ORGANIZING INDEPENDENT EDUCATION IN THE CREDIT-MODULE SYSTEM USING INNOVATIVE TECHNOLOGIES

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Abstract:

In the article, it is stated that the effectiveness of education in the credit-module system depends on the correct organization of independent education of students, and specific recommendations are given on the use of innovative methods in this process, and the effectiveness of the methodology built on the basis of these recommendations is proven in special experiments. shown. In the independent education of students, although students move freely to master a certain program, it is very important for the teacher to provide students with information about the subject, to motivate students, and to control their activities.

Keywords: credit-module system, independent education, creative thinking, information age, labor market, competitive personnel.

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1. Introduction

Although sciences appear due to the real needs of mankind in their time, the evolution of sciences and the needs of mankind in the new era do not always develop in parallel. The experience of countries with developed educational systems has shown that the most important thing is that the knowledge we acquire is focused primarily on issues that are relevant for the current period. Therefore, changes in the education system, revision of state education standards and curricula according to modern needs, and necessary changes are a natural and very responsible process.

Considering that the basics of science are mainly taught in general secondary education, especially in higher education, these changes should be a frequent process in accordance with the times and new needs. It should not be excluded that these changes, if necessary, may be slightly different in each higher education institution based on the conditions of each region. In order to quickly adapt to these changes, it has already been proven in the world experience that each higher education institution should first of all be academically independent and organize education following the principles of the credit-module system of teaching.

2. Literature analysis and 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 weakened as a result of the presence of many subjects that had lost their importance in science programs and practices (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 soon after he abolished the university's strictly defined academic programs. As a result, students of the university have the opportunity to choose the subjects they 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 of the USA. Subjects in the university curriculum begin to be sorted naturally [1]. Subjects such as economy, labor market, which were of high practical importance in their time, are becoming the main subjects in educational programs.

Finally, by 1989, in Europe, based on the American credit system and the Dutch higher education system, a new credit-module system was developed, and it was called the European Credit Transfer System (ECTS) [1]. Appendix 1 of the 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 phased (based on ECTS) credit- the procedure for transfer to the module system will be introduced" [2].

Transitioning to the credit-module system, along with creating many opportunities and conveniences for the student, increases his personal responsibility. This can be understood from the fact that in the credit-module system, one independent study hour is 60% of full-time study hours at the bachelor's level, and 70% at the master's level [3]. So, this system is a system that focuses on independent education of students. Therefore, properly organized independent education in this system is the main factor that increases educational efficiency.

In the world, organization of the educational process through independent education (Simulations), wide application of forms of distance education (Moodle, Ilias, Dokeos, etc.), continuity of education in the conditions of information-educational environment (e-learning) and practical direction, development of creative abilities of learners, development of the process of innovative preparation for professional activity, improvement of the methodology of using educational software is of great importance. Harmonization with the levels of the international standard classification of education (ISCO) adopted by UNESCO, full implementation of the National qualification system in the educational process, innovative design of the educational content so that the trained personnel can take a decent place in the labor market, professional special attention is currently being paid to the division of competencies into components, the creation of new methodological models of education and their application in specific educational practices.

Independent education is one of the forms of education aimed at the knowledge that must be mastered by the student and the skills and competences that must be formed in the student. Based on recommendations, it is mainly performed outside the audience [3]. Independent education of the student under the guidance of the teacher (in course work, course project, thesis for conferences, preparation of articles, etc.) and without the guidance of the teacher (basically, the student independently reads the specified part of a certain course for mastering) is organized [5].

