STATION ROTATION MODEL OF BLENDED LEARNING IN HIGHER EDUCATION: ACHIEVING A BALANCE BETWEEN ONLINE AND IN-PERSON INSTRUCTION

MODELO DE ROTAÇÃO DE ESTAÇÕES DE APRENDIZAGEM EM BANDA NO ENSINO SUPERIOR: ALCANÇAR UM EQUILÍBRIO ENTRE O ENSINO EM LINHA E PRESENCIAL

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ABSTRACT

The purpose of the article is to empirically test the effectiveness of the model of teaching with rotating stations in a mixed format on the basis of a survey conducted among teachers of higher education institutions in Ukraine. The study uses a mixed-methodology approach to collect qualitative and quantitative data from 65 teachers during the first semester of the 2023-2024 academic year. The main instruments are questionnaires and interviews among teachers who have used the Station Rotation Model. The responses were processed using descriptive statistics and comparative analysis to identify any significant differences in the results. The results emphasise the need for careful selection of a platform for distance learning and the acquisition of skills in creating e-resources. The results of the study provide practical recommendations for the implementation of the model in the Ukrainian higher education context. This is important for Ukrainian higher education institutions looking for optimal methods of blended learning. The findings of the study highlight the positive attitude of teachers to the proposed model, which promotes the individualisation of learning and development of digital competence. However, implementation requires additional time and advanced digital skills of teachers. The average score of the model's effectiveness (approximately 4.046) and the percentage distribution in scores 4 (47.69%) and 5 (30.77%) indicate a high level of acceptance of this approach by modern teachers. The recommendations are based on the individual experience of teachers, indicating the variability in the choice of the optimal means of communication with students. The study contributes to the understanding of the effectiveness of the blended learning model and will help to optimise its wider implementation.

Key words: blended learning, rotational model, universities, Ukraine, digitalisation.

RESUMO

O objetivo do artigo é testar empiricamente a eficácia do modelo de ensino com estações rotativas num formato misto com base num inquérito realizado entre professores de instituições de ensino superior na Ucrânia. O estudo utiliza uma abordagem de metodologia mista para recolher dados qualitativos e quantitativos de 65 professores durante o primeiro semestre do ano letivo de 2023-2024. Os principais instrumentos são questionários e entrevistas a professores que utilizaram o Modelo de Rotação de Estações. As respostas foram processadas utilizando estatísticas descritivas e análise comparativa para identificar quaisquer diferenças significativas nos resultados. Os resultados sublinham a necessidade de uma seleção cuidadosa de uma plataforma para o ensino à distância e a aquisição de competências na criação de recursos electrónicos. Os resultados do estudo fornecem recomendações práticas para a implementação do modelo no contexto do ensino superior ucraniano. Isto é importante para as instituições de ensino superior ucranianas que procuram métodos óptimos de aprendizagem mista. Os resultados do estudo sublinham a atitude positiva dos professores em relação ao modelo proposto, que promove a individualização da aprendizagem e o desenvolvimento de competências digitais. No entanto, a implementação requer tempo adicional e competências digitais avançadas dos professores. A pontuação média da eficácia do modelo (aproximadamente 4,046) e a distribuição percentual nas pontuações 4 (47,69%) e 5 (30,77%) indicam um elevado nível de aceitação desta abordagem pelos professores modernos. As recomendações baseiam-se na experiência individual dos professores, indicando a variabilidade na escolha do melhor meio de comunicação com os alunos. O estudo contribui para a compreensão da eficácia do modelo de ensino misto e ajudará a otimizar a sua aplicação mais ampla.

Palavras-chave: aprendizagem mista, modelo rotativo, universidades, Ucrânia, digitalização.

Introduction

Problem Statement. Given the large-scale digitalisation processes in higher education, blended learning is becoming increasingly relevant. This is a method of formal education whereby students learn one part of the educational information online and the other part in the classroom with teachers. In this system, digital technologies play an important role in ensuring the effectiveness of the innovative learning environment. In this system, the function of the teacher is transformed: he or she acts as a consultant: helps students solve complex problems, helps them find creative ways to solve them (Krymets, 2022). However, it is worth noting that the use of modern online services, virtual laboratories, information technologies and resources, and cloud services not only increases the motivation of students but also contributes to better results compared to traditional education (Sherman et al., 2022; Tsekhmister et al., 2009; Tsekhmister, 2021).

