



## The Effectiveness of Blended Education in Educational Institutions

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### ABSTRACT

Digital educational resources, as the most crucial element of blended learning, enable the organization of non-linear development of learning materials, taking into account students' characteristics. The role and significance of modern teaching methods - interactive approaches and innovative technologies - in the educational process is immeasurable. To determine the level of development of students' pedagogical competence through the implementation of a blended learning system in the educational process, 66 students were involved in the experimental field. Of these, 34 participated in the experimental group and 32 in the control group. Various methods of knowledge assessment were employed in the experimental work: questionnaires, interviews, discussions, and tests.

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## 1. INTRODUCTION

The problem of choosing the most effective innovative methods and technologies in the modern education system remains relevant. Innovative methods are methods based on the use of modern achievements in science and information technology (Salomova, 2020a). Innovative methods are primarily aimed at optimizing the educational process, creating the most favorable conditions for mastering educational material, which ultimately serves to improve the quality of education. The introduction of innovative technologies into the educational process has led to the emergence of a blended learning format for teachers and students. Innovative technologies are the introduction of innovations and changes into the pedagogical process and the activities of teachers and students, and their implementation primarily utilizes interactive methods. Interactive methods are called collective thinking, that is, methods of pedagogical influence are an integral part of the content of education (salomova, 2021; salomova, 2020b). Blended learning is designed to help address the shortcomings of technologies used in teaching practice today. With full-time classroom instruction, it is not always possible, first and foremost, to implement the requirement to involve each student in the educational process. Secondly, the time frame of the lesson does not allow many to achieve the necessary depth of understanding of the issues being discussed, which does not allow for the implementation of the flexibility requirement in the learning process (Salomova, 2020b).

The advantages of blended learning include personal connections formed in the classroom, allowing for faster acquisition of new knowledge, and shaping the individuality, flexibility, and interactivity of learning in the information and educational environment for e-learning (Salomova, 2021; Karshiey, 2020). Flexibility in blended learning means that it is not constrained by rigid boundaries of time and place, lesson, and school and that the pace and rhythm of learning are not dependent on the work speed and rhythm of other students in the classroom. Blended learning ensures 100% student engagement in the learning process. Flexibility is implemented as an opportunity to organize the educational process for students with diverse abilities and needs. While individualization is achieved by structuring the educational process based on student's individual learning needs and capabilities, the methodological approaches and pedagogical technologies used by the teacher in the lesson are complemented by interactive educational tools and adapted software. Today, blended learning enables the resolution of new challenges in the field of education. It expands students' educational opportunities by enhancing the availability and flexibility of learning, taking into account their learning needs as well as the pace and rhythm of learning the material (Jabbor *et al.*, 2024). It changes the teacher's style, helping the learner transition from knowledge transfer to interactive interactions with the learner, and contributing to the construction of their knowledge (Khimmataliyev & Burieva, 2024; Andreev, 2004)). Researchers believe that blended learning is not a completely new phenomenon, but a logical, consistent development of traditional forms in a changing environment (see **Table 1**).

Based on **Table 1**, analysis of various interpretations, we propose considering blended learning as a form of teaching organization. Analysis of the literature shows that scientists and researchers describe the blended learning model in different ways. Researchers in blended learning offer various models and approaches to its implementation in the educational process. The essence of the blended learning concept lies in coordinating traditional and electronic learning formats and providing technical support. We believe that the main goal of blended learning is to try to combine the benefits of traditional education and e-learning. In the blended learning model, the electronic component is a logical continuation of the traditional classroom component, and conversely, the electronic

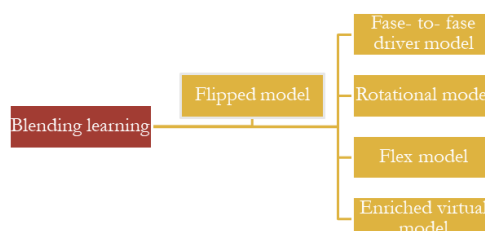
component of blended learning activates the educational process through the systematic and continuous use of information and communication technologies, which contributes to the development of the ability to consciously and independently carry out and manage educational activities, activate interaction between participants in the educational process, and create a unified learning society. The knowledge acquired independently in the lesson is systematized, analyzed, and creatively applied in practice.