The main goals of independent education of students are as follows: student

- ○ to have the ability to master new knowledge independently;
- ○ to have the ability to search for the necessary information, identify convenient methods and tools for learning;

○ effective use of information sources and addresses;
○ work with educational and scientific literature, regulatory documents;
○ work with electronic educational literature and data bank;
○ effective use of the Internet;
○ analysis of the database;
○ determination of a rational solution to the assigned tasks;
○ systematic and creative approach to tasks;
○ able to obtain scientific information independently from educational and scientific literature;
○ must be able to perform practical tasks (independent work) given for independent performance in practical training and defend independent work between the responsible teacher and students of the group, etc. [7].
In most cases, students work independently, learn to self-manage, monitor and evaluate, which allows them to understand their own work, self-determine the level of knowledge and skills they have, and see their mistakes. and provides an opportunity to eliminate them [4].

Duties of the student in performing independent work.
● choosing the topic of the work based on the requirements of the department;
● timely completion of assignments based on a plan drawn up together with the scientific supervisor;
● submit an independent work and report to the department within the specified period according to the established procedure [5].
The final control is carried out by professors and teachers based on the schedule developed by the department in order to clarify the achievement of the goal set by the student's independent work, the degree of mastery of the subject. The types of supervision of students' independent work and their evaluation criteria are developed at the beginning of the academic year and approved by the scientific council of the faculty.

Summarizing the above, in the process of teaching concrete and natural sciences, at the level of "independent thinking" in each student, it is possible to distinguish the components of abilities (see Figure 1):

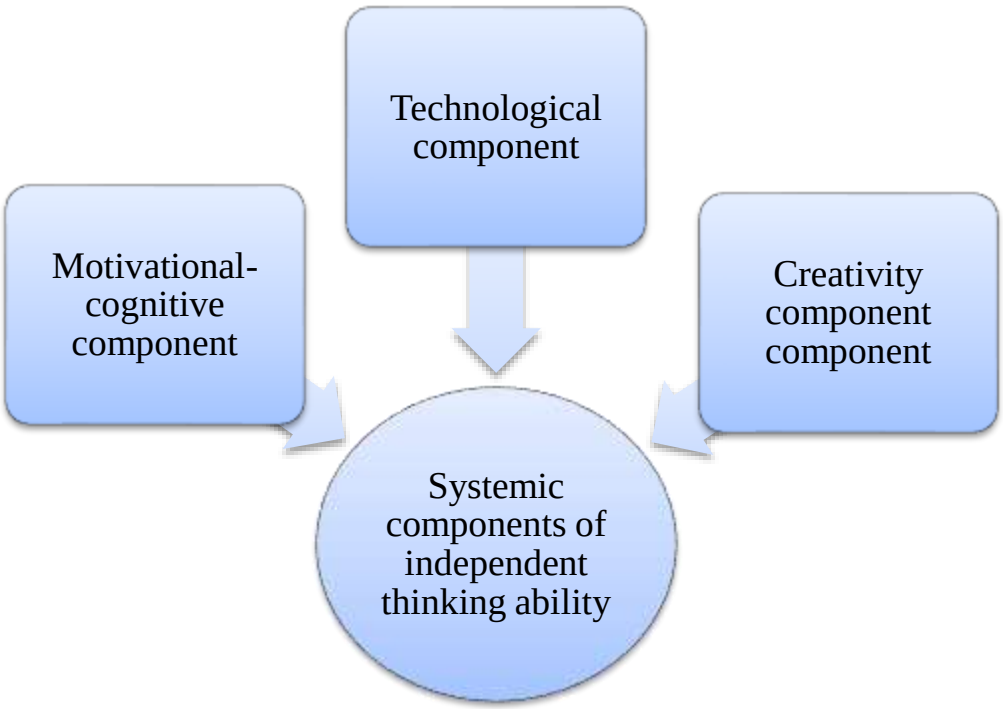

Figure 1. Systemic components of independent thinking ability.

