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MODEL OF BLENDED LEARNING IN HIGHER EDUCATIONAL INSTITUTIONS: DEVELOPMENT, IMPLEMENTATION AND EVALUATION

Abstract. The paper examines the problem of blended learning modeling to ensure high-quality vocational training of specialists-to-be of various profiles at higher education institutions of Ukraine. The purpose of the research is to develop a model of blended learning for higher education institutions and to analyze the results of its implementation in the educational process. It was concluded that there are quite a few approaches to the development and practical implementation of blended learning models. In the paper blended learning is considered as a reasonable combination of the traditional educational process in classrooms with distance learning, students' self-study and the use of digital technologies, which takes place according to a certain scheme. The concepts of "blended learning" and "hybrid learning" as well as several existing models of blended learning are analyzed. The generalized model of blended learning at higher education institutions along with its visual representation has been developed. The implementation of this model allows practitioners to combine different types of educational activities in the process of face-to-face and remote classes in exactly the combination that is necessary to achieve the expected results under the conditions of a specific higher education institution. The results of a survey conducted at Bogdan Khmelnitsky Melitopol State Pedagogical University are given. During the survey attention has been paid to the following aspects: how students understand the

essence of blended learning as well as the difference between the use of distance learning elements in the face-to-face learning process and the full application of distance and blended learning technologies during quarantine; students' attitude to traditional, blended and distance learning; how students perceive the educational process organized on the basis of the proposed generalized model of blended learning. In addition, it has been found out which digital technologies are used at universities for the organization of blended learning. In general, according to the results of the survey, the expediency of using the developed model has been confirmed and promising directions of scientific research in the field of blended learning have been determined.

Keywords: higher education; model of blended learning; distance learning; information and communication technologies; students' attitude.

1. INTRODUCTION

The problem statement. Nowadays higher educational institutions are forced to adapt to the rapid changes in society and the challenges which are connected with economic, social, cultural and epidemic problems in the world. It is also important for higher educational institutions to stick to the student-centered education, to meet the students' needs for quality education, despite natural and social cataclysms. Today, in the context of digital transformation [1], the training of future professionals is undergoing appropriate changes in the organization of educational activities and interaction between the subjects of the educational process due to the development of distance and blended learning technologies, which became especially important during the Coronavirus pandemic [2]. Thus, according to a study of the G2R group, led by Imed Bouchrika, PhD, online learning emerged as a safe and viable option for education continuity as the COVID-19 pandemic turned personal and professional worlds upside down [3]. The development of distance learning technologies contributes to the diversification and spread of blended learning, which is considered to be the best for teaching and learning in secondary schools [4] and higher educational institutions [5], [6]. However, the issue of selecting a model of blended learning in higher educational institution requires a separate study. After all, it is necessary to choose the most successful and appropriate organization of blended learning, taking into account the characteristics of the institution and its experience in digital learning. This task involves the analysis of existing models of blended learning, their modification or development of our own model for the organization of blended learning in higher educational institution and evaluation of the results of the developed model implementation.

Analysis of recent studies and publications. The issue of modelling and implementation of blended learning in higher educational institutions to maintain efficient professional training of students are considered by C. Andersson, P. Appiah-Kubi, N. Balyk, E. Basile, N. Kushnir, L. Kuzmich, D. Logofatu, S. Lytvynova, M. McCabe, V. Oleksiuk, N. Osypova, C. Şentürk, O. Spirin, S. Sydorenko, N. Valko, K. Zouhri and other researchers.

C. Şentürk [5] presents results of examination how a blended teaching-learning approach affects academic achievement and twenty-first century skills of preservice teachers who take the teaching principles and methods course at university. He gave generalized blended learning model which is the crossing of face-to-face learning and virtual learning. The researcher found that the blended learning experiences had a high level of impact on students' long-term learning and their twenty-first century skills.