Research Focus. In the system of blended learning, an important role is played by the model called "station rotation", which is widely used in modern innovative education in Western Europe. In Central and Eastern Europe, this trend is just entering the arena of widespread use. In particular, in Ukraine, only a few higher education institutions widely use this form. However, given the replacement of part-time study with distance learning, this model can be useful for many Ukrainian educational institutions. Therefore, the main focus of the article is to analyse the Station Learning Model based on an empirical study.

Research Aim and Research Questions. The purpose of the article is to empirically test the effectiveness of the Station Learning Model of blended learning at Ukrainian higher education institutions.

Research questions:

1.   Characteristics of key aspects of blended learning as an approach that combines traditional and online approaches

2.   Research validation of the effective Station Rotation Model

3.   Characterisation of the main advantages and difficulties of this model

Theoretical framework

Modern researchers studying innovative education models agree that blended learning is an educational approach that combines traditional face-to-face classroom learning with online learning (Barber, 2022). Thus, this hybrid model seeks to optimise the benefits of both face-to-face and online education. Table 1 summarises the main aspects of blended learning.

Table 1 – Key principles of blended learning

Principle	Description
Flexibility	Blended learning offers flexibility in terms of time and place, allowing learners to access content and resources at their own pace and from multiple locations.
Large-scale integration of technologies	This process includes technological tools and platforms to enhance the learning experience.
Face-to-face interaction of participants in the learning process	An important aspect is that this form of learning retains a face-to-face component, allowing for direct interaction between students and teachers. Thus, it fosters a sense of community and facilitates real-time feedback.
The principle of differentiation	The model supports personalised learning paths, allowing students to develop at their own pace and focus on the areas of greatest interest.
Synthesising different types of learning	Blended learning combines a variety of learning methods, including traditional lectures, group discussions, practical exercises, and online assignments. This diversity meets different learning preferences.
Availability of training materials or resources	In this form, online resources and materials are easily accessible, which provides students with a wealth of information. This accessibility helps to develop independence in students.

Source: analysis of Bushman (2022); Dobrovolska et al., (2021); Dovhal et al. (2021); Nedermeijer (2023); Puspita et al. (2022).

It is also worth noting that blended learning often includes interactive and multimedia elements to make the learning process more engaging. This can include videos, simulations, game content, and other interactive tools. In addition, technology integration allows for the collection and analysis of student performance data (Rajab, 2018). Instructors can use this data to tailor instruction and provide targeted support as needed. According to Harb (2018), this form of learning encourages collaboration between learners through online forums, discussion boards, and collaborative projects. This promotes peer-to-peer learning and the development of various relevant skills in students (digital competence, information literacy, teamwork, critical thinking, creativity, etc. At the same time, an important aspect is that the blended learning model can be adapted to different subjects, grade levels, and learning environments (Nazarenko, 2015). Thus, this model adapts different teaching styles and educational goals. Modern researchers also emphasise the cost-effectiveness of this form. It is argued that by using online resources and reducing the need for a physical classroom, blended learning can help save on infrastructure and materials (Kulichenko et al., 2022). At the same time, it should be agreed that the process of effective implementation of blended learning requires careful planning, constant evaluation, and use of the strengths of both traditional and digital learning.

In modern pedagogical studies, scholars identify several models of blended learning, all of which have individual features (see Figure 1).

Figure 1 – Key forms of blended learning
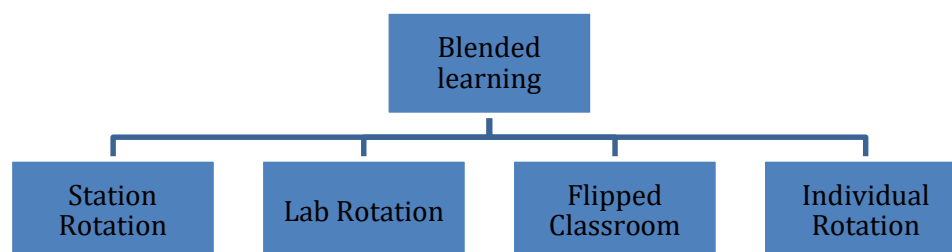
Source: Larsari et al. (2023).

In this system, the rotational model of blended learning is a popular approach that involves periodic alternation between the traditional classroom learning process and the use of online resources (Nurkamto et al., 2019). In this model, students can study part of the material or complete assignments online and then meet in a regular classroom setting for discussions, practical exercises, or other learning activities. The rotation can be based on time or on specific tasks (see Figure 2).

