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# Organization of Independent Education in the Credit-Module System Using Web Applications

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**Abstract.** The article describes that the effectiveness of learning in the credit-module education system depends on the proper organization of students' independent learning. It also gives important features that should be in the online web applications used in this process and recommendations for their use in progress. In the web application that we have developed and proposed, the student and the instructor can post information on relevant topics, and the possibility for the student and, of course, the instructor to express their opinion about these resources has an important positive impact on the quality of independent learning. The teacher should not actively interfere in this process, when students express contradictory opinions or even post some erroneous information on the Internet, students should be active and learn to refer to parallel resources on the Internet independently. In the conducted experimental work, it was found that the impact of the above on learning efficiency is positive.

## INTRODUCTION

It is seen that the organization of the educational process through independent education is considered an urgent issue in the world, that students are not only able to acquire certain knowledge through independent education but also to be formed as quality individuals for the modern world environment and acquire positive characteristics. The higher education systems of developed countries, especially the USA and European countries with developed educational systems, as well as several other developed countries, have switched to the credit-module system, as well as innovative technologies in education, as well as convenient interfaces, and targeted functions. With the improvement of the quality of independent education through the use of software tools, it is certainly possible to see that the effectiveness of education is achieved first.

To transform our country's educational system into one that can meet the requirements of world standards and deliver competitive personnel to the labor market, we will conduct training sessions based on new pedagogical technologies in all educational institutions and study the experience of countries with developed educational systems. and wide opportunities have been opened for the professional development of employees in the field in foreign countries with a developed educational system. Also, the support of the innovative and experimental activities of our experts in the field of education is aimed at ensuring the introduction of the newest innovative technologies into the educational system and thereby achieving higher educational efficiency. One of the boldest steps in this field was, of course, the transition of higher educational institutions of our Republic to the credit-module system [1,2].

## METHODS

If we look at the history of the introduction of the credit-module system, in the second half of the 19th century, students' interest in studying was weakened as a result of the presence of many subjects that lost their importance in

science programs and practice (Latin, etc.) and it appeared as a result of the fact that students who graduated from higher education institutions "well" have not yet formed into modern, "good specialists". In 1869, Charles Elliott was elected president of Harvard University, and he soon abolished the university's rigidly defined academic programs. As a result, university students have the opportunity to choose the subjects they want and are interested in from among the subjects offered. Thus, in 1872, the first credit module system was introduced at Harvard University. This reform increases interest in Harvard University among young people in the USA. The subjects in the university curriculum also begin to sort out naturally. Subjects such as the economy, and labor market, which are of high practical importance in their time, become the main subjects in educational programs.

Finally, by 1989, a new credit module system was developed in Europe based on the American credit system and the Dutch higher education system, and it was called the European Credit Transfer System (ECTS) [3]. Appendix 1 of Decision No. 824 of December 31, 2020, of the Cabinet of Ministers of the Republic of Uzbekistan on measures to improve the system related to the organization of the educational process in higher education institutions and according to the Regulation on the procedure for introducing the credit-module system into the educational process, "starting from the 2020/2021 academic year, the educational process will be gradually (based on ECTS) credit module in the higher educational institutions of the republic the system transfer procedure will be introduced" [4].

Transition to the credit-module system, while creating many opportunities and conveniences for the student, increases his responsibility. This can be understood from the fact that in the credit-module system, independent study hours alone account for 60% of full-time study hours at the undergraduate level, and 70% at the graduate level. So, this system is a system that focuses on the independent education of students. Therefore, properly organized independent education in this system is the main factor that increases educational efficiency.

Independent work, independent education, and its theoretical foundations have been formed and developed throughout the history of mankind. However, among the great historical didactics who have focused on its organizational and methodological support and the conditions for effective organization, M. Monten, Ya. Kommenskiy the tooth will be suitable for the purpose. M. Garunov, B. Esipov, I. Lerner, P. Pidkasistiy, as well as A. Abdukodirov, M. Aripov, U. Begimkulov, S. Kakhkhorov and several other pedagogues from our country, can be counted as pedagogues who conducted research in this field and are growing in recent years.

