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Review Article

# METHOD OF IMPROVING SELF-STUDY WORKS OF STUDENTS IN BIOLOGY BY MEANS OF INFORMATIONAL RESOURCES

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**Abstract**
The article describes the methodology of improving the students' self-education with the help of informational resources in biology. The legal basis for the organization of independent learning of students, the pedagogical conditions and influencing factors to form the social and pedagogical conditions were scientifically based. The organization and control of students' self-study work in biology was given. The types of self-study work, a model of the process of organizing self-study work, a methodological system for organizing self-study work of students in biology were studied. The formation of the students' skills on active self-study work with informational resources at biology classes, and the materials about the basic conditions for conducting pedagogical experimental works, so a statistical analysis of its results and effectiveness were justified.

**Keywords:** students, biology, self-study work, informational and communicational technologies, information resources, control of self-study work, pedagogical conditions, factors, function of self-study work, reproductive level, partial search, productive, creative level.


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## INTRODUCTION

In the modern world, a special attention is paid to supporting self-study education through the widespread introduction of informational and communicational technologies in the educational process, creating a base of educational resources and increasing the efficiency use of it. In the teaching of the natural sciences, in particular, biology, based on SMART technologies, based on the visual and virtual possibilities of interactive software, the development of students' knowledge in biology, the role of electronic information resources grows aimed at developing reflective skills.

In studies of the International Programs (PISA, TIMSS) for assessing the literacy of students in mathematics and natural sciences, scientific researchers are being conducted on designing students' self-study works in teaching the biology courses, and on creating informational resources to ensure their professional training. The theoretical significance of these studies concludes in updating the methodological support for teaching the natural sciences, and in particular, biology, expanding interdisciplinary connections and opportunities for modular education, introducing an online system for monitoring independent work and evaluating them, using virtual laboratory works, and web-quest technologies.

Reforms carried out in our country calls the necessity of improvement of the methodological conditions for the use of information resources in the teaching of biology, the use of opportunities such as strengthening the material and technical bases of educational institutions, creating the necessary conditions for pedagogical activity of teachers, encouraging students of secondary schools by using multimedia educational resources, advanced pedagogical and modern information technologies to increase efficiency natural sciences, particularly in biology.

In the strategy for further development of the Republic of Uzbekistan, the priority tasks are to "in-depth study of such important and relevant sciences as chemistry, biology, physics, mathematics, computer science, foreign languages, improving and increasing the quality of secondary specialized education". A great importance is the improvement of the methodology for organizing self-study educational activities of schoolchildren in the study of biology, using virtual laboratory tasks and using of informational resources.

Adapting of the educational process to modern requirements, modernization on the basis of developed foreign experiences under ensuring the effective organization of self-study works of students is an important. The creation of the necessary conditions for students to receive self-study education, the direction to creative activity, the formation of basic and subject competencies are considered one of the main tasks of continuous education.

## PROPOSED METHODOLOGY

In the course of the study, in order to organizing the self-study work of students in the teaching of biology, it became necessity, first of all, to clarify the conception of the learning process.

In the curriculum of "Methodology of teaching biology", published for students of pedagogical higher educational institutions, the learning process is described as follows: the educational process includes of the assimilation of specific educational materials by students, their educational activities in conjunction with the pedagogical activity of the teacher on the base of organization and management of this process.

Since the educational process is an organized and controlled process, the question arises of how is it created?

Sources regarding the methodology of biology teaching are based on various teaching methods, which are implemented in various conditions (biology room, excursions, living nature corner, nature) and are expressed in the form of their theoretical and practical activities, as self-study works, extracurricular activities, excursions and extraclass activities.

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corner, nature) and are expressed in the form of their theoretical and practical activities, as self-study works, extracurricular activities, excursions and extraclass activities.

It should be noted that the above mentioned forms of training are organized interconnectedly and interdependently.

**RESULT ANALYSIS**

The problem of the study is that the successful organization of students' self-study works will be directly related to the new topic of the lesson and related homework and self-study works, conducting observations and experiments on the content of the topic, so, organizing extraclass activities, directly participation to extraclass activities in order to satisfy the students' needs to study the bases of biology.

Adopted decisions in the country on the modernization of the education system and defined activities in it, determines a new approach to the organization of self-study works of students.