Figure 2 – Key points of the rotational model
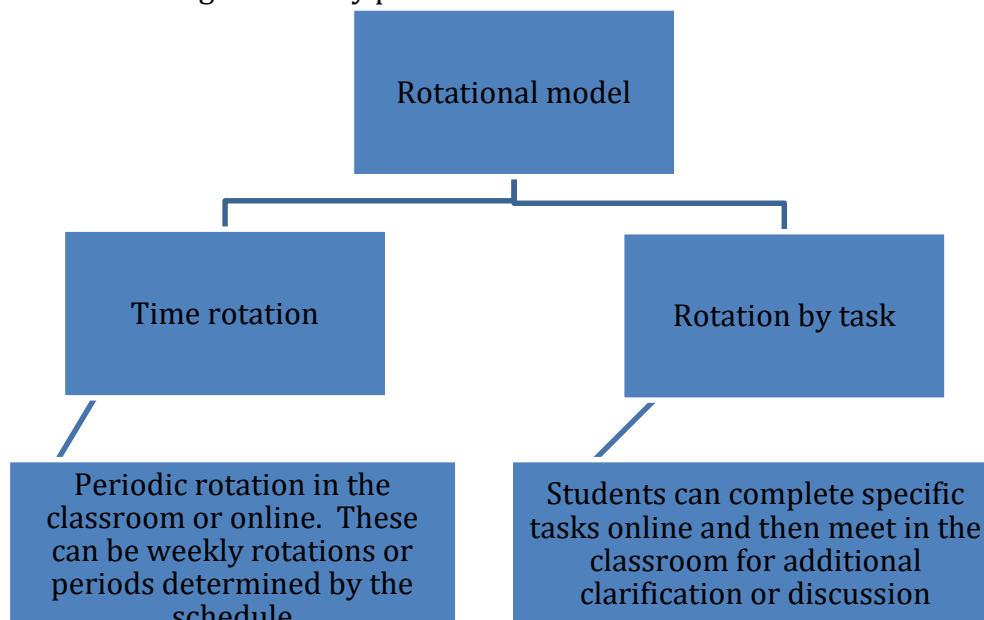
Source: based on Harb (2018).

Therefore, the Station Rotation Model is a special form of blended learning that involves students moving through a series of learning stations, both online and offline, during the teaching of a particular discipline (Nazarenko, 2015). In this model, the class is divided into groups, and each group alternates between different stations, which may include different activities, including online learning, face-to-face learning, group work, and independent study (Truitt & Ku, 2018). Key aspects of the station rotation model include station design, flexibility, differentiated instruction, student collaboration, etc.

In general, this model allows for flexibility in the allocation of time at each station. Some students may need more time at a particular station depending on their learning needs, while others may progress more quickly. The model can also be adapted to different subjects and levels of learners (Harb, 2018). Teachers can modify station activities to meet specific learning objectives. Therefore, Station Rotation combines the advantages of online and face-to-face learning, offering a flexible and dynamic learning environment that meets the diverse needs of students.

Methodology

Research Design. A mixed methods research design was used to collect both quantitative and qualitative data. The work began with the collection of quantitative data and continued with the collection of qualitative data to gain a full understanding of the effectiveness of the Station Rotation Model.

Sample and Settings, Participants. The study was conducted among 65 teachers working in higher education institutions of Ukraine. The participants of the study during 01.09.-01.11. of the first semester of the academic year 2023-2024 had to use the Station Rotation Model in their professional activities. The study ensured diversity in terms of age, gender, academic disciplines, and years of teaching experience (see Table 2).

Table 2 – Criteria for inclusion and exclusion of participants

Criteria for inclusion in the study	At least one academic year of experience in implementing blended learning. He is currently teaching at a university. Consent to participate in the study.
Exclusion criteria	Teachers who did not use the "Station Rotation" model Those with less than one academic year of experience in using blended learning.

Source: compiled by the authors.

At the same time, the study selected institutions from different geographical locations in Ukraine to take into account potential regional differences in educational practices. At the same time, the survey ensured the representation of teachers teaching various academic disciplines, including science, engineering, humanities, social sciences, etc.