Independent education is a systematic activity aimed at forming theoretical knowledge, practical skills, and competencies based on independent mastering of educational material, tasks of varying complexity, and creative and independent performance of practical tasks in the audience and outside the audience. in one of the instructions aimed at organizing the limit. This guideline also defines independent work and explains how it differs from and is a component of independent education.

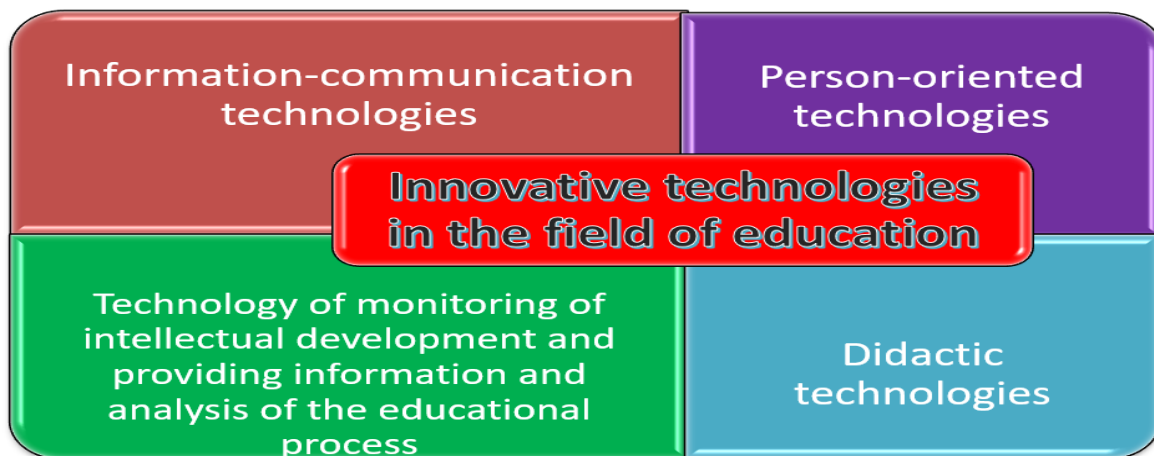
Independent work is an active method of learning that solves the educational task under the teacher's instructions and guidance. Independent work is the organization and implementation of specific activities of students in connection with the set goal. Student's independent works are activities based on his high level of activity, creativity, independent analysis, initiative, and timely and perfect performance of all tasks.

Nature and types of innovative educational technologies. Innovative educational technology - to increase the efficiency of the educational process, to consider its content and essence according to modern demands and proposals, that is, to create conditions for educational activities that are most compatible with the current trends of socio-economic development, to update existing methods and tools, or it can be called a methodology for organizing educational activities that includes quality improvement.

Innovative educational technologies are based on three main components:

1. Knowledge acquired for the continuation and development of the industry is important in today's market conditions. Knowledge in obsolete fields, no matter how prestigious the field, is passively used in practice, bores the learner, and most importantly, does not cover the costs of acquiring this knowledge in the market economy.
2. Increase of student activity in the educational process, compatibility with practice, and the main focus of education on the formation of competencies of future specialists. For modern specialists not only to know their field, but also to effectively solve problematic situations in their professional activities, they must have high competence in their field, integrate all processes in their field, and, if necessary, all vital laws., should be able to see as a whole.
3. Availability of modern infrastructure, and availability of organizational and technological components for the application of new forms of education.

Innovative technologies in the field of education are constantly developing, of course. New technologies are being developed based on modern requirements. Nevertheless, innovative technologies in the field of education can be seen in the following groups according to certain characteristics (Fig. 1).



**FIGURE 1.** The main innovative technologies in the field of education.

1. Information and communication technologies, the level and culture of working with information of teachers and students increases. All fields can be easily mastered using the knowledge in this field.
2. Person-oriented technologies. In this, the uniqueness of the person is highly considered, and thus the quality of education is improved.
3. Technology of intellectual development monitoring and educational process information-analytical support. The purpose of this technology is to form personal conclusions in students by disclosing the received information and getting motivation from this process.
4. Didactic technologies. It is an innovative technology based on the effective use of literature and many other educational tools by students [5].