The Resolution of the Cabinet of Ministers of the Republic of Uzbekistan № 997, dated December 8, 2018, about "About measures on organization of international researches in the field of assessing the quality of education in the system of public education" provides for the modernization of the education system, improving the quality and effectiveness of education.

The decree defines the followings: the principles of international cooperation in assessing the quality of continuous education, improving students' literacy in reading, mathematics and science, developing innovative methods and technologies using by international assessment programs, installing, developing and implementing the international projects, international scientific conferences and symposium, conducting fundamental and applied researches in the field of assessment of education quality, providing scientific and methodological support to these researches, ensuring the participation of secondary schools in the international researches, comparing the results with the results of other countries, conducting systematic monitoring of the implementation of the educational process, studying the best practices in this field and recommending them to educational institutions, using innovative teaching methods for reading, mathematics and science, developing educational -methodical recommendations for teacher training.

Realization of these goals requires the improving of the quality of educational services, modernizing of the educational process, improving of the process of teaching and learning in order to achieving a high level of quality education.

One of the International PISA assessment programs, noted in this Decree is intended to assess students'literacy in reading, mathematics and science, and also includes of taking into account the application of their knowledge, skills and abilities in the field of reading, mathematics and science in life and problematical situations . It evaluates training and test tasks through information resources.

Based on the above thoughts, using of informational resources in the organization of self-study works of students in biology is a pedagogical problem.

This pedagogical problem requires the creation of pedagogical conditions.

The studies of the biology teacher of J.O.Tolipova on the theory and practice of improving the level of scientific and methodological training are divided into the following groups of pedagogical conditions for the research task:

1. Socio-pedagogical conditions.
2. Didactic conditions.

Socio-pedagogical and didactic conditions were determined under organizing of self-study works of students in biology.

The organizational conditions by using of information resources on the students' self-study works in biology were examined during the research, and recommendation was prepared based on this.

Factors, affecting to the formation of socio-pedagogical conditions are continued in the followings: individualization of the use of information resources in the school, in the performing of self-study works on biology; formation and motivation of students; the availability of scientific and methodological information resources and material and technical bases; equipping the biology class with modern computers.

Factors, affecting the occurrence of didactic conditions are as follows:

according to B. Bloom's taxonomy, the didactic stages of students' self-study works on biology (reproductive, productive, research, creative) are determined on the basis of a grouping of elements of independent learning;

development of an independent curriculum by using of information resources by prioritizing the components of the diagnostic (preparation, training, practice) and organizational and technological (stage, method, condition, form) components in the electronic informational environment;

the method of organizing students' self-study works (analysis of situation, hypothesis, use, argumentation, verification) on the base of use of information resources, directed at comparing the structure and characteristics of various biological organisms in the training;

development of proposals and recommendation on virtual educational materials on biodiversity based on verbal, graphic, animation and tactile information resources for independent study of laboratory work.

I. A. Zimnyaya believes in that self-study work is a purposeful, internally motivated activity, structured directly by the subject in the sequence of the sum of the performed actions and subsequently corrected by them on the process and the final results. Its implementation requires a high level of self-awareness, reflexivity, self-discipline, personal responsibility, as a result it gives the student satisfaction as a result of self-improvement and self-knowledge [6].

Self-study work is the educational activity of students, which is carried out in order to acquire knowledge or apply skills through the implementation of various levels of tasks. It serves not only the effective assimilation of educational information, the acquisition of knowledge and techniques for the implementation of professional activities, but also the education of such necessary personal qualities as responsibility, initiative, creativity, hard work.

Improving students' self-study works in biology through information resources: it provides modern didactic materials, maximum visibility and adaptation to learning in specific interactive conditions; increases the motivation and interest of students in knowledge, accelerates the learning process.

This model provides for the use of information technologies and computer tools in the process of organizing the self – study works, goals and objectives, that guarantee effectiveness of education, its essence and content, the harmony of educational tools, methods and forms, the level of difficulty of self-study work tasks, didactic goals, as well as expected results ( Fig. 1).

The educational function of independent work tasks, as well as the identification of typical deficiencies in the knowledge, skills and abilities of students, encourages them to study the basics of science systematically in order to expand their knowledge.

The educational function of self-study work tasks involves that

that students will have difficulty finding the exact answers to their individual tasks and will be able to create the basis for their competence using intellectual processes: analysis, synthesis, comparisons, generalizations and conclusions to solve the problems: will, conscious disciplines, allowing them to develop as a person, mobilizing their knowledge and strength to solve certain educational problems.

