Integrative Model for Enhancing Students' Competencies and the Quality of Educational Services

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***Abstract*: The active introduction of digital technologies leaves its mark on all spheres of life, as well as on the modern education system, in particular, the need to improve the quality of educational services forces us to look for new teaching methods.**

The opportunities provided by modern science to the young generation of teachers, in close interconnection with the accumulated experience of traditional teaching systems, make it possible to significantly increase both the effectiveness and quality of training and the competence of students.

The rhythm and dynamics of modern life necessitate the search for new approaches to traditional paradigms in enlightenment. The capabilities of the digital age technologies make it possible to implement such training schemes that were simply impossible with traditional approaches.

A flexible approach and a modular structure allow you to quickly adapt any training course to any needs, adding and updating outdated information at no particular cost. Combined training systems fully realize all the advantages of distance learning, which can significantly expand the geographical and time frames, making any course truly universal.

Keywords* : *Competencies, Educational Services, Integrative Model, Quality, Student.

I. INTRODUCTION

From time immemorial, the process of transferring knowledge from teacher to student has been the main engine of development of human civilization. It was the learning process that made it possible to preserve and increase the knowledge accumulated by mankind. The primary learning process on a "from master to student" basis could often be unsystematic in nature, however, in those cases when the teacher nevertheless approached the issue systematically, over time, peculiar centers of one or another knowledge appeared that were transmitted from generation to generation.

Many of them have sunk into oblivion, while others have developed and flourished, and undoubtedly the key to their success was not only the presence of a "source" of this knowledge, but also a streamlined system for their transfer - an effective mechanism for training and improving the quality of educational services. In modern times, the development of a common information space, as well as the active introduction of digital technologies in all spheres of life, forces us to reconsider traditional approaches to learning.

Active use in the learning process of information technology, technical means, including telecommunication networks, providing the transmission of necessary information via communication channels, the use of multimedia materials for the transfer of educational material, all this led to the emergence of e-learning.

The appearance of the concept of e-learning itself became possible immediately with the widespread introduction of personal computers in everyday life. Initially, the use of e-learning was used only for individual training courses, but over time, this technique has found wide application in many educational processes, which undoubtedly improved the quality of educational programs. Undoubtedly, before introducing the electronic form of training in all training courses, one should ask about the appropriateness of such an act. In Fig.1 five theoretical questions are presented, the positive answers to which allow us to say that the electronic form of training will be an appropriate choice for which particular course.

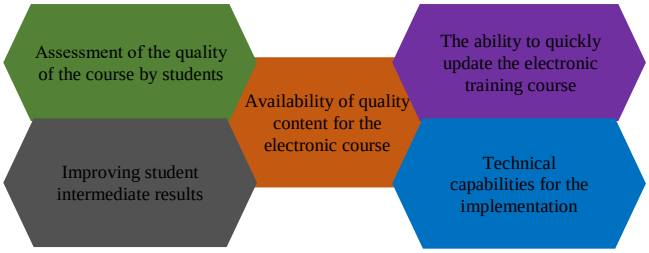

Fig. 1. Factors determining the appropriateness of the electronic form of education

Along with the advantages, purely e-learning has its drawbacks, among which it is worth noting:

1) There is no verbal interaction between the student and the teacher.
2) Students require more rigorous self-discipline when using the electronic form of training.
3) The availability of technical capabilities for continuous access to sources of training materials.

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4) Reducing the role of practical exercises and seminars necessary for the qualitative assimilation of educational material.
5) The inefficient use of the capabilities of multimedia materials may not improve, but rather reduce the quality of e-learning.

All this makes us think about alternative forms of the training system.

A system is needed that can take full advantage of e-learning, and at the same time greatly offset its negative factors.

II. METHODOLOGY

A. Description of the approach to a combined training system

The obvious advantages of the traditional training system can be combined with the advantages of electronic and distance forms of e-learning, as a result, the so-called - combined form of training will be obtained.

At the same time, it is undoubtedly important that the traditional education system is still relevant and quite effective, but with the introduction of a new combined system, the quality of the educational services provided can increase many times over.

The basic element of the combined training system is its electronic component shown in Fig. 2. This component of the combined training system often causes the maximum number of concerns among teachers. After all, it is traditionally believed that a lack of student competencies will not allow it to be used effectively.