I. Motivational-cognitive component, includes:
- interest in learning a specific subject;
- interest and inclination to technical training;
- professional goals in fields related to technology.
II. Technological component
- technical thinking;
- spatial imagination;
- technical observation.
III. Creativity component
- technical knowledge and skills;
- brainstorming.
It is impossible to fulfill the tasks set before modern education at the required level without improving the independent mastering of educational materials by students.
It is true that the reforms carried out in today's education system are aimed at developing students' independent thinking, eliminating problems that

hinder the growth of students' creative thinking ability and the formation of practical skills, but in the independent education of students it should not be forgotten that 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 adequately support the student in this process. For this purpose, in order to achieve efficiency in the independent education of the student without the guidance of the teacher, which is the most important for students, what specific documents and information the teacher should deliver to the student today, that is, the student who wants to master the subject independently. Let's talk about what should be in.

- First of all, the student must have a syllabus - a working study program of the subject designed for the student. Because a student should have a general idea about the subject, even if it is superficial, by knowing when, how long, and using what kind of literature he can master the specified subject. In addition, the syllabus will reflect everything from when and what controls will be held for this course, to when you can get advice from the teacher.

— Together with the list of used educational literature, at least the electronic format of the main literature should be presented to the student [9,12].

— A collection of Internet links - a digest, which is necessary for mastering this subject, should also be delivered by the teacher to the students.

- A brief explanation of terms in science - glossaries should be prepared by the teacher and given to the student. At the same time, it is desirable that the references of this type of information and, if necessary, their main ones be delivered to the student in electronic form.

— A set of assignments, i.e. exercises (for example, problems) is very important as it strengthens the student's theoretical knowledge and develops 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.

Forums are one of the best opportunities for students to exchange ideas about science. Nowadays, there are opportunities for students to learn a certain course well 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 by using mobile applications, which are now widespread in the world, etc. Assignments for independent work are given at the beginning of the semester and the deadline for their completion is set. Assignments for independent work should consist of two parts:

1. Mandatory part. It should consist of topics and sections of the course within the framework of the minimum knowledge that a student studying a certain course should know.
2. Optional part. In order for gifted students to improve their knowledge in this field, additional tasks and materials are provided for their independent study, of course, these are recommended in nature.

Based on the situation of the students in the group, the teacher can ensure the success of the students in mastering the specified part of the subject by dividing them into separate groups and allowing the students to choose topics and materials based on a certain order [6].

As the ratio of independent study hours to general-full-time study hours increases, it will not be possible for pedagogues to fully control students. But by teaching students self-control, we can dramatically improve the effectiveness of learning by eliminating one of the disadvantages of self-directed learning. For this, we need to ensure that the students have a strict, scientifically-based daily routine, and sports and health training as part of this daily routine. Regardless of the major, students must have the understanding and desire to practice sports in moderation, to the extent that they have a positive effect on the culture of rest, proper nutrition and activities.

In any case, the mental state of a student who follows a healthy lifestyle and regularly practices a certain type of sport is quite stable, and this student's self-confidence always helps him master the sciences and overcome difficulties. At the same time, it is necessary to create conditions for aesthetic relaxation of students [8,11].

Discussion. Based on the principles recommended above, we have created a single systematic method, and in selected groups of physics students of several higher educational institutions, through this method and in traditional forms, independent training sessions have been organized, research, that is, experience the test was carried out.

In the experimental groups, training was conducted with the help of mainly newly proposed methods of using innovative technologies, and in the control groups with traditional methods. The results of the experimental and control groups were evaluated using a 5-point rating system.

Experimental work was carried out at Bukhara Institute of Engineering and Technology, Navoi State Pedagogical Institute, Karshi State Pedagogical Institute with the participation of a total of 841 students (respondents) and 29 professors (see Table 1).

Table 1. The number of professors, teachers and students from higher education institutions who participated in the experimental work

№	Name of higher education institution (province where it is located)	Number of participants	
		Professor is a teacher	**Students**
1	Bukhara Institute of Engineering and Technology	11	299
2	Navoi State Pedagogical Institute	10	285
3	In opposite state pedagogic institutes	8	257
Total:		**29**	**841**

At the confirmatory and clarifying stage of the experimental work, the experimental work was completed and concluded. Tests, questionnaires, questionnaires, test-questionnaire samples, written works and laboratory exercises, conversation topics were developed, multiplied in the appropriate amount, and distributed to professors, teachers and students. The project of experimental training, the development of educational training, methodical recommendations were developed. On the basis of direct participation in the process and observations, recommendations were made to hold training sessions in control and experimental groups.