The development of independent work encourages students to develop their knowledge, skills and abilities, self-development through self-realization and understanding of their role in the future.

The possibility of self-study work allows students to identify gaps in knowledge, to replenish and strengthen their knowledge, skills and abilities.

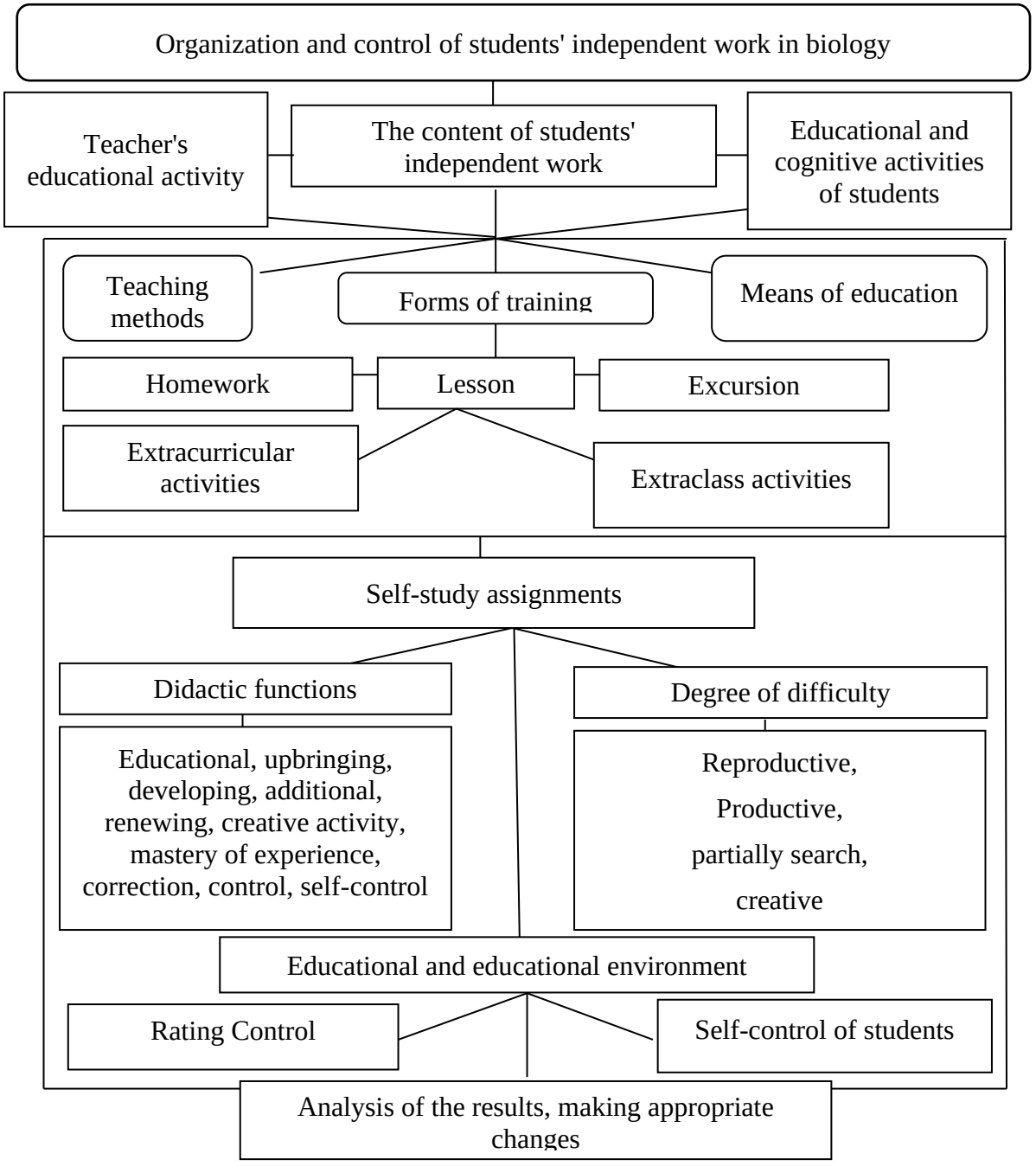


**Fig. 1. Model of the process of organizing the self-study of students in biology.**

The function of self-study work on updating knowledge allows students to acquire previously acquired knowledge, skills and abilities, to update in new and unexpected situations and to acquire new knowledge.