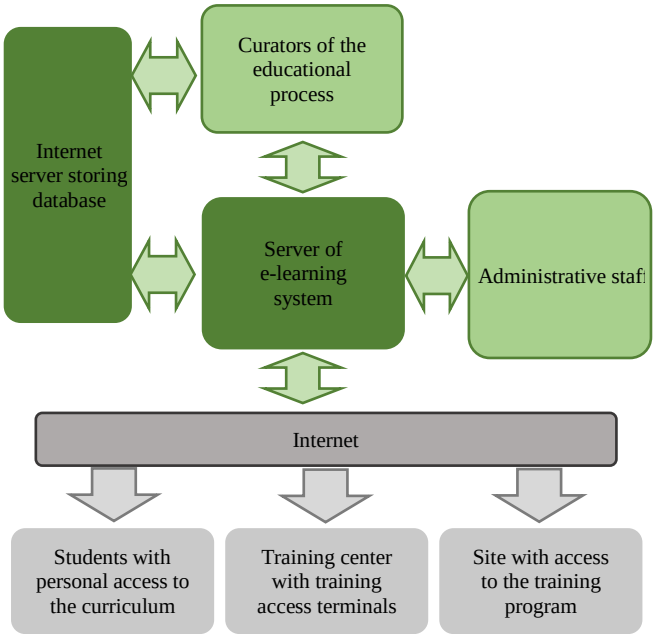

Fig. 2. The electronic component of the system of combined education

The electronic component of combined training, in addition to directly electronic training courses and manuals, also includes:

- standards and specifications for electronic educational materials and technologies, their development, control, implementation, testing and modernization;
- teaching materials for the teaching staff on the development and implementation of the system of combined education;

The distribution of functionality for working with an electronic component between various participants in a given system also determines a different level of access to components and functionality of the system itself:

1) access of curators and teaching staff to the electronic course system and database, both for the purpose of working with students (training, knowledge control, course management) and for working with the educational materials themselves (checking relevance, updating outdated information, transforming educational material);
2) access of administrative personnel, including system administrators and software engineers of the support department, for the purpose of working with the software component (software update, repair and replacement of technical media, search and correction of errors in the code);
3) students' access from personal computers or from a specialized training center, basic access to educational materials for the purpose of working on them (material study, self-knowledge testing);
4) global and remote access from the school's website, this option may include two different levels, one will provide remote access for students without technical ability to install specialized course software on a personal computer, the second level is open access to part of the material through specialized sections site.

A variant of this scheme assumes that each link in the system can operate independently (or with minimal dependence) from each other. The implementation of training using such a scheme allows you to scale this system to the needs of almost any educational process, increasing the quality of educational services provided, from small trainings to a full-scale university course.

B. The methodology of building a system of combined learning

The basis of the system of combined education, as already stated above, is the principle of synergy of traditional and electronic forms of education. The mutual integration of these systems is supposed to be extremely close, while the basis will be the alternation of traditional lectures using interactive material, the student's independent work with the course materials, and also work in a specialized training center under the supervision of a curator. At the same time, the combined training system itself is also aimed at developing students' competencies, because even for effective work with it, the student himself must possess skills that will only increase with regular work with the training course.

This approach allows you to get the maximum effect from the teacher's direct communication with students, that is, eliminate the peculiarity of a purely electronic form of learning - the isolation of students. In addition, this approach leaves students with a lot of opportunities to work with learning materials at a convenient pace for them, while increasing their personal competencies through self-learning and development.

A key feature of this approach is additional control by teachers by assigning electronic tests conducted both according to the schedule and unscheduled, which will increase control and increase the quality of educational services provided. This feature allows you to keep students in an additional tone, and eliminates the problem with the necessary increased self-discipline characteristic of an exclusively electronic form of training.

In general, the operation scheme of the combined system is presented in Fig. 3.