In higher educational institutions, training sessions were organized on the educational material prepared for the subject of "General Physics" and the obtained results were summarized. A final conclusion was drawn based on the mutual comparison of the indicators of the experimental work at the end of the experiment.

At the end of the experiment, a test, written work and a test laboratory work were conducted. In order to evaluate the students' knowledge, to create projects of educational activities, to demonstrate the effectiveness of its application to the educational process, control work carried out in experimental and control groups: for the convenience of calculating the results of tests, written works and test laboratory work The 100-point rating system was changed to a 5-point rating system.

During the experiment, independent educational sessions for mathematics students for the subject of "General Physics" were organized using innovative technologies and the criteria for evaluating students' knowledge were developed (Table 2).

Table 2. Criteria for evaluating students' knowledge in the process of organizing self-study classes in "General Physics" using innovative technologies using newly proposed methods

T/r	Rating levels	Classification of assessment
1.	**Reproductive**	The student has no idea about "General Physics" and did not fully understand the content of the subject; physical thinking ability is not developed and cannot express his opinion; makes mistakes in the use of formulas; misinterprets physics terms and concepts and does not understand the task.
2.	**Productive**	Has a partial idea of "General Physics", but does not fully understand the content of the subject; makes mistakes in the use of formulas when solving independent problems; can complete the given task with the help of the teacher; understands theoretical information, but cannot fully express his opinion; the teacher can solve this type of problem depending on the example he solved, but he cannot do it independently.
3.	**Partly sought after**	has an idea of "general physics" and knows the relevant concepts and terms; does not make mistakes in the use of formulas when solving medium-level problems and gets the desired result, but cannot get an independent result in problems that require additional logical thinking; understands theoretical information, can partially express his opinion; it is difficult to imagine the subject in harmony with natural phenomena, and to justify and explain it, but with the help of the teacher, he can draw correct conclusions and quickly correct even small mistakes.
4.	**Creative**	Has a complete understanding of the science of "General Physics" and knows the relevant concepts and terms;

		does not make mistakes in using formulas when solving problems and interpreting phenomena based on physical laws and obtains the desired result; understands theoretical information, can fully express his opinion; does not have difficulty in imagining and justifying and explaining the subject in harmony with natural phenomena; can apply the theoretical information given by the teacher in practice; relying on certain physical knowledge, he tries to independently analyze the properties of new physical phenomena and can defend his independent views on these phenomena.

At the beginning of the experiment, the results of 422 participants in the experimental groups and 419 participants in the control groups were analyzed based on the criterion of the closeness of the knowledge levels of higher education institutions.

We determined the formation of knowledge of "General Physics" of students in experimental groups according to the following indicators (see Table 3).

Table 3. Indicators of formation of knowledge of "General Physics" of students in experimental groups and their corresponding results

	INDICATORS of formation of knowledge of "General Physics" of students in experimental groups	**Result (% sense)**
1	Having mastered basic concepts of general physics	96
2	Knowing and being able to explain the formulas used within the topics	84,6
3	Being able to use the formulas used within the topics to solve problems while understanding their essence	76,3
4	Knowing and being able to explain the physical properties used within the topics	81,8
5	Being able to understand the essence of the physical properties used within the topics and be able to apply them in solving problems	74,5
6	To be able to apply the knowledge and concepts acquired in the subject of "General Physics" in solving some problems in other subjects	65,4
7	Relying on the knowledge and concepts acquired from general physics, to understand the principle of operation of the most important techniques and to be able to perform technical creativity in laboratory conditions	51,2

From the data presented in the above table, it is clear that students in experimental groups can use their existing knowledge in practice, can be creative by conducting analysis. This process is explained by the fact that students have a high potential, that certain knowledge of "General Physics" has been formed, that they have a high interest in science and that they conduct research to achieve results, and that they can do free and independent creativity.