The functions of self-study work on the acquisition of creative experience include of a partial search and independent creative tasks, that one's help students to think creatively, to gain experience in creative work, to make decisions and draw conclusions about videogenic experiments.

The function of correction of self-study work of tasks is to identify typical deficiencies in the knowledge, skills and abilities of students, their elimination and increasing of knowledge through repeated execution.

The functions of knowledge control and self-control of self-study work include of interdisciplinary training in educational programs in information technology, including of

reproductive, productive, partially search and creative complexity, as well as teacher control, as well as self-control of knowledge, skills and abilities, it gives the development of education results on the base of achieved results.

The analysis of the main advanced ideas, presented in the methodological approaches of teachers and psychologists in the electronic educational space on the subject of this problem and the organization of self-study work of students through informational resources was conducted and the direction of research was determined.

In order to enhance educational and cognitive activities and the effective organization of the process of self-study work during the research, the necessity of designing of didactic model was arisen.

During the training, Bloom's taxonomy was one of the components of students' knowledge of biology in self-study; in accordance with the objectives of the curriculum, the following tasks were developed: knowledge of biological concepts and regularities, understanding of biological processes and phenomena, practical application of acquired knowledge, skills and abilities, repetition and strengthening of the acquired knowledge and skills and abilities, analysis of biological processes and phenomena on the base of biological concepts and regularities, a synthesis of biological processes and phenomena on the base of biological concepts and regularities, the groups of self-study works were picked out on the creative application of acquired knowledge, skills and abilities, the groups of self-study works on the control and evaluation of acquired knowledge, skills and abilities, on the creative approach under solving of problem situations, complex groups of self-study works.

Self-study work on biology, which is created by using of information technologies, it is beyond the scope of the program and directs students to self-development, creativity, creation and creativity. As a result of this approach to the task, from knowing how to reproduce (describe a remembered object), knowledge is mastered on the basis of creative processing in new circumstances.

There are four types of self-study works, related to didactic goals (Fig. 2).

The use of informational resources in the process of organizing self-study works of students in biology allows to activate the educational and cognitive activities of students, to develop the basic and individual competencies of students on the subject, to increase the motivation and quality of education.