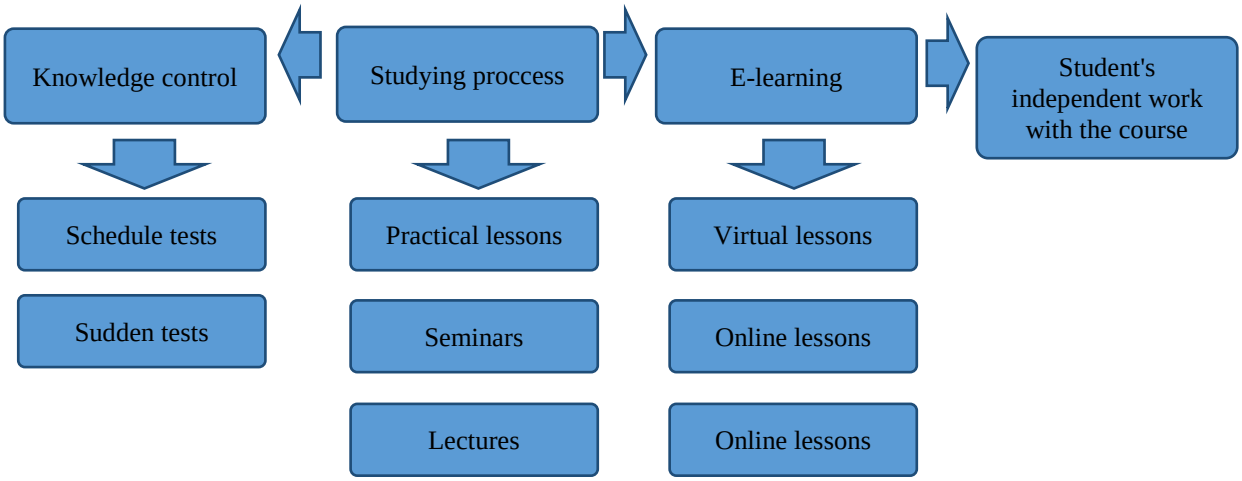

Fig. 3.The scheme of the components of the educational process in combined learning

It is no coincidence that all four main components of the combined system are brought to the same level, I want to emphasize that, unlike the traditional and electronic forms of training, in the combined system there should be no distortions of one of the components to the detriment of the other. It is the observance of this principle of balancing that will allow avoiding the basic problems inherent in each of the systems separately.

Additional components introduced into the educational process of the electronic component of the combined system will be some new approaches to traditional educational tools:

1) E-learning community - groups of students and teachers of the same course, or simply with similar educational interests create a virtual chat to consolidate the knowledge and ideas that arise during the educational process. This tool allows you to both participate in the discussion and serve as a repository of accumulated knowledge by the training group. Each member of the learning community can supplement the system with their own materials, so the system is modernized and expanded. Such an approach will contribute to the development of the necessary competencies of students, increasing their skills and abilities.
2) Virtual audience - the use of a website or computers of a specialized training center, allows you to implement the so-called virtual audience. In this case, the Internet is a means of communication between geographically separated students and teachers. Thus, a virtual audience makes possible a synchronous form of learning, and fully realizes the benefits of distance e-learning, which will increase the quality of educational services for students studying remotely.
3) Web-based training group - this tool involves the joint educational work of a group of students online, under the supervision of teachers. As a work, a joint project implemented by the group can be selected. Students are provided with a variety of tools for remote access to a common knowledge base. Self-development and mutual assistance is one of the key features of this tool. Working with this technique, students will strive to develop their competencies and improve group work skills. This technique is also applicable as a compensation mechanism for reducing the share of practical classes for students engaged exclusively in distance learning.

The construction of the educational process itself is based on the principle of “Three equal parts” - the study time is distributed evenly between the three phases:

- Teaching in the presence phase - teachers give traditional lectures and seminars, but their capabilities are enhanced by using multimedia modules to implement the study. Students are provided with relevant information and training material. It should be noted that since this training event is temporally and spatially dependent, for those students who study remotely, it is necessary to organize video broadcasting.
- Distance electronic courses - this part of the study involves working on the training material online. At the same time, the lessons are accompanied by a teacher, and practical classes can be implemented interactively based on web technologies. The training is independent of spatial distribution and time, which increases the possibility of its application for other more traditional approaches.
- Independent study of the material of the training course - in this case, the students are not accompanied by the teacher and independently in the group or individually work with the educational material. In this case, despite the seemingly easier form of study for the student, it will nevertheless require more effort from the student.

Necessary competencies, such as self-control and internal discipline will be constantly developed, provided the student works. At the same time, independent study is monitored through periodic testing to prevent gaps in the knowledge gained.

The second and third stages of the combined training scheme involve the active use of additional tools described above. It is their active use that allows students to avoid psychological problems associated with apparent isolation and lack of involvement in the educational process, while teaching methods are primarily aimed at developing the respective competencies of students, which in general will positively affect the entire educational process.

C. Approaches to assessing the effectiveness of a combined training system

The introduction of the combined teaching methodology naturally requires an assessment of its effectiveness, because the introduction of a new approach alone does not guarantee an increase in the quality of the educational process.