The results of the final analysis of students' knowledge level were as follows (see Table 4).

Table 4. Results of students at the end of the experiment

Educational institutions	**Groups**	**Number of students**	**Grades**			
			"2"	**"3"**	**"4"**	**"5"**
Bukhara	Experience	152	14	21	89	28
	Control	147	20	39	72	16
Navoi	Experience	145	12	21	90	22
	Control	140	22	36	68	14
Kashkadarya	Experience	125	10	19	75	21
	Control	132	24	28	67	13
Total	Experience	**422**	**36**	**61**	**254**	**71**

	Control	**419**	**66**	**103**	**207**	**43**

Based on the above results, empirical values were checked and analyzed separately for each region. The diagram was created from the general results of tests and written assignments (see Table 4) in experimental and control groups formed from a total of 841 students (respondents) at the Bukhara Institute of Engineering and Technology, Navoi State Pedagogical Institute, Karshi State Pedagogical Institute, where the research work was carried out. (see Figure 2). Organization of independent educational sessions for the subject of "General Physics" in selected groups using innovative technologies, through newly proposed methods, as a result of giving instructions to students based on this method, the level of mastery of students in experimental-testing groups was excellent. 16.82% (6.56% more compared to control groups), and the mastery rate for good grades increased to 60.2% (10.8% more than control groups). Attainment to "satisfactory" grade decreased by 14.45% (compared to 10.13% of control groups), while attainment to "unsatisfactory" grade was 8.53% (compared to 7.22% of control groups). decreased to From this, it can be seen that the number of students who received "satisfactory" and "unsatisfactory" grades in the experimental groups decreased compared to the control groups, while the number of students who received "excellent" and "good" grades increased. Therefore, as a result of the use of innovative technologies in the teaching of "General Physics", in particular, in the organization of independent education, the activity and labor productivity of students increased. At the next stage, we will describe the results of the pedagogical experiment conducted in three regions (see Table 4) in a convenient way (see Figure 2). For this, we use the following two series of comparative analysis:

Experimental group $\begin{cases} m_i: & 2 & 3 & 4 & 5 \\ M_i: & 37 & 61 & 254 & 71 \end{cases}$

Control group $\begin{cases} n_i: & 2 & 3 & 4 & 5 \\ N_i: & 66 & 103 & 207 & 43 \end{cases}$