## RESULTS AND DISCUSSION

Any form of education involves some amount of "independent learning". That is why pedagogic scientists do not have the same views on the concept of independent education. However, they are unanimous in terms of the positive skills that self-directed learning develops in the learner. Based on the above considerations, we give the author's definition of independent education as follows:

Independent education is a systematic approach aimed at the independent acquisition of knowledge, skills, and competencies by the learner without the direct scientific support of the educator, but based on his direct or indirect instructions, if necessary, is a form of learning in the form of an activity, which is mainly organized outside the classroom.

Tasks and questions given in the auditorium to reinforce the subject taught in the auditorium, or information given to students for mastering after the lesson, supplementing the subject taught, would be appropriate if we call them independent works. So, independent work is independent education as a popular form is considered its component.

The reforms carried out in the education system today are aimed at developing students' independent thinking, based on individual educational trajectories, solving problems related to the formation of creative thinking and practical skills in students [6]. However, it should not be forgotten that in the independent education of students, it is very important for the teacher to properly organize the process, motivate the students in this process, and control their activities. Therefore, first of all, every professor-teacher should master the method of organizing students' independent education based on the nature of the subject, through innovative methods, and should be able to provide sufficient support to the student in this process. For this purpose, it was the most basic for students

To achieve efficiency in the independent education of the student without the teacher's guidance, let's talk about what specific documents and information the teacher should deliver to the student today, that is, what should be in the hands of the student who wants to master the subject independently.

First, the student must have a syllabus - a working study program of the subject designed for the student. Because the student is determined he should have a general idea about the subject, even if it is superficial, by knowing when,

how long, and using what literature he can master the subject. In addition, the syllabus will reflect everything, from when and what kind of supervision will be held on this course, to when you can get advice from the teacher" [7].

- Together with a list of educational literature, at least a basic electronic format of literature should be provided to the student.
- A collection of Internet links necessary for mastering this subject the digest should also be delivered to the students by the teacher.
- A brief explanation of the terms in the subject - glossaries should be prepared by the teacher and given to the student. At the same time, the references of this form and, if necessary, their main ones should be delivered to the student in electronic form.
- A set of tasks, that is, exercises (for example, problems) are very important, as they strengthen the student's theoretical knowledge and develop the ability to put his knowledge into practice. Cases related to problem situations also serve to develop the student's ability to think independently and creatively.
- Presentations or video materials with logical, high-quality animations on specific topics in the subject will increase the student's interest in the subject.

One good way for students to exchange ideas about science is through forums.

Nowadays, there are opportunities for students to master a particular course by helping each other with ideas and information through telegram groups. At the same time, it is possible to achieve high efficiency in the independent education of students using mobile applications, which are now widespread in the world, etc.

We need to teach the students of the modern, new generation to stop considering their points of view and opinions as unique, final, and irrevocable. They should feel that all areas are developing and developing, and great achievements are in the hands of modern personnel who can digest alternative ideas and thoughts.

We need to free the youth from psychological barriers.

The fact that the teacher takes into account the status, level, and learning indicators of the students in the audience when preparing independent works and assignments also shows his skills. That is, allowing all students to express themselves through tasks of different levels, this process increases efficiency, and this, in turn, motivates students to perform better, motivated by the results.

Also, another motivating factor is the sufficiency of the students' existing knowledge to complete the assignments for independent work intended to be performed in the classroom.

Since one of the main conditions in any educational technology is the clarity and guarantee of the goal, independent work and tasks should begin with a clear plan and end with controls.

It is known that students who have collected 56%-100% of the maximum possible points according to the total result of the control types conducted for certain sections or topics of the subject study those sections or topics of the subject. are considered to be used. Based on the fact that the mastery rate of students is different when composing independent works and tasks, it is appropriate to create tasks with several levels of complexity. For example, if we cite recommendations for creating independent work tasks of three different levels of complexity from the mechanic's department of general physics:

- Tasks of the 1st type should be performed directly using the definitions and properties given in the lessons. For example, at what angle to the ground must a speeding cyclist make a circle of radius  $l$  to be in equilibrium?
- Type 2 assignments should be based on the ability to use the ideas and methods needed to cover a specific topic. For example, if the tangential acceleration of a cyclist moving in a circle with a radius equal to, at what angle must the cyclist move concerning the ground to be in equilibrium?