Details of the study

1. Technological infrastructure. The study took into account the level of technological infrastructure available in the institutions. All institutions had such technical equipment as PCs, laptops, tablets, digital whiteboards, and TVs.

2. Class size. The variation in class sizes was taken into account to understand the scalability of the station rotation model. The study mainly involved teachers who taught in groups of 20–25 students.

3. Course characteristics. The study was conducted among teachers who taught classes at different academic levels (bachelor's and master's) to assess the applicability of the model at different educational stages.

4. Types of courses. This study includes a combination of lecture and interactive courses to assess the adaptability of the model to different learning formats.

5. Implementation details

A). Duration of implementation: During 01.09.-01.11. of the first semester of the academic year 2023-2024, the study participants had to use the Station Rotation Model in their professional activities

B). Frequency of rotation: students rotated between stations at pre-determined intervals - weekly. The rotation schedule could change, with students spending a certain amount of time at each station before moving on to the next.

C). Technological tools used: learning management systems, interactive modelling, digital whiteboards, e-learning platforms, cloud resources, communication messengers, e-mail.

Data Collection

Qualitative Data Collection. A structured survey was developed to assess the participants' perception of the effectiveness of the Station Rotation Model. The questionnaire included both open and closed questions. Information was collected on aspects such as student engagement, learning outcomes, and perceived challenges. Other quantitative data was also collected on the frequency and duration of the online and face-to-face station rotation model components. The study used data from the learning management system (LMS) and attendance records for face-to-face classes.

Quantitative Data Collection. Semi-structured interviews were conducted with 15 pilot participants to explore their experiences in more depth. The problems they faced were studied and the general attitude of teachers towards the model was assessed.

Data analysis

The study used statistical methods, in particular, to characterise the responses and impressions of the participants using descriptive statistics to understand the participants' perceptions of the station rotation model. The proportion of time spent on the online and face-to-face components was also estimated. A comparative analysis was conducted to identify any significant differences in outcomes based on demographic factors or teaching context. Thematic analysis was used to describe recurring themes from the interviews. The findings were then integrated.

Ethical Considerations

The authors complied with all necessary ethical guidelines during this study. Participants were assured that there was no risk in taking part in this study. Their participation was kept confidential. A comprehensive explanation was given to all

participants before they filled out the questionnaire and they were asked to provide their voluntary consent before proceeding with the survey.

Results

In the Station Rotation Model, learners rotate between stations at pre-determined intervals. The rotation schedule can vary, with learners spending a certain amount of time at each station before moving on to the next, or the rotation can be based on the completion of specific tasks or activities. In general, the model allows for flexibility in the allocation of time at each station. Some students may need more time at a particular station depending on their learning needs, while others may progress more quickly.

To implement the Station Rotation Model, a university must carefully select a dedicated distance learning platform that will facilitate learning and research efforts. This involves acquiring the necessary skills in creating and developing e-resources such as e-courses, digital whiteboards, e-portfolios, etc. (Bieliaieva et al., 2023). To familiarise stakeholders with the platform, comprehensive training sessions are needed, covering activities such as registering participants and making the most of all the platform's features.

Based on this model, the most advanced digital tools include online seminars (25%), online lectures (30%), online consultations (10%), use of mailboxes (6%), use of digital resources (12%) and online scientific conferences of applications (10%). An additional 7% is allocated to the use of instant messengers (see Figure 3).