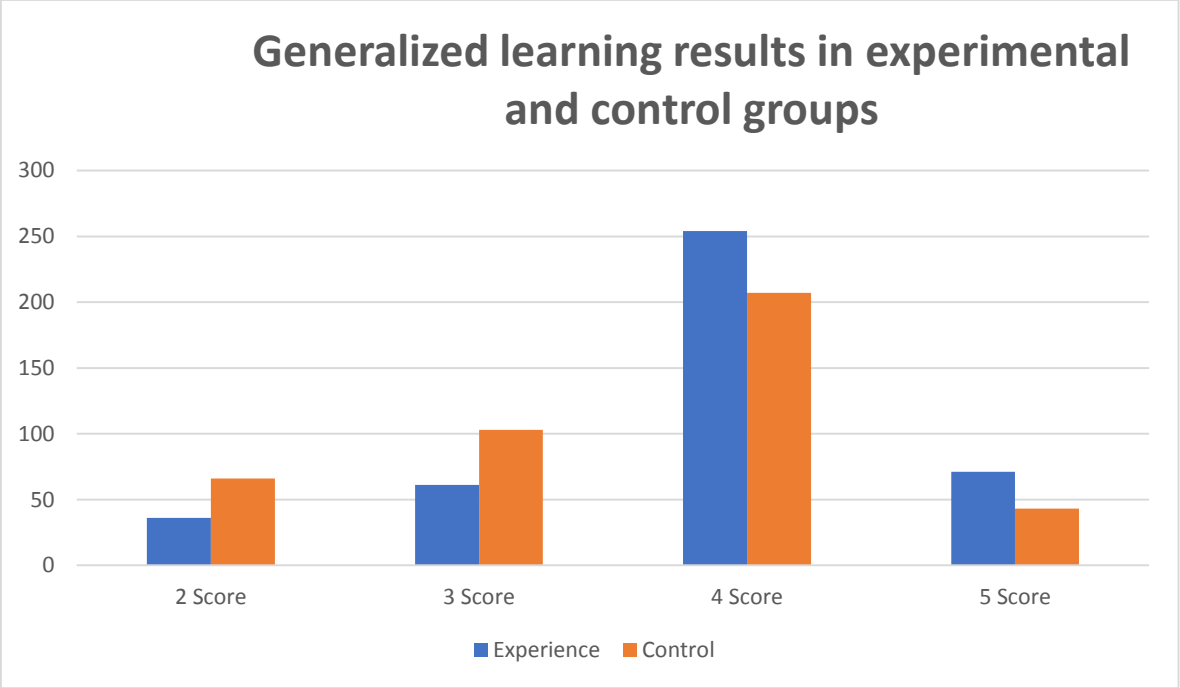

Figure 2. A diagram of the results of tests and written papers summarized in experimental and control groups formed from students of higher education institutions in the field of mathematics.

We calculate the general average learning indicators of the experimental and control groups:

$\bar{x} = \frac{1}{M} \cdot \sum_{i=1}^{4} m_i M_i = \frac{1}{422} \cdot [2 \cdot 36 + 3 \cdot 61 + 4 \cdot 254 + 5 \cdot 71] = \frac{1626}{422} = 3{,}853$

$\bar{y} = \frac{1}{N} \cdot \sum_{i=1}^{4} n_i N_i = \frac{1}{419} \cdot [2 \cdot 66 + 3 \cdot 103 + 4 \cdot 207 + 5 \cdot 43] = \frac{1484}{419} = 3{,}542$

It can be seen in this, $\bar{x} = 3{,}853 > 3{,}542 = \bar{y}$. So, the average acquisition in the experimental group is 8.1% higher than the average acquisition in the control group.

At the next stage, we will identify possible errors in the evaluation of students' knowledge. To do this, we first find statistical sample variances. For experimental groups:

$$S_x^2 = \frac{1}{\mathrm{N}} \cdot \sum_{\mathrm{i}=1}^{4} m_i^2 M_i - \bar{\mathrm{x}}^2$$
$$= \frac{1}{422}[2^2 \cdot 36 + 3^2 \cdot 61 + 4^2 \cdot 254 + 5^2 \cdot 71] - 3{,}853^2$$
$$= \frac{6532}{422} - 14{,}8456 = 0{,}6331$$

For control groups:

$$S_y^2 = \frac{1}{\mathrm{N}} \cdot \sum_{\mathrm{i}=1}^{4} n_i^2 N_i - \bar{\mathrm{y}}^2$$
$$= \frac{1}{419}[2^2 \cdot 66 + 3^2 \cdot 103 + 4^2 \cdot 207 + 5^2 \cdot 43] - 3{,}542^2$$
$$= \frac{5578}{419} - 12{,}5458 = 0{,}7669$$

Now we find the coefficients of variation for the experimental and control groups.