First of all, it is worth noting that one of the ways to check the effectiveness of the methodology is to compare the results of testing students undergoing similar training courses using the traditional and the new combined system.

With a sufficiently representative sample of test results, there should be a noticeable improvement in the quality of the test results, if the applied technique is effective.

In general, the educational process can be represented in the form of a mathematical formula:

$$S_{proc} = M_{motiv} + E_{compet} + Q_{es} \quad (1)$$

where M_{motiv} is the motivation for learning;

E_{compet} - students' competencies;

Q_{es} - quality of educational services.

According to the formula, it can be seen that the learning process becomes effective only if the student has enough motivation to learn the necessary knowledge, and also independently performs the training activity that is adequate to the learning goal, and finally, this activity is controlled externally by methods that guarantee a given quality of education.

When assessing, one should also take into account factors that undoubtedly provide the combined training system with a clear positive color:

Combined training using an adapted distance learning program allows you to include the educational process for those categories of students who, due to time or geographical restrictions, are not able to study according to the traditional curriculum.

This scheme has the prerequisites to become economically more profitable, due to the reduction in the share of time spent by the teacher in comparison with the traditional teaching scheme. In addition, despite the costs of creating an electronic component, it should be noted that its construction is able to reduce the cost of using existing infrastructure.

Combining training allows students to adjust the pace and rhythm of learning, depending on personal performance. Moreover, in the traditional form of training, this prerogative applied to teachers.

Combined training allows you to improve the quality of educational services due to the benefits provided by information technology. Expanding the variability of the forms of teaching material, while maintaining the personal control of the teacher over the process of studying it, makes it possible to add and multiply the advantages of traditional and electronic forms of training.

The teaching staff is more actively involved in the management of the curriculum, more responsibility is assigned to them, but at the same time they have more opportunities for updating and modifying the teaching material.

Combined learning gives learners potentially equal learning opportunities. It reduces the personal impact of the quality of teaching of a particular teacher, and allows students to independently work with educational material.

Students with a combined form of education are more motivated to develop personal skills and competencies, such as self-control, motivation, time management, research activities. At the same time, sufficient control on the part of teachers over the course of the learning process remains.

Undoubtedly, the main result of training should be an increase in the volume of knowledge in the studied subject after the learning process, a system of tests or exams is traditionally used to evaluate it.

A combined training system is characterized by the use of an electronic form of testing, this allows us to evaluate the results more quickly, even during the educational process, and to adjust the course of the educational process based on the assessment.

Assessment of the growth of knowledge can be estimated by increasing the number of correctly completed tasks, for this you can use the formula:

$$T_{total} = \frac{1}{m}\sum_{i=1}^{m} t_i \quad (2)$$

where T_{total} is the average number of correctly completed tasks, m is the number of students in the group,

t_i is the score of the i-th students.

Assessment of satisfaction with training - based on a survey of students and teachers after completing the course. This will allow us to assess the overall satisfaction with the educational process, as well as identify problem areas in the learning process. In addition, the questions of the questionnaire will be aimed at identifying the development of personal competencies of each student. Questioning both students and teachers allows you to look at possible problems from different points of view. Each questionnaire evaluates satisfaction with the training on a 4-point scale. The following is a calculation of satisfaction according to the formula:

$$L_{quality} = \frac{\sum_{i=1}^{n} V_i}{V \times n} \quad (3)$$

III. EXPERIMENT

The experiment on the introduction of the combined system was carried out in an educational institution, in which some of the methods of

e-learning were already involved. In particular, computer classes were created in educational institutions in which it was possible for students to work with multimedia materials, other tools specific to the combined training system were also actively used.

To control the implementation results, five study groups of 20 students were selected, two of which were transferred to the traditional form of training, completely excluding the electronic components of their learning process. At the same time, in these control groups, students were not forbidden to use electronic teaching aids on their own, but as further practice showed, their motivation to use decreased significantly

Three groups were trained according to a combined training system, among them joint projects were implemented and "Web-based training groups" were created, as well as during the training, students took the initiative and created electronic communities of interest. Upon the creation of such communities, teachers joined as mentors and curators. Each of the curators of the groups noted the fact that students clearly demonstrated the development of personal competencies, based on the results of work in the group.

The measurement of the increment of knowledge was carried out in two stages before and after the learning process. The level of knowledge was determined by testing including 20 tasks. The characteristic of the student in this case is the number of correctly solved problems. The results of measuring the level of knowledge in groups with traditional and combined training before and after the experiment are shown in Table 1.