P. Appiah-Kubi et al. [6] describe the study which was initiated to learn about the level that Engineering Technology students engaged with online course materials using Zoom and Learning Management System. Researchers point out that Engineering Technology programs incorporate a lot of laboratory and hands on modules. So, it is necessary to ensure that students stay engaged in learning by doing despite restrictions of online mode. They found

that students who performed better in the blended courses demonstrated a higher level of engagement with course materials.

O. Spirin et al. [7] consider a cloud-based approach to blended learning of computer networks. Their teaching technique is to use an integrated academic cloud, which includes Apache CloudStack and EVE-NG Community platforms, to support work in groups. Researchers discuss some techniques of blended learning: combination of face-to-face and distance learning, group members' partnership, development of group work skills, heterogeneous grouping, combined use of individual and peer assessment, teacher's monitoring of the students' work, task-oriented approach, chance for every member to be a leader, essential feedback. Results of their experimental work show that blended learning allows teachers to use the technological benefits of academic cloud to achieve the study goals more efficiently.

An approach to development of an instructional design model for mobile blended learning in higher education is described by I. K. Suartama, P. Setyosari, S. Sulthoni, and S. Ulfa [8]. Researchers created mobile blended learning design for university Instructional Media Course aimed to students get the knowledge and skills in the field of design, development, utilization, evaluation, and assessment of media in learning. Developed model is presented like a matrix, which consists of learning objectives, stages of learning and features of mobile app of Moodle LMS. Researchers formulate 8 learning objectives based on the learning objectives of the revised Bloom taxonomy. They think there are 3 stages of blended learning: 1) before class (online); 2) in the class/onsite (offline); 3) after class (online). So, they offer activities for each learning objective and each stage.

A. Adel and J. Dayan in [9] describe a design for a system of blended learning activities for New Zealand institutions. This is a total learning model, which blends digital technologies with traditional learning. Its central point is social media site where all other components (introductory session; e-learning; classroom instruction; virtual support) are linked together.

Wahjono et al. [10] present a model of blended learning based on semester credit system implementation. It combines three main stages, namely, planning, organizing, and teaching-learning process. A planning stage includes in particular student's admission, program selection, class grouping. An organizing stage includes in particular preparing for guidance documents, basic competence analysis, and mapping, management system development. The third stage includes in particular preparing the teaching and learning documents, the teaching and learning process, assessment, collaborative coaching, reporting on the learning process. All of these stages are supported by computer software. Authors illustrate their model with detailed flowcharts, which let to understand processes on all stage.

Therefore, there are various approaches to modeling the blended educational process, which depends on the conceptual views of the authors, the characteristics of the certain educational environment, and the general cultural characteristics of the country. It can be argued that there is no single version of such a model, therefore it is appropriate to develop an author's approach to solving this problem.

The research goal. The research goal is to develop the model of blended learning for higher education institutions and to analyze the results of its implementation in the educational process.

2. THE RESULTS AND DISCUSSION

2.1. Analysis of subject domains

In the research works the terms "blended learning" [7], [11] and "hybrid learning" [5], [12] are mentioned. In order to solve the problem of the correct use of the term, we have