When completing type 3 tasks, the student is also forced to independently search for ways to solve the problem. When solving such problems, the student uses additional literature and the Internet, and the main thing is to think more logically. For example, you can ask logical questions such as "Give your opinion about the forces that make the earth rotate around its core". At the same time, as long as such issues find a positive solution only through high-level analytical thinking, and this level of analytical thinking is achieved through independent research, it becomes clear that independent education is an indispensable and most important part of the educational system.

In the process of independent education, the development of organizational skills of students is considered as one of the main conditions of educational efficiency, and according to the Law of the Republic of Uzbekistan "On Education" dated 23.02.2020 in its new edition in September, it was specified that "Independent education is carried out individually and serves the professional, intellectual, spiritual and cultural development of students" [1]. Because in the credit-module system, more than 60% of the entire education is allocated to independent education outside of a single classroom. Yes, of course, the availability of a large number of educational and scientific literature in almost all fields and the fact that these works of literature reach students without too much difficulty due to modern

opportunities make it worth spending more time on this type of education. However, through our research and pilot work, we have realized that the separation of classroom learning and out-of-classroom learning has led to and continues to reduce the focus on out-of-classroom learning and minimize the impact of self-directed learning on educational effectiveness.

In this case, the teacher takes the main responsibility (as in the traditional system) and tries to achieve certain efficiency by directly conveying the most important topics of the curriculum to the students in the audience. A set of topics of relatively less practical importance is given to independent education. This situation directly affects the psychology of students and leads to a sharp decrease in attention to independent education.

The bottom line is that by separating in-classroom and out-of-classroom learning, we reduce students' interest in independent learning. Therefore, only if one of the main goals of classroom education in the credit-module system is to prepare students for independent education outside the classroom, independent education becomes the main factor affecting educational efficiency and leads to a significant increase in educational efficiency in a modern educational environment with high access to innovative technologies. For this, we decided to look at independent education in a new philosophical interpretation and divide it into the following components:

1. Any information, information, question, or problematic situation that encourages students to actively think independently in the classroom is a component of independent learning and the first stage of preparation for independent learning outside the classroom. At this stage, the student dares to think independently and express his opinion about this subject.
2. Independent tasks are given to students in the auditorium, designed to be performed in a short time - as a component of independent education, the second stage of preparation for education outside the auditorium. At this stage, the student learns to independently solve the smallest problems of this subject.
3. Independent works intended for mastering in the short term, given to students in the form of homework - a component of independent education and the third part of preparation for independent education outside the auditorium - the last stage. At this stage, the student can independently strengthen the topic taught in the lecture hall, prepare slides, or independently master several new topics that are scientifically close to the topic taught in the lecture hall.
4. In the credit-module system, more than 60% of full-time education is "literally" independent education outside of the allocated classroom - the last and main component of independent education, of course [6].

As long as we first develop the first three components of self-study, our research has shown that self-study outside the classroom can have a positive impact on learning outcomes. For this, not the topics of less practical importance, but those that are relatively easier for students to learn independently, and the general essence of which is revealed as much as possible in classroom training it is completely reasonable to allocate topics for independent learning outside the classroom and to include questions in proportion to the volume of these topics in the final examinations. After all, control and its results serve as the main motivation for the student. From the teacher, work with higher responsibility and experience is required in this direction.

In today's developed era, many opportunities for independent education of students have been created through many platforms (for example, Hemis), search engines, and groups on telegram channels. However, in our research, we found that using a single-location site is effective for students to be able to learn independently and collaboratively with other students in a group while maintaining self-control. Surveys have shown that even with advanced features and redundant capabilities, learning platforms that do not meet the above basic requirements will be difficult to achieve. The simplicity of the interface of our web application, which helps us organize independent education through innovative technologies, also serves the effectiveness of the quality of education, which is reflected in questionnaires, questionnaires, and tests. Taking all of the above into account, we created a new educational web application called "Innovative Independent Learning Web Application" and implemented it into the educational process.

Therefore, in the organization of independent education in the credit-module system, the interaction of students and the ability of the teacher to control this process are considered important. At the same time, as in the case of the Hemis platform, practice tests are important so that the student can get basic information about a certain course from a specific location and, if necessary, independently check the level of mastery of each topic.