Figure 3 – The structure of using digital tools in the Station Rotation Model system
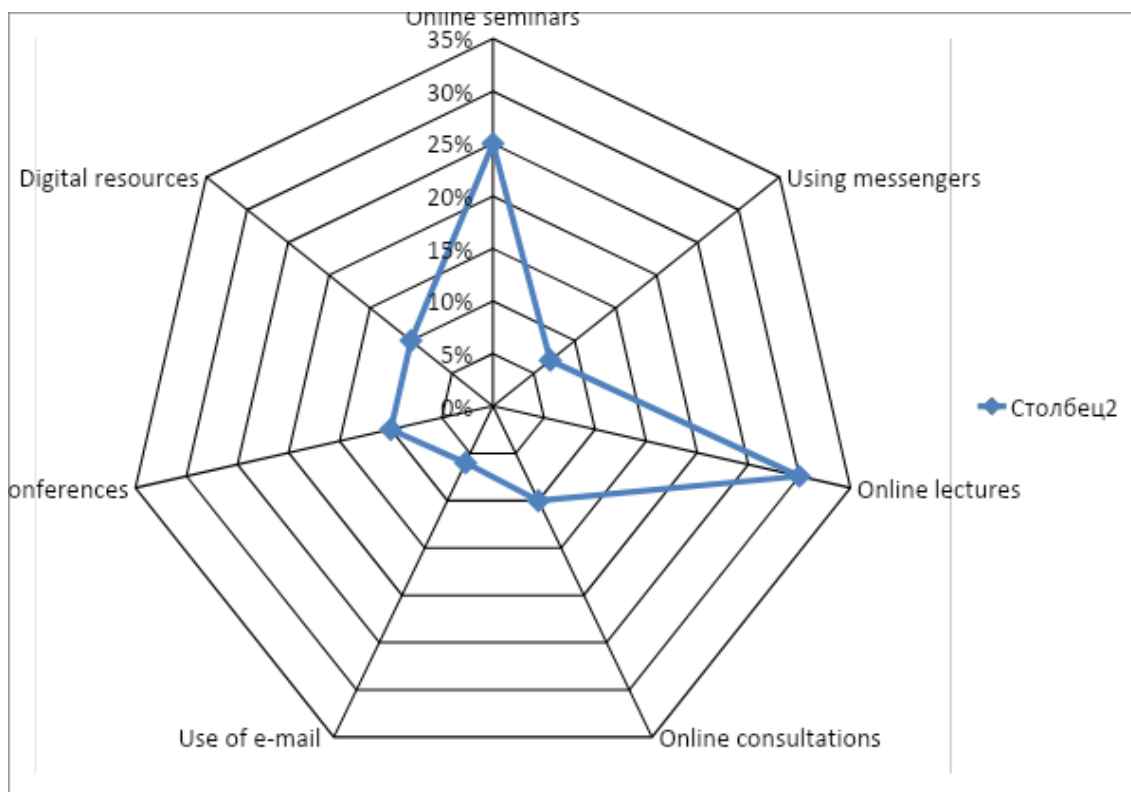
Source: compiled by the authors.

The technology for implementing distance learning has been tested, revealing that all resources should be easily accessible. It should be noted that the openness of an educational institution's website is a real mechanism for establishing interaction between teachers and students, coordinating joint actions, and controlling the organisation of the educational process.

Different communication channels can be used for effective communication between teachers and students, such as messengers, email, online platforms (Biliuk et al., 2023). The choice of the optimal method of communication should be based on individual experience and specific circumstances of application. The results obtained from the use of the distance learning model with the above-mentioned digital tools emphasise the importance of accessible and diverse communication channels to improve the educational process (see Table 3).

Table 3 – Ways to work with students in the Station Rotation Model

Digital tool	Number of votes	Popularity (in %)
Messengers	18	25
Email.	14	23
Online platforms	31	49
Other	2	2

Source: compiled by the authors.

To implement the Station Learning Model, it is important to engage the digital resources of the school administration. It is crucial to create a reliable infrastructure for sustainable blended learning (Vaughan, 2021). In addition, the institution should have at least a cadre of professionals capable of performing key roles in organising, advising, and supervising the educational process. Proficiency in the use of learning management systems and content management systems is essential for the effective implementation of this model, and digital technologies should be used at least several times a week, if not systematically, in this model (see Table 4).

Table 4 – Frequency of use of electronic technologies

Answer	Number of votes	Popularity (in %)
Continuously and systematically	30	48
From 2-4 times a week	20	30
Several times a month	9	14
Very rarely	6	8
Not used at all	0	0

Source: compiled by the authors.

The respondent teachers noted that the Rotation Station Model facilitates individualised learning for students with different educational requirements and needs (see Table 5).

Table 5 – Does the Station Rotation Model facilitate individualised learning for students with different learning needs?

Answer	Number of votes	Popularity (in %)
For example, students with special needs began to show better results	40	60
No, this model does not affect the individualisation of learning	5	9
The situation has not changed	20	31

Based on the interviews, it was found that there are several ways in which the process of individualisation of learning can be promoted within this model.

1.   Use of different teaching methods. The rotational model allows you to use different teaching methods for different groups of students. For example, students with different learning needs can receive individual study of certain topics using online resources, while others work in groups or interactively in class (Voropayeva et al., 2022).

2.   Introduction of personal pace of individualisation. Students can work at their own pace in different parts of the rotational model. Those who need more time to understand the material can spend more time on independent work or individual study.