analyzed the relevance and usability of the terms "blended learning" and "hybrid learning" in English and Ukrainian languages during the last 5 years according to the indicators provided by Google Trends. We have come to the conclusion that both Ukrainian and English terms of "hybrid learning" are not commonly used in Ukraine [13]. Thus, it is advisable to focus on the term of "blended learning", which is defined as a kind of hybrid methodology with a combination of traditional (offline learning, learning in the classrooms, face-to-face learning), online learning and self-study [14]. This means not just the use of modern information and interactive technologies in addition to traditional ones, but a qualitatively new approach to learning. Visually, it can be represented as follows (Fig. 1):
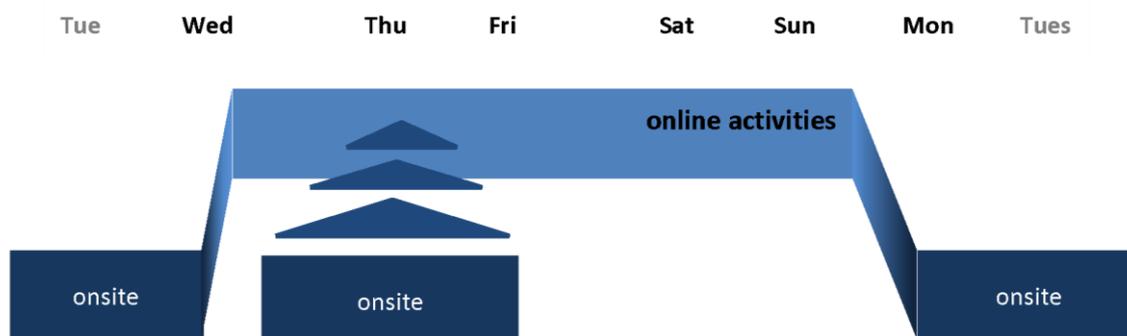

Figure 1. Sample movement in blended learning (source: [15])

2.2. Models of blended learning

According to the sequence of actions in the learning process, there exist two models [16]:

The first "distance" model – learning process is taking place according to the following scheme (Fig. 2):
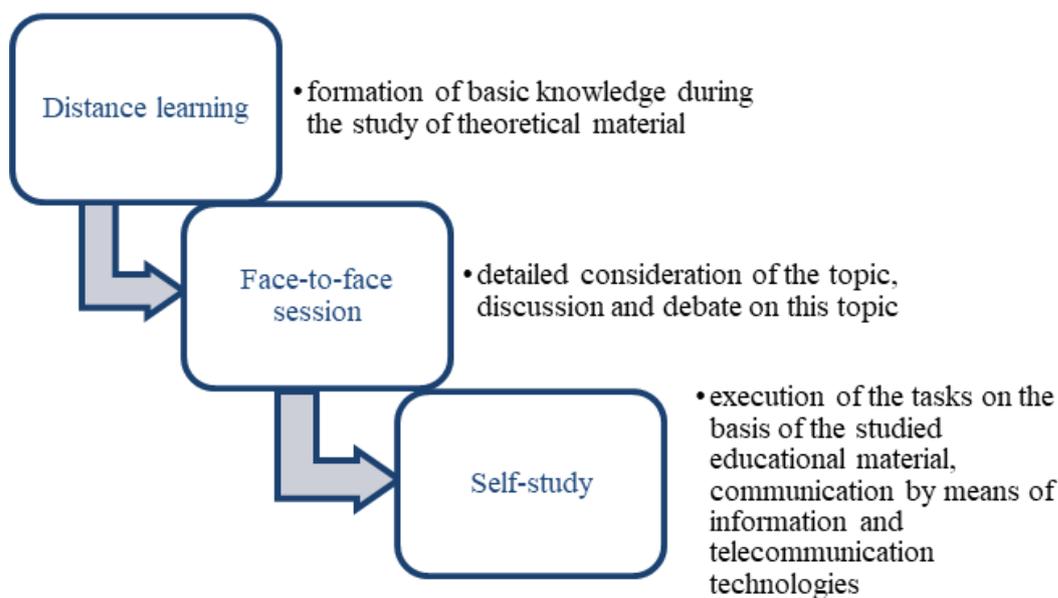