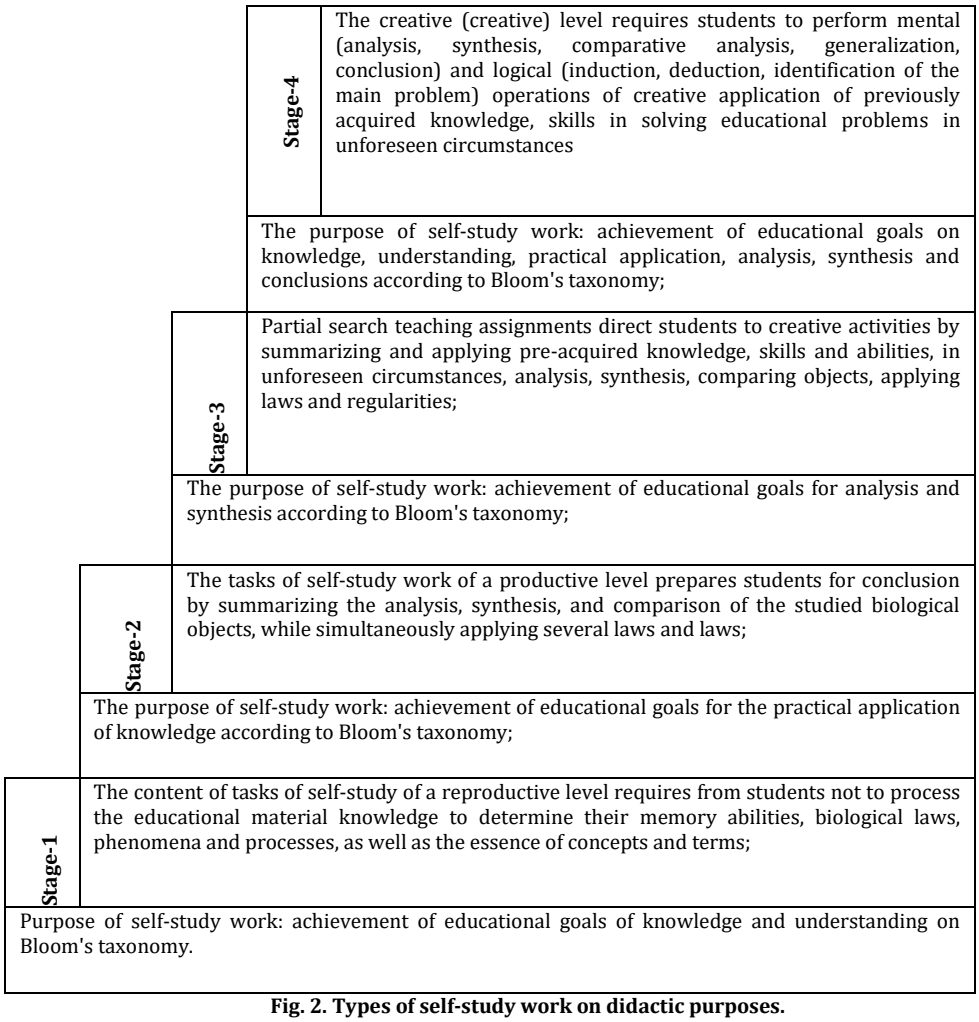


**Fig. 2. Types of self-study work on didactic purposes.**

The organization of self-study works of students in biology through informational resources is carried out directly in the process of lessons, laboratory studies, as well as through self-monitoring or completing tasks on the control of gained results. Compiled and submitted tasks during the sresearch in the educational and methodological support differ from each other in their form and level of difficulty. When compiling educational tasks, students are required to master a certain

level of knowledge, skills and abilities, the security of their independence in obtaining knowledge.

**Table 1 Methodical system for organizing self-study work of students**

| No | The constituent parts of the methodological system | Specific features of the components of this system |
|---|---|---|
| 1. | Methodological basis | Principles of the International Valuation System |
| 2. | The paradigm of the educational process | Personally oriented individual education, word by word education, competency-based approach |
| 3 | Identity Goals | The formation of the educational goals of the tasks of self-study work of students in Bloom's taxonomy |
| 4 | Didactic principles | Science, the integration of theory and practice, consistency, logical sequence, continuity, succession |
| 5 | Content of education | Knowledge, abilities, skills, supporting and biological competences in the subject of "Biology" |
| 6 | Means of education | Natural-visual, verbal-exhibition means, hypermedia education and information programs |
| 7. | Teaching methods | reproductive, problem-searching, logical, self-study work, self-control and assessment method |
| 8. | Forms of training | Lesson, excursion, laboratory work, practical work, extracurricular activities, extra class activities |
| 9. | Innovative technologies | Problematic training, work in small groups, training in cooperation and design technology |
| 10. | Control and self-control | Standard and non-standard study assignments for self-study work |

The formation of the students' skills of active self-study works with informational resources in biology classes, providing communication contribute to the deep assimilation of biology related subjects. Creating a system for students to work with informational tools in biology classes in accordance with innovative technologies, justified from a scientific and methodological point of view, and answering to modern requirements, it makes possible to widely use the capabilities of an intellectual educational system.

The first component used by informational resources in the systematic organization of students' self-study works is based on the use of electronic educational resources in biology classes. In the electronic resource of "Technology of organizing of self-study works of students in biology classes", which was created by us during the study and giving us copyright, a system of tasks for organizing self-study works of students in biology in academic lyceums was developed and methodological recommendation for its application were given.

The second component is manifested in the methodology for organizing self-study work of students in laboratory classes in biology, the third component is in the establishing a system of self-control with the help of test tasks.

The curriculum of the academic lyceum in biology, along with theoretical ones, includes of laboratory and practical classes. The didactic goals of these exercises are to achieve acquired abilities and skills, basic and specific competences in the subject with the help of GOSOSO, applying theoretical knowledge acquired by students to familiar, new and unexpected situations. During the research, laboratory and practical classes were conducted to study the self-study work of students, as well as using natural, visual, verbal and information resources.

Software and methodological support was developed to provide students with the opportunity, independently or together with a teacher, to use a computer training resource in organizing self-study work and in laboratory classes. The content of laboratory studies in the electronic information resource is as follows: educational and scientific materials - only orally; educational materials - in the form of verbal (text) and two-dimensional graphics; multimedia applications, that is, information in three-dimensional graphic form, audio-video, animation and partial verbal (text); tactile, characterized by a process that executes a process or represents the movement of an object.