Table- I: The results of knowledge control in groups with traditional and combined forms of learning

Number of correctly solved problems before learning course					Number of correctly solved problems after learning course				
Traditional system		Combined system			Traditional system		Combined system		
Study group 1	Study group 2	Study group 1	Study group 2	Study group 3	Study group 1	Study group 2	Study group 1	Study group 2	Study group 3
13	8	16	15	15	14	5	14	13	13
5	17	9	17	18	4	18	11	20	19
18	17	20	6	15	16	18	23	7	13
8	9	18	17	7	8	12	17	20	6
14	8	9	20	12	16	6	7	18	11
14	9	20	9	8	12	12	22	7	7
16	12	14	14	6	13	15	17	14	5
7	14	12	13	11	7	16	21	15	13
19	20	8	12	8	21	23	6	14	6
18	5	15	7	18	17	4	16	8	19
7	12	20	13	18	8	9	23	12	18
17	14	7	20	16	17	11	7	23	18
13	20	11	17	14	14	21	14	15	15
14	6	8	19	16	12	6	10	22	16
16	15	16	18	18	15	17	17	17	21
11	10	11	14	18	10	9	11	15	20
15	19	9	13	14	15	17	12	16	14
12	13	14	9	14	14	10	14	9	13
6	10	16	20	14	8	7	15	20	12
15	13	17	16	11	15	10	18	17	13

After the end of the educational process, a survey of students and teachers was conducted, the questions were divided into three blocks:

1) general satisfaction with the course;
2) assessment of the quality of training;

3) the presence of technical problems;

The results of the survey were processed and presented in the form of graphs (Fig. 4-5).

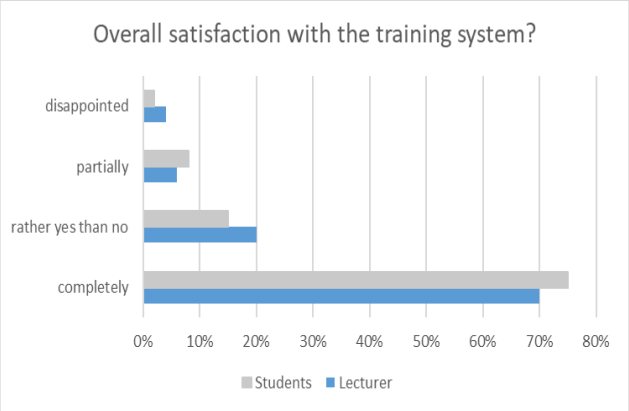

Fig. 4. Survey results for the block "Overall satisfaction with the course"

Figure 4 shows the total result for a block of questions related to overall satisfaction with the course, questions for students and teachers were similar and their task was to highlight how this form of training is suitable for teachers and convenient for students themselves. The result indicates a general satisfaction of both.

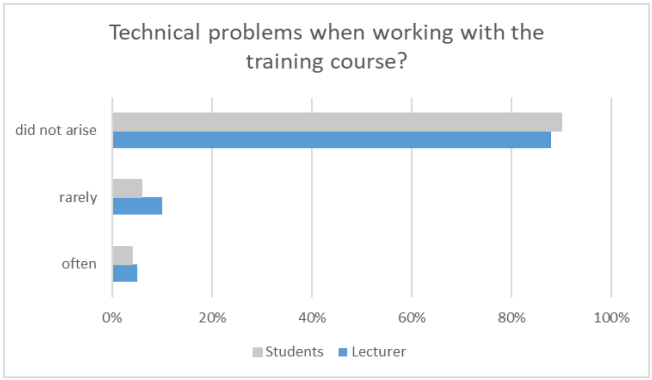

Fig. 5. Survey results for the block "Assessment of the quality of training"

Blocks with questions on the general assessment of the knowledge gained are presented in fig.5. In this graph you can see that the assessment of the knowledge gained by students, from the point of view of the teachers, was higher than that of the students themselves. This can be explained by the initial skepticism of the teachers themselves to the new training system. According to the test results, you can see that their skepticism has dissipated.