Figure 2. Distance model of blended learning

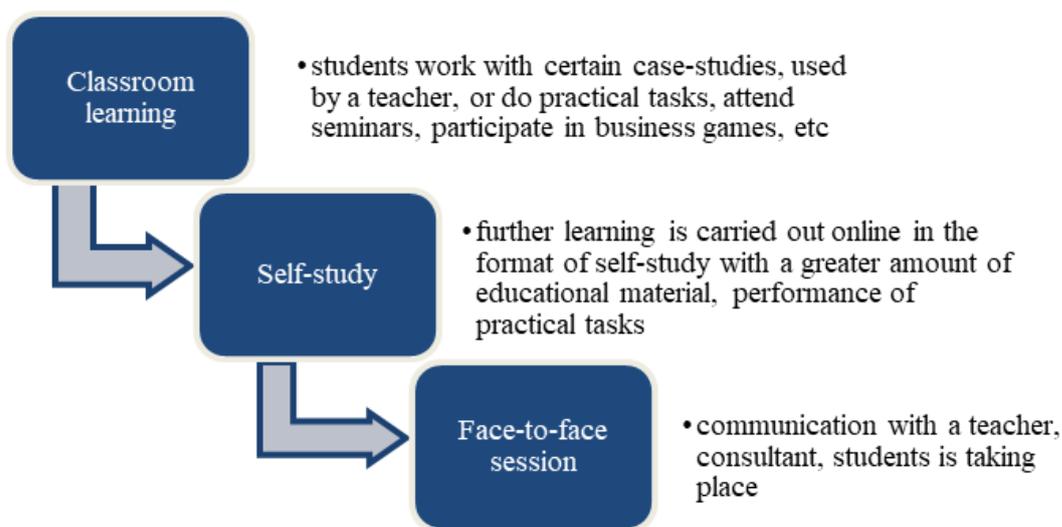2. The second "training" model is implemented according to another scheme (Fig. 3):

Figure 3. Training model of blended learning

In the system K-12 from the perspective of the student there are the following models: Rotation model, Flex model, Self-Blend model, Enriched Virtual model [17], [18].

Rotation model is a program in which within a given course or subject (e.g., math), students rotate on a fixed schedule or at the teacher's discretion between learning modalities, at least one of which is online learning.

Flex model is a program in which content and instruction are delivered primarily by the Internet, students move on an individually customized, fluid schedule among learning modalities, and the teacher-of-record is on-site.

Self-Blend model describes a scenario in which students choose to take one or more courses entirely online to supplement their traditional courses and the teacher-of-record is the online teacher.

The analysis of the existing models of blended learning suggests that none of them can be implemented without changes in the process of professional training in higher educational institution. Therefore, our aim was to identify an effective model of blended learning that would work adequately in Ukrainian higher educational institution.

It should be noted that in Ukraine the implementation of blended learning in the real conditions of higher educational institution's work is determined and limited by the requirements for the educational process set by university authorities and the Ministry of Education and Science of Ukraine.

The experience of introducing blended learning [13] and distance learning technologies [19] allowed us to develop a model of blended learning with a focus on the sequence of actions. In general, there is the following sequence of actions in the higher educational institution:

Face-to-face lectures → More detailed distance learning of theoretical material → Face-to-face practical classes → Self-study of practical tasks at home, Work with additional online materials → Automated testing (in the classroom or distantly) → Self-study of the materials or online self-study tasks → Face-to-face or distance assessment of the level of knowledge (Fig. 4). The cycle of theoretical and practical educational material learning along with automated testing and online self-study is repeated as many times as it is needed for a comprehensive mastering of the discipline according to the syllabus of the discipline. Then the assessment of the level of knowledge takes place usually in the form of exam or test.
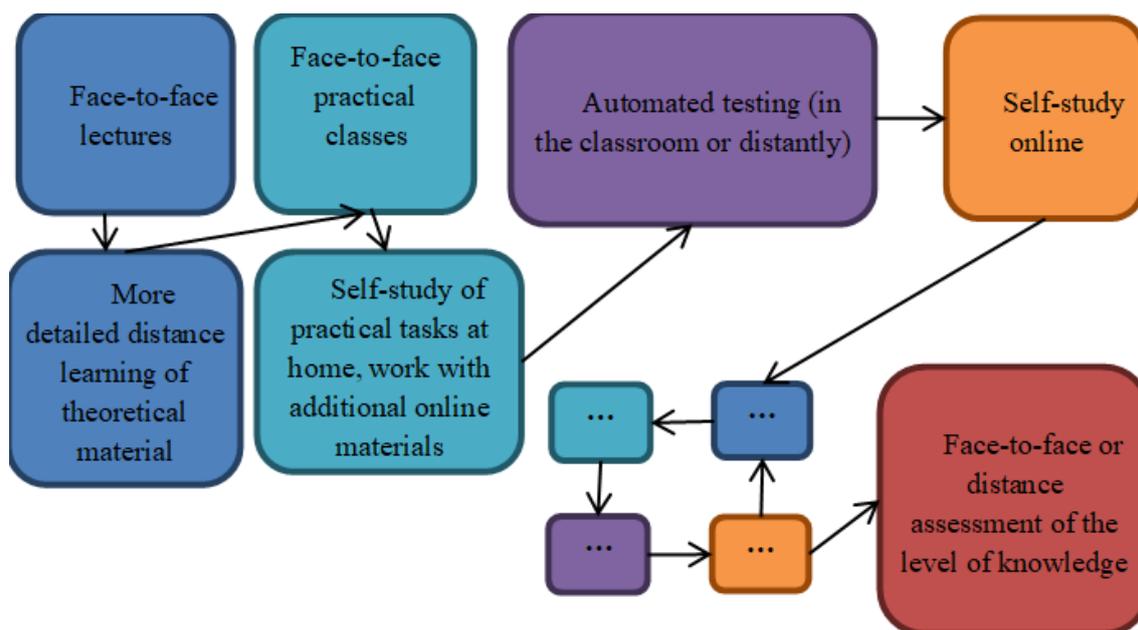
Figure 4. Generalized model of blended learning in the higher educational institution

It should be noted that not all processes take place sequentially, and some of them may take place simultaneously, depending on the pace of work of individual students and the tasks they choose in the process of studying a particular discipline. This is a main feature of the individualization of the learning process: each student can choose their own learning path, duration of learning through online learning tools, time to study theoretical material or develop practical skills, as well as a convenient time to do the tests in order to demonstrate learning outcomes. One student may feel that it is enough to have face-to-face classes (as it was proved by the results of automated testing), and others may find it more convenient to learn everything online. Thus, the model is variable and can be adjusted to the needs and preferences of students.

The important feature of the quality of organization of blended learning model is the responsibility of a teacher for the excessive filling of the e-learning environment, used in the process of blended learning in higher educational institution, with teaching materials, practical tasks and additional resources. Most often, educational institutions use the Moodle platform [8], [20], [21] and distance learning courses are developed there.

2.3. Research of the results of introduction of the generalized model of blended learning in the higher educational institution

During 2 semesters in Bogdan Khmelnitsky Melitopol State Pedagogical University the 1st-4th year Bachelor students and the 1st-2nd year Master students of specialties 015.39 Vocational Education (Digital Technologies), 014.09 Secondary Education (Informatics) and 122 Computer Science were taught the disciplines of the professional cycle according to the developed generalized model.

After the introduction of lockdown and the start of global use of distance learning technologies in the learning process, students were interviewed about the use of blended and distance learning technologies. The purpose of the survey was to find out students' attitudes towards these technologies. The survey was conducted on a voluntary basis using Google Forms. 74 students (27% of them were Master students and 73% – Bachelor students) took part in the survey.

Analysis of the survey results allows us to draw the following conclusions and generalizations. Almost all students (91.9%) have an idea of what blended learning is and all students are acquainted with distance learning technologies provided by means of Internet technologies (100%). It has to be mentioned that the vast majority of students believe that blended learning is a combination of online learning, traditional learning and self-study, which largely confirms the claim that they are aware of this technology.