The program we created, which combines all the above tasks, is the reason why we call the program "Innovative independent education - web application". This online web application is mainly a convenient assistant for students to learn independently and control themselves. The absence of redundant sections in the web application, we think, allows the student to concentrate on acquiring the necessary knowledge without getting confused. Go to the application <http://mt-turayev.uz/admin/> through any web browser or search engine, and users designated as teachers by the creator of this site enter using their usernames and passwords. As a result, the following step of entering the Innovative independent education - web application will be launched [6].



Through the "View site" item, we as teachers, unlike students, had additional opportunities, such as adding subjects, editing or adding groups, and enriching optional subjects with information.

If a student accesses this web application, the following is the main information about the subjects taught in the student group and, through this, all the basic information about that subject: normative documents of the course, materials for each subject, as well as information posted by other students about these subjects. and the opinion of the rest of the students about it, and most importantly, we will have the opportunity to use the test on the topic [7].

The student assigned by the teacher through the <https://mt-turayev.uz> application enters his special name and password specified for this web application in the necessary lines and enters the above application by clicking the "Login" icon with the cursor. As a result, the following is included in the Innovative independent education - web application [7-8].

Thus, this web application opens the way for the effectiveness of students' independent learning by enabling interaction. In this case, it is certainly useful that the teacher does not leave the process unattended, but a little passive intervention in the process opens the way for students to exchange ideas more freely. This is especially reflected in practical training. That is, students solve problems related to the topic, present it to everyone, and worry less about getting it wrong. It was often observed that the teacher intervened in the main, substantive errors, and elementary errors were corrected by other students in the group.

We have used this Web application as additional support for mastering the subjects of independent education from the General Physics course for experimental testing in several higher educational institutions of the Republic. As a result, absorption efficiency has been significantly improved. Another advantage of this site is that the student can easily use the site and can do it even on his normal smartphone.

Experimental work was carried out in 2019-2022 in three stages (study stage, implementation stage, final stage). The number of students participating in the experiment (419) was determined, and they were divided into an experimental group (210) and a control group (209) was divided. At the end of the experiment, a test, written work, and a test laboratory work were conducted. 100 points to make it easy to calculate the results of tests, written works, and test laboratory work in experimental and control groups to demonstrate the effectiveness of drawing up projects of educational activities in the assessment of student knowledge, and to demonstrate the effectiveness of its application to the educational process. The rating system was transferred to a 5-grade system. The effectiveness of the proposed methodology in pedagogical research was justified by comparing the indicators recorded at the end of the experimental work.

**TABLE 1.** General results of the experimental work.

Participants of the experiment	Grades	Experimental groups				Control groups			
		Experience At the beginning of	%	Experience At the end of	%	Experience At the beginning of	%	Experience At the end of	%
All respondent's general results on	Excellent "5"	20	9	43	21	21	10	21	10
	Good "4"	88	42	123	58	84	40	100	48
	Satisfactory "3"	60	29	27	13	63	30	54	26
	You are not satisfied "2"	42	20	17	8	41	20	34	16
Total		210	100	210	100	209	100	209	100

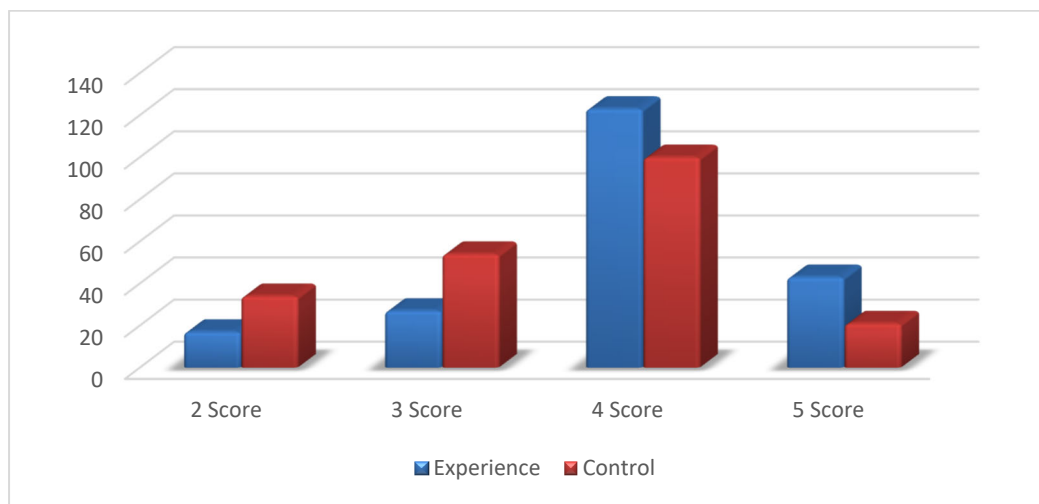
Based on mathematical-statistical methods of reanalysis of the results, the effectiveness of the research was evaluated by determining the difference between the results of the experimental and control groups of the students who participated in the experiment Oral, written, test, logic-observation questions, and computerized tasks were used to determine the effectiveness.