**Table 1.** Previous research.

Description	References
More effective use of blended learning technology with the benefits of full-time and e-learning	<a href="#">Khimmatiev et al. (2023)</a>
Fixed components of blended learning	<a href="#">Андреева (2016)</a>
Experience in using blended learning technologies in a foreign language	<a href="#">Крылова (2020)</a>
Blended learning is a system of traditional learning that combines full-time, distance learning, and independent learning.	<a href="#">Нагаева (2016)</a>
Successful blended learning development	<a href="#">Орешкина (2014)</a>
The origins of blended learning	<a href="#">Ashurova (2021)</a>

## 2. LITERATURE REVIEW

The term "blended learning" has existed as a pedagogical category since the end of the last century. Blended learning is a system of learning that combines traditional full-time, distance, and independent learning, encompassing the interaction of teachers, learners, and interactive information sources, reflecting all components inherent in the learning process (purpose, content, methods, organizational forms, and means of learning), which are constantly interconnected and constitute a whole ([Ashurova, 2021](#)). The research blended learning models are presented below (**Figure 1**).



**Figure 1.** Blended learning models.

### 2.1. Flipped model

In the flipped model, traditional classroom instruction is inverted. Learners first encounter the instructional content outside of class, typically through video lectures, readings, or online modules. Then, in-class time is dedicated to active learning activities, discussions, group projects, and exercises that reinforce and apply the pre-learned material. The flipped model allows for more personalized and interactive learning during face-to-face sessions and provides students with the flexibility to learn at their own pace.

### 2.2. Face-to-face driver model

The face-to-face driver blended learning model is the closest to traditional classroom training, as most of the training takes place in a classroom setting under the guidance of an instructor. This approach offers individual, personalized support to learners who are struggling to grasp the new concepts or are falling behind the training curriculum.

### 2.3. Rotational model

In the rotational model, learners rotate between different learning modalities, such as face-to-face instruction, online activities, small-group discussions, and independent study. These rotations can be on a fixed schedule (e.g., daily or weekly) or based on learners' progress. It offers flexibility and caters to various learning styles, allowing employees to work in the modality that best suits their needs at a particular time.

### 2.4. Flex model

The flex model provides learners with significant autonomy and control over their learning path. It combines online learning with in-person support as needed. Using an adaptive learning platform, learners have the flexibility to choose when and where they access online content and resources, making it suitable for self-paced learning. Instructors are available to assist learners when required, helping them navigate through the material and address any challenges.

### 2.5. Enriched virtual model

The enriched virtual model is primarily an online learning experience with periodic face-to-face sessions. Most of the learning occurs in a virtual environment, but learners attend physical classes, or workshops at designated times for hands-on activities, assessments, or collaborative projects. This model combines the flexibility of online learning with the benefits of in-person interaction, ensuring learners receive both individualized instruction and opportunities for group engagement.

## 3. METHODS

To determine the effectiveness of the experimental work, respondents were assigned to the experimental and control groups. In the experimental group, practical activities were conducted based on methods and pedagogical technologies that help analyze the theoretical foundations of the methodology for preparing students for innovative activity in a blended learning environment, and educational and practical work was conducted in the control groups according to the traditional order. Sixty-six students participated in the experimental work. Of these, 34 participated in the experimental group and 32 in the control group. Various methods of knowledge diagnosis were used in the experimental work: questionnaires, interviews, conversations, and tests. The results of the control and experimental groups were systematically analyzed, and comparative conclusions were drawn.