3.   Use of differentiated tasks. Teachers can create assignments that take into account different learning styles and levels of proficiency.

In general, the surveyed teachers noted that the Station Learning Model is effective and promotes student engagement in the learning process. In particular, when answering questions 1 to 5: "How do you assess the level of students' interest in learning through the rotational station model?" The majority of teachers - 47% - gave a score of 4, while 29% gave a score of 5. 19% of teachers rated this process as mediocre – "3". Only 5% of teachers rated it as not contributing to the development of motivation among higher education students. Figure 4 shows how the respondents assessed the effectiveness of the model in general (score from 1 to 5).

Figure 4 – Evaluating the effectiveness of the Station Rotation Model
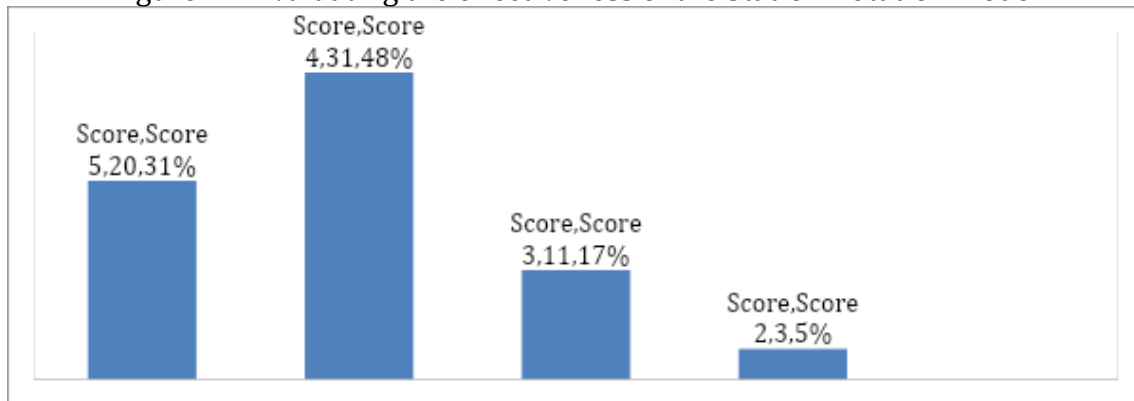
Having received this data, we will determine the average score:

$$\sum \frac{score * number\ of\ answers}{Total\ number\ of\ answers}$$

$$\sum \frac{(5 \times 20) + (4 \times 31) + (3 \times 11) + (2 \times 3)}{65}$$

So, the average score is ≈4.046. Let's determine the percentage distribution of each grade using the formula:

$$\frac{number\ of\ answers\ according\ to\ the\ score}{total\ number\ of\ answers} \times 100\%$$

For scores 5, 4, 3, 2, respectively:

$\frac{20}{65} \times 100\% \approx 30.77\%$ $\frac{31}{65} \times 100\% \approx 47.69\%$ $\frac{11}{65} \times 100\% \approx 17\%$ $\frac{3}{65} \times 100\% \approx 4.62$

Thus, the results of the analysis indicate that the average score of the model's effectiveness is approximately 4.046, and the majority of teachers gave a score of 4 (47.69%). It is worth noting that more than half of the responses are concentrated in the 4 and 5 ratings, which emphasises the positive attitude of the teachers towards the proposed model.

So, while the Station Rotation Model can be an effective blended learning method, it can also face a number of challenges. In particular, 8 respondents stated that the need for technical resources was an important challenge for them. In some cases, teachers did not have the full range of digital tools. At the same time, 25 teachers emphasised that preparation for this model was a significant challenge for

them. Implementing this model requires additional training for teachers. Effective classroom management in a rotational model can also be a challenge. This aspect was emphasised by 18 teachers. It should be noted that in this model, teachers need to skilfully organise transitions between different stations and take into account the needs of different groups of students. 14 respondents emphasised that time constraints are an important challenge, as the implementation of the Station Rotation Model may require more preparation and planning time on the part of the teacher. It should be borne in mind that the effective use of this model may take longer than traditional teaching methods.

While these challenges exist, they can be overcome through proper teacher training, supportive administration, and appropriate technical and pedagogical resources.