In the course of the experiment, independent education sessions were organized through pedagogical software tools, innovative technologies, and active use of "Innovative independent education - web application", and criteria for evaluating students' knowledge were developed.

The following results were obtained when evaluating the results of the students according to the formation of knowledge, skills, abilities independent analysis, and decision-making ability (see Table 1).

Organization of self-study classes for general physics in selected groups using innovative technologies, using the proposed methods, giving instructions to students based on this method, and using the methodological manual "Independent education in the credit-module system", "General physics (independent education in the credit-module system)" and the educational process of "Innovative independent education - web application" as a result of its introduction, the rate of students in experimental test groups achieved an excellent grade by 20.5% (10.5% more than the control groups), and the level of achievement by a good grade increased by 58.5% (10.5% more than the control groups) 6% more grew. Attainment to a "satisfactory" grade decreased by 12.9% (compared to 12.9% of control groups), while attainment to an "unsatisfactory" grade was 8.1% (compared to 8.2% of control groups). decreased to from this, it can be seen that the number of students with "satisfactory" and "unsatisfactory" grades in the experimental groups decreased compared to the control groups, while the number of students with "excellent" and "good" grades increased.

The results of the experiment and the mathematical statistical analysis based on these data showed that the effectiveness of the experimental groups was higher than the results of the control groups. The analysis of the final results of the student indicators obtained at the end of the experiment and the control group can be seen in the diagram below (see Fig. 2).



**FIGURE 2.** At the end of the experiment, the results of the generalized learning in the experimental and control groups.

The results of the experiment are summarized and analyzed based on the criterion of K. Pearson's  $\chi^2$  experimental and control groups (xi square) done. In this case,  $\bar{y}$  and  $\bar{y}$  are the arithmetic mean of mastery grades, M and N are the number of respondents,  $M_i$  and  $N_i$  are the group indicators, and  $m_i$  and  $n_i$  are the number of students corresponding to the indicator.

Average mastery rate:

$$\bar{x} = \frac{1}{M} \cdot \sum_{i=1}^4 M_i m_i = \frac{1}{210} \cdot [2 \cdot 17 + 3 \cdot 27 + 4 \cdot 123 + 5 \cdot 43] = \frac{822}{210} = 3.9143$$

$$\bar{y} = \frac{1}{N} \cdot \sum_{i=1}^4 N_i n_i = \frac{1}{209} \cdot [2 \cdot 34 + 3 \cdot 54 + 4 \cdot 100 + 5 \cdot 21] = \frac{735}{209} = 3.517$$

Efficiency indicator:

$$\eta = \frac{\bar{x}}{\bar{y}} = \frac{3.9143}{3.517} = 1.11297 \approx 1.113.$$

## CONCLUSION

From the statistical analysis of the results of the experiment, it was found that the efficiency of the experimental group was 11.3% higher than that of the control group. The results of the final stage of the pedagogical experiments (results at the end of the experiment and the control group) and their mathematical-statistical analysis proved that the effect of the use of innovative technologies on the effectiveness of education in the organization of independent education of students in the credit-module system is sufficiently positive.



Therefore, a person who meets modern requirements, who not only has modern knowledge, but also can independently analyze received information through his developed analytical and critical thinking, sorts and uses the selected information for the development of science, the development of the country, and the well-being of the people. as we plan to train competitive personnel in the labor market, with a responsible approach to the organization of independent education in higher education, in this process, the purposeful use of innovative technologies, online web applications, and, in general, innovative software tools in education gives a positive effect.

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