The aim of next block of questions was to find out how students understand the difference between the use of distance learning elements in process of face-to-face learning and the full use of distance and blended learning technologies during the lockdown. It turned out that before the lockdown 54.1% of teachers used blended learning in their teaching and 41.9% of them used distance learning. And during the lockdown, the percentage of such teachers increased to 90%.

The aim of the third block of questions was to find out students' attitudes towards traditional, blended and distance learning, as they were able to get to know the differences between them through measures taken during the Coronavirus pandemic. Researchers were particularly interested in the issue of the diversity of learning process. The answers of the respondents were as follows: 1) 40.5% of students believe that during distance learning the communication was better, 35.1% – consider the communication to be better during traditional learning, 24.3% pointed to the blended learning; 2) 60.8% of respondents noted that they received the best grades during distance learning, 25.7% – during traditional learning, 13.5% – during blended learning; 3) traditional education fully satisfies only 29.3% of students, distance learning – 37.8%; blended learning – 44.6%; 4) traditional learning is considered to be of better quality – 38%, distance learning – 23%, blended learning – 45% (Fig. 5).
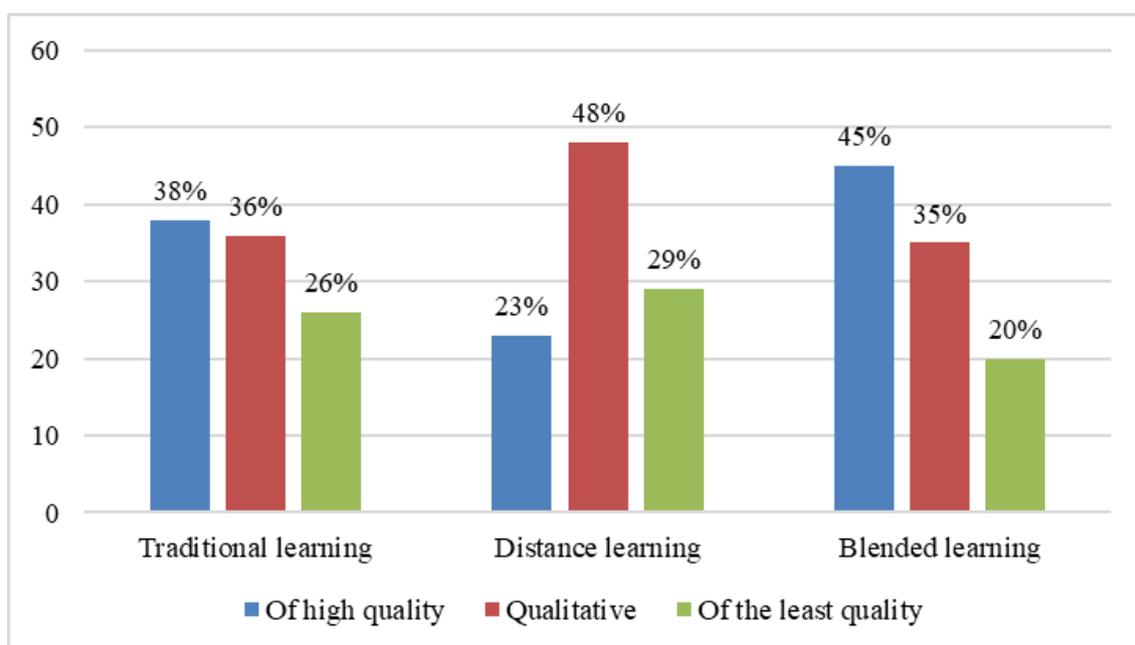