Discussion

The results show that the combination of innovative digital technologies and traditional teaching methods is an important tool for implementing and using the Station Learning Model. This combination requires a critical and creative approach from teachers and lecturers themselves. This is confirmed in a number of contemporary works, including Hordiichuk et al. (2022), who draw attention to the fact that teachers emphasise the importance of maintaining an optimal ratio of students to computers in computer labs to ensure that teachers have enough time to provide individual assistance to all students (Hordiichuk et al., 2022; Järvis et al., 2021; Panasenko, 2021).

This study found that the Station Learning Model is effective and promotes student engagement in the learning process. This is supported by other studies that describe teachers' positive perceptions of blended learning and emphasise the urgent need for the expanded use of the Station Rotation Model (Salnyk et al., 2023; Kolbina & Oleksenko, 2020). For example, the study by But and Panchenko (2016) notes that teachers are in favour of increasing professional development opportunities, emphasising that effective implementation of blended learning

requires not only their expertise but also appropriate technological support, such as the provision of basic digital tools. This aspect is also confirmed by our experiment.

In addition, this study draws attention to another important aspect - teachers' understanding of the unique needs of their students. As the results of this study have shown, it is the Station Rotation Model that facilitates an individual approach to each student. Teachers who have this understanding are more likely to develop meaningful and adaptable blended learning experiences. This has been confirmed by other research, with Larsari et al. (2023) noting that modern educators express a positive impression of the Station Rotation Model. Their survey of 25 teachers in a blended learning environment showed that 58% of them strongly endorsed the approach. The findings highlighted the need for ongoing support, professional development, and clear teaching strategies to enable teachers to effectively implement blended learning in the university.

The results of the study showed that an important challenge in using this model for teachers was the need for technical resources. This aspect is not new, it has been emphasised by many contemporary scholars (Smith, 2021; Tytova & Mereniuk, 2022)

The hypothesis that the Station Rotation model gives preference to exercises that allow interactive interaction between the student and the teacher in the process of implementing learning has been confirmed by other studies (Wong et al., 2022). Modern researchers note that it is the variety of types of tasks (for example, crossword puzzles, multiple-choice quizzes, grouping, classification, games) that make the learning process more engaging (Piamsa-nga & Poovarawan, 2020; Shevchenko et al., 2021). This is also demonstrated by our results, as the majority of teachers stated that this model contributes to the formation of greater interest and motivation among students than in the traditional form of classes.

Thus, the results have opened up a new perspective on the effectiveness of the blended learning model in the higher education system, especially in times of crisis. In addition, it has been proven that blended learning contributes to the development of critical thinking in students, independence, and digital

communication culture. These skills are particularly relevant in the globalised labour market today.

This study has practical implications for higher education institutions in Ukraine, especially those considering the introduction of blended learning. The main conclusions and recommendations can serve as a source of information for teachers, administrators, and pedagogical departments of universities.

It should be borne in mind that the study may have some limitations. First of all, we are talking about time constraints. Since the study was conducted over the course of one semester, it can be seen as a pilot project, and its long-term effects may be limited. Second, an important limitation is the focus on Ukrainian conditions. The recommendations are based on the Ukrainian experience of teachers and may have limited applicability outside of Ukraine. Therefore, while this study provides a valuable contribution to understanding the effectiveness of the mixed Station Rotation Model in the teaching system, its application requires careful consideration of the specific conditions and constraints of each higher education institution.

Conclusions

Thus, the Station Rotation Model is an important approach that combines elements of traditional and online learning. A study of the effectiveness of the Station Rotation Model in blended learning in higher education, conducted among 65 lecturers, indicates a positive attitude towards the proposed approach. The respondents noted that the Rotation Station Model promotes individualised learning for students with different educational requirements and needs. At the same time, it was determined that this model contributes to the development of digital competence among both students and teachers. However, the implementation of this form of education requires more time for teachers to prepare and have developed digital skills. This system provides for the use of various digital learning technologies and forms of teaching.

The average score of the model's effectiveness is approximately 4.046, which indicates a high level of acceptance by teachers. The majority of responses are

concentrated in scores 4 (47.69%) and 5 (30.77%), which confirms the positive attitude of teachers towards the model. The recommendation is based on the individual experience of teachers, and they note that the choice of the best way to communicate with students varies according to personal experience and the specific circumstances of using the model.

Thus, the conclusion of the study indicates that the model with rotating stations in blended learning was positively assessed by teachers, and its implementation in the educational process can contribute to the optimisation of higher education in Ukraine.

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