## 4. RESULTS AND DISCUSSION

During the experimental work, the levels of development of students' pedagogical competence through the introduction of a blended learning system in the process of higher education were determined based on established criteria and levels. Then, all the results were summarized and subjected to mathematical and statistical analysis. The levels of indicators for the development of pedagogical competence among students during the experiment, as well as the introduction of a blended learning system, are presented in **Tables 2-3** and **Figures 2-3**.

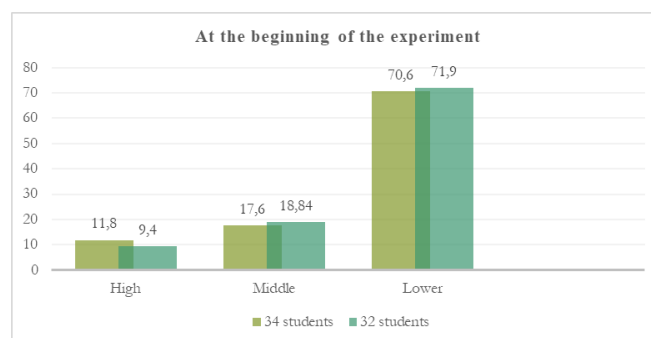
As a result of the introduction of a blended learning system, the level of development of students' pedagogical competence was 11.8% higher at the beginning of the experiment and 20.6% higher at the end of the experiment. The average level increased from 17.6% at the

beginning of the experiment to 47.1% at the end of the experiment, while the low level decreased from 70.6% to 32.4%.

The level of development of the pedagogical competence of students in the control group at the beginning of the experiment was 9.4%, and at the end of the experiment, it was 12.1%. The average level increased from 18.8% at the beginning of the experiment to 24.2% at the end of the experiment, while the low level decreased from 71.9% to 63.6%.

**Table 2.** Indicators of the level of development of students' pedagogical competence at the beginning of the experiment.

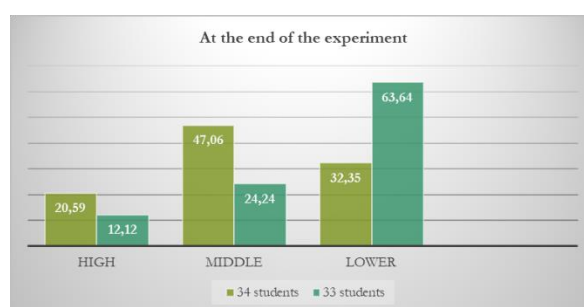
The level of development of students' pedagogical competence	Experimental group		Control group	
	34 students participated in the experiment		32 students participated in the experiment	
	number	%	number	%
High	4	11.76	3	9.38
Middle	6	17.65	6	18.75
Lower	24	70.59	23	63.64
<b>Total</b>	<b>34</b>	<b>100</b>	<b>32</b>	<b>100</b>



**Figure 3.** Indicators of the level of development of students' pedagogical competence at the beginning of the experiment.

**Table 3.** Results of pedagogical experimental work.

The level of development of students' pedagogical competence	Experimental group		Control group	
	At the end of the experiment, 34 students		At the end of the experiment, 33 students	
	number	%	number	%
High	7	20.59	4	12.12
Middle	16	47.06	8	24.24
Lower	11	32.35	21	63.64
<b>Total</b>	<b>34</b>	<b>100</b>	<b>33</b>	<b>100</b>



**Figure 4.** Results of pedagogical experimental work.

## 5. CONCLUSION

The use of blended learning technology ensures students' active participation in the learning process and the rational use of class time. The interactivity of education increases, and working with a large number of real electronic resources positively impacts the learning process. Thus, in the system of continuous education, blended learning is now effective for both learners and teachers, allowing for a reduction in class hours for in-depth study of problematic issues. The results of the conducted experimental work show that the level of development of the implementation of a blended education system is 1.114 times higher than in the control groups, that is, it is 11% higher.

## 6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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