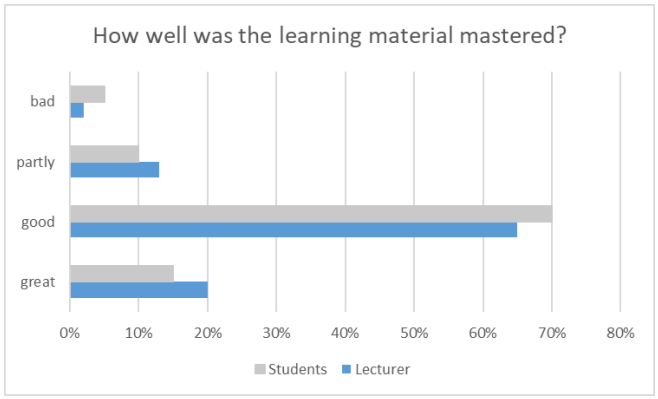

Fig. 6. Survey results for the block "Technical problems with the training course "

The block with technical questions is presented in Fig.6. Here there were detailed polls to identify technical difficulties encountered during the course, the results showed that teachers faced them more often than the students themselves.

IV. RESULT AND DISCUSSION

Based on the results of the tests, three levels of knowledge were determined: satisfactory (the number of solved problems is less than or equal to 12), good (the number of solved problems is strictly greater than 12, but less than or equal to 15) and high (the number of solved problems is strictly greater than 15) - they are presented in table

After that, the results were aggregated to the previously selected levels, characterized by frequency. For example, on the basis of the data in table 1, for traditional groups, before the start of the experiment, the number of its members who received a score belonging to one or another range: m1 = 15 (that is, 15 students of the control group before the experiment showed a satisfactory level of the competency under consideration formed), m2 = 5, m3 = 8. The results are presented in Table 2.

Table- II: Consolidated knowledge measurement results

	Before learning course					After learning course				
	Traditional system		Combined system			Traditional system		Combined system		
Knowledge level	Study group 1	Study group 2	Study group 1	Study group 2	Study group 3	Study group 1	Study group 2	Study group 1	Study group 2	Study group 3
Satisfactory	7	10	9	5	7	8	12	7	5	6
Good	7	5	3	6	6	7	1	4	6	7
Great	6	5	8	9	7	5	7	9	9	7

In order to quantify the results, the average number of correctly completed assignments was calculated for all groups trained in the traditional and combined forms after the

end of the training course. Using the formulas presented above, the following results were obtained:

For groups with traditional training
T_{total} 1 = 12,8; T_{total} 2 = 12,3,

For groups trained in the combined system
T_{total} 1 = 14,75; T_{total} 2 = 15,1; T_{total} 2 = 13,6,

Thus, the experiment showed that the average number of correctly completed tasks of the final test by students in groups with a combined system is 2.6 more than in the control, and the spread in the number of correctly completed tasks in general is 1.7 less than in the control.
The use of the combined teaching methodology increased the level of knowledge by 20% and reduces the spread in the number of correctly completed tasks by 35%.
Moreover, the survey results showed that 75% of students and 70% are fully satisfied with the combined teaching methodology. In addition, 15% of students and 20% of teachers, along with satisfaction with the training course, proposed a number of improvements based on the results of training. An analysis of questionnaires also showed that students in groups with a combined learning system sought to develop personal competencies. They have a more attentive approach to the educational process itself, in particular, students from the combined groups were interested in improving the quality of educational services in general, it is also worth noting that these students worked more effectively in teams and began to participate more actively in discussions and discussions.

V. CONCLUSION

In situations where the traditional system of obtaining knowledge is not effective enough, and the transition to a fully electronic form of training seems insufficiently justified, a combined training system comes to the rescue. It is important to understand that the effectiveness of this system will primarily depend on the involvement of the teachers themselves and the motivation of students.

The combined training system shows excellent results if there is an appropriate technical base, while adapting traditional teaching materials, and the use of modern multimedia means of presenting information significantly improves the assimilation of the material and improves the quality of the educational services provided.
A special point should be noted is the explicit development of personal competencies of each of the students undergoing training in a combined system, they demonstrated the development of teamwork skills, showed an increase in the ability to conduct a constructive dialogue, and participate in discussion of problems not as passive observers.

It should be noted that the traditional fears associated with a decrease in the effectiveness of the electronic components of the training system due to a lack of technical knowledge and skills are increasingly losing relevance in modern conditions. On the contrary, the ability of students to effectively use modern computer technology more and more motivates teachers themselves to use information technology in the educational process.

At the same time, the combined training system retains all the advantages of personal communication between teachers and students, which are characteristic of the traditional education system, which allows to increase students' competencies and the quality of educational services.

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