Coefficient of variation for experimental groups:

$$V_x = \frac{s_x}{\bar{\mathrm{x}}} \cdot 100\% = \frac{\sqrt{0{,}6331}}{3{,}853} \cdot 100\%$$
$$= \frac{0{,}795676}{3{,}853} \cdot 100\% \approx 20{,}7\%$$

Coefficient of variation for control groups:

$$V_y = \frac{s_y}{\bar{\mathrm{y}}} \cdot 100\% = \frac{\sqrt{0{,}7669}}{3{,}542} \cdot 100\%$$
$$= \frac{0{,}875728}{3{,}542} \cdot 100\% \approx 24{,}7\%$$

The coefficients of variation for the experimental and control groups did not exceed 30%. It can be seen that it was determined in the experiment $\bar{\mathrm{x}}$ and $\bar{\mathrm{y}}$ theoretical mean value (i.e a_x, a_y) fully covers. $\bar{\mathrm{x}} = a_x, \bar{\mathrm{y}} = a_y$.

It is known that the mathematical expectation of a random variable with given random x and y in case of dispersed normal distribution M_x and M_y The confidence interval for the estimate is determined based on the inequalities:

$$\bar{\mathrm{x}} - \frac{t_a \cdot S_x}{\sqrt{M}} \leq a_x = M_x \leq \bar{\mathrm{x}} + \frac{t_a \cdot S_x}{\sqrt{M}}$$
$$\bar{\mathrm{y}} - \frac{t_a \cdot S_y}{\sqrt{N}} \leq a_y = N_y \leq \bar{\mathrm{y}} + \frac{t_a \cdot S_y}{\sqrt{N}}$$

In this case, t is the confidence coefficient. We find the 95% confidence intervals of the theoretical mean using the standard method given below. γ- the reliability or confidence level of the estimate. Usually 0.9 as confidence level; 0.95; Either 0.99 or 0.999 is acceptable. In this experiment, we will use the value when g=0.95. Using the empirical (statistical) distribution function, we find the confidence coefficient t: $\Phi_0(t) = \frac{\gamma}{2}$, $\Phi_0(t) = \frac{0{,}95}{2}$, $\Phi_0(t) = 0{,}475$ and based on the table of values of the Laplace function $t_a = 1{,}96$ it follows that At the last stage, the coefficient of effectiveness is calculated based on the ratio of the average arithmetic values of the experimental and control groups (see Table 5).

Table 5. The general result of the analysis of experimental work conducted in selected higher education institutions

	Experimental group M=422				**Control group N=419**			
Grade value	2	3	4	5	2	3	4	5
Number of matching grades	36	61	254	71	66	103	207	43
Arithmetic mean value of grades	$\bar{\mathrm{x}} = 3{,}853$				$\bar{y} = 3{,}542$			
Efficiency coefficient	$\eta = \bar{\mathrm{x}}/\bar{y}$, η =1,088							
Confidence interval	$3{,}777 \leq a_x \leq 3{,}929$				$3{,}458 \leq a_y \leq 3{,}626$			

3. Conclusion

Based on the last table, according to the results obtained at the final stage of the experimental work, the chosen method proved to be effective. To encourage students to learn independently based on modern opportunities, to create conditions for them to freely organize this activity, at the same time not to leave this activity unsupervised,

if necessary, to develop students' independent thinking in lectures and practical training. conducting classes using educational methods, positively affecting the quality of education, most importantly, serving to form independent knowledge and research skills needed in the entire professional activity, and also practical in the conducted experimental work was shown.

Those who meet the requirements of the times, who not only have modern knowledge, but who can independently analyze, sort and sort the received information through their developed analytical and critical thinking for the development of science, the development of the country, and the well-being of the people, in the labor market. as we plan to train competitive personnel, we must use innovative technologies in this process, taking a responsible approach to organizing independent education in higher education. Independent education is also the

basis of one of the most convenient and effective methods of teaching - distance education, which is a modern opportunity and sometimes a modern necessity. Yes, "a good teacher conveys, explains, teaches a certain knowledge, a great teacher reveals the essence of this knowledge, and a great teacher inspires, motivates and guides students to master this knowledge. The phrase "shows" is more valuable, especially in the present era. Students should, first of all, use the opportunities created and provided by our government, learn the secrets of science from teachers, take their valuable advice, work on themselves and become competitive specialists in the labor market.

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