.4
Satisfy (D)	26.1	19.9	13.4
From. satisfied (E)	26.3	19.1	14.4
No satisfied (F)	4.8	-	-
Assimilation factor	0,70	0,80	0,89

**Diagram 3.** Results of automated testing of knowledge of students of III and IV courses

As a rule, students are assessed who answered all the test questions correctly within the maximum period of time for grading. The student's wishes were taken into account when assessing knowledge on the exam. Almost all inspection tasks were of the same difficulty level.

The score is based on the number of correct answers to the main and additional questions and the total number of attempts to

answer them. The following rating ranges were used using the same criteria as in the balloon system: excellent (91-100 points-A), very good (81-90 points-B), good (71-80 points-C), fair (61 -70 points - D)), satisfactory (51-60 points-E), insufficient (0-50 points-F). To increase the share of each additional question, a special coefficient was applied. Tasks were selected in advance in accordance with the degree of difficulty and time.

It can be concluded that the use of ICT in the educational process of universities makes it possible to improve the quality of education by 15-25%, depending on the level of adaptation to the individual psychophysiological characteristics of students.

In addition, the efficiency of the process has increased significantly as a result of the application of our methodology compared to traditional methods. This information teaches how to plan the learning process using automated learning systems. Thus, when using ICT, we are implementing a different approach that takes into account the relevance of students' knowledge for the profession.

RESULTS

1. Pedagogical technologies (computer training system, automated training systems) are the best methods and tools to help students acquire specialized knowledge. It prepares students to design and manage processes in the field in which they will work in the future.

2. The main task of using pedagogical technologies is to achieve pedagogical goals, mainly through the development of the student's personality. Unlike teacher-centered methods, pedagogical technologies are student-centered. It also ensures that the student achieves guaranteed results through proactive and purposeful activity.

3. Problematic teaching methods and information and communication technologies can be used together in high-quality teaching in the specialties of university students. The best didactic and individual information is obtained through the use of heuristic systems and adaptive automated learning systems. Their use in the educational process gives statistically significant positive progress and has a positive effect on the formation of specific knowledge and

skills, personality and key areas of specialization among university students.

4. An important element of increasing the efficiency of using ICT and ATC is the adaptation of the color background of the screen to the current psychophysiological state of the student and the choice of the optimal time (lesson time) for classes.

5. Compliance with important rules in relation to scientific research, the main characteristics of higher education and the restructuring of the higher education system is becoming increasingly important. This study should provide a scientific basis for development policy by improving the professional training of modern universities and students.

6. It is considered as a single system from the point of view of educational process management, individualization of teaching, attention to the individual and psychological qualities of students, multidimensional assessment of teachers, as well as the effective use of ICT. Thanks to the use of new pedagogical technologies, taking into account the use of analytical technologies, the training of specialists in universities will increase. These components of the scientific support system should be included in the process of professional training of university students. He must effectively contribute to the achievement of the goals and objectives of professional training in the educational process.

The main provisions of the dissertation are reflected in the following scientific articles:

1. Software tools and their teaching methodology // – Baku: ICT in Education, – 2018. Volume 35 No. 1, – p. 260-264.

2. Methodology of application of electronic training tools in the teaching process // – Baku: ICT in Education, – 2018. Volume 35 No. 2, – p. 229-236.

3. Elements of cybernetics and its application to teaching / – Baku: ICT in education, – 2018. Volume 37 No. 3, – p. 152-157.

4. Historical and theoretical analysis of the use of information technology in pedagogy // – Berlin, Germany: Spirit time, – 2018. No. 8, – p. 18-22.

5. Training technologies and their role in higher education reform // – Baku: ICT in education, – 2019. No. 3, – p. 20-26.
6. Scientific textbook system for effective use of new information technologies in higher education // – Ganja: Ganja State University, Scientific news, – 2019. No. 3, – p. 243-247.
7. Methods and organizational forms of training // – Moscow: Scientific aspects of modern research, – 2019. No. 4, – s. 269-271.
8. Conceptual bases and essence of the use of information technologies in the educational process // – Ganja: Ganja State University, Scientific news, – 2020. No. 3, – p. 163-169
9. Systematic definition of the concept of advanced education and its role in the development of personality // – Almata: Pedagogy and psychology: pedagogy and psychology, – 2021. No. 2(47), – p. 176-182.
10. The importance of modeling in raising the level of specialization // VI Akdeniz international social science congress, – Turkey: 23-24 Kasım, 2021, – p. 89-97.
11. Problematic learning technology in the educational process of higher schools and adaptation of its application to specialization // Sustainable development strategy: Global trends, national practices and new goals, – Mingachevir: 2021, – p. 391-394.
12. Fundamentals of informatics and programming: textbook / H.Taghiyev, R.Humbataliyev, Kh.Rzayeva [etc.] - Baku, - 2017. - 243 p.
13. Application methodology of programming in solving mathematical problems: textbook / R.Humbataliyev, S.Haziyeva, Kh.Rzayeva [etc.] - Baku, - 2018. - 126 p.
14. Information exchange in the economy: textbook / H.Taghiyev, V.Huseynova, Kh.Rzayeva [etc.] - Baku, - 2019. - 143 p.

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