The purpose of the experimental work is the content, ways to improve the self-study work of students in biology through information resources.

In the process of experimental work on the basis of the created electronic educational resources, the methodology for organizing and conducting self-study work of students in biology classes at the school was improved.

A chart with average indicators for the received results is shown in the following figure.

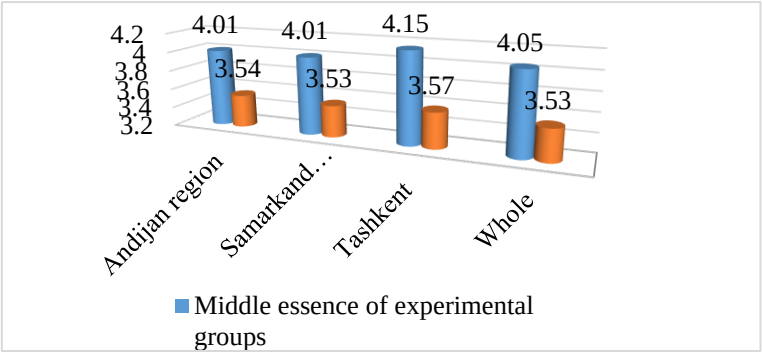


**Fig. 1. The results of the effectiveness of completing tasks of self-study work of students in the experimental and control groups.**

As you can see, the average indexes of the experimental group are 15% higher on compared with the control group. Therefore, the effectiveness of the conducted researches was proved.

The analysis of the diagram, the high level of assimilation of educational materials by students of the experimental group on the comparing with the control group, the introduction of information resources into the educational process when organizing self-study work in the experimental group, it proves the effectiveness of the process of mastering of students' knowledge, skills and abilities.

**CONCLUSION**

On the base of the analysis of the results of the scientific and pedagogical research and its results, we came to the following conclusions:

1. An analysis of the theoretical and methodological sources of research showed that in biology there is no single approach to the process of self-study work, self-organization of the student through information resources. Therefore, it was determined that the content of the didactic stages of students' self-study work (reproductive, productive, curious, creative) and the elements of self-study should be selected in accordance with the goals of Bloom's taxonomy.
2. In accordance to the importance of organizing independent educational activities of students, the diagnostic process (preparation, readiness, practice) on electronic media is based on information resources and organizational and technological (level, method, condition, form) components, on the base of an analysis of priorities.
3. As a result of the research, the process of using of informational resources for students' self-study work was improved with the help of pedagogical approaches (a systematic, personality-oriented, active, contextual approach to learning, dialogue). In the context of informational and communicational education, a methodological basis for the organization of independent training was developed and scientifically substantiated. Among teaching and training in the field of biomedicine, integrated methodology, based on human resources, and provide the basis for biological education in the context of interactive information exchange (teacher, student).
4. A methodological system by using of informational resources in organizing of self-study work of students in biology was created, biological processes, the structure and characteristics of organisms, interactive informational models, based on analysis and comparisons, software and symbols (for example, biological processes, didactic properties and functions of electronic educational resources, phenomena, graphic diagrams of processes, biological tasks, virtual observations and biological experiments) were determined; verbal, graphic, animated types of self-study work were worked on (case analysis, hypothesis, use, argumentation, verification), by means of which a database of educational and test tasks was developed and implemented in practice, which provides an independent study of the content of education as a result of the use of biological informational resources, form and speed, control and self-control, as well as additional tools for correcting detected gaps.
5. The use of informational resources in organizing self-study work of students in biology allowed to the teachers to establish a task on the base of the type of activity and training goals, teaching aids and e-learning resources. Self-study work consists of in the following algorithm:

   Department of biology subject $\longrightarrow$ didactic goals of the subject $\longrightarrow$ activation of knowledge, skills and abilities $\longrightarrow$ planned results $\longrightarrow$ teaching results $\longrightarrow$ effectiveness of the results.
6. The results of pedagogical experiments showed, that the results of the research correspond to the goals and objectives of methodological recommendation for organizing students' self-study work through informational resources. Organization of self-study work through electronic learning resources contributes to the development of motivational and educational resources of students and provides on an increase the quality of education in biology.

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