Figure 5. Students' attitudes towards traditional, blended and distance learning

The aim of the fourth block of questions was to find out how students perceive the learning process organized on the basis of the proposed generalized model of blended learning. Among the advantages of such learning, students singled out the following: accessibility (learning materials are available anytime and anywhere) – 60.8%; digitization (work mainly with digital resources) – 55.4%; productivity (you can choose the time, place

and pace of learning) – 52.7%; consideration of students' individual needs (it allows students to learn at their own pace) – 48.6%; communication (opportunities to communicate with the teacher and other students anytime and anywhere) – 47.3%; independence (independent identification of what, when, how and where to learn) – 44.6%; collectivity (is provided by a variety of content types) – 29.7%; interest (it is more interesting to learn in such a way) – 27% (Fig. 6).
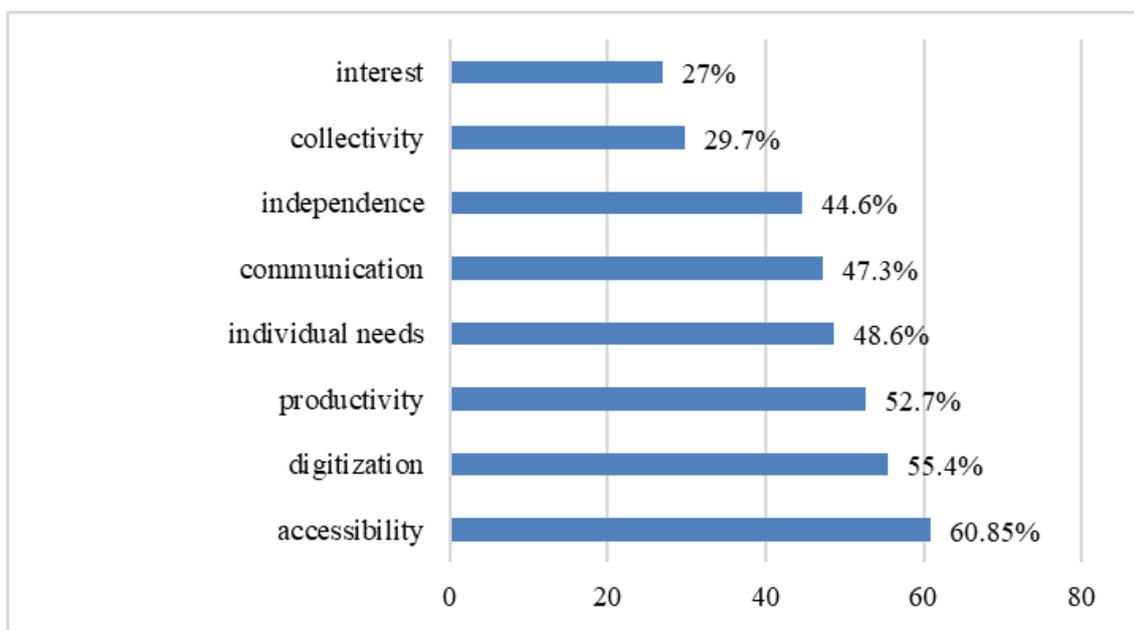

Figure 6. Advantages of blended learning according to students' point of view

So, 48.6% of students stated that they would be able to study well in the process of blended learning, 37.8% – neither agree nor disagree, 13.5% – believe that they will not be able to study well in the process of blended learning.

Among the reasons that prevent students from participating in blended learning, the respondents chose the following: motivation to study – 28.4%; lack of confidence in achieving academic success – 27%; Internet quality – 23%; absence or the computer or when it is out of date – 12.12%. Therefore, it can be concluded that there are no reasons related to the organization of blended learning according to the proposed model. In addition, 44.6% emphasized the absence of reasons preventing them from participating in blended learning.

The survey allowed us to find out what technologies students and teachers use when organizing blended learning by means of information and communication technologies: video telephony programs (Discord, Zoom) – 94.6%; e-mail – 77%; distance learning platforms (Moodle) – 85.2%; messengers (WhatsApp, Viber) – 59.5%; teamwork services (online boards, online documents) – 47%; educational websites – 43.3%; video hosting (YouTube, Youku, Tudou, meWATCH) – 27%; social networks (Facebook, Instagram) – 13.5%; microblogging (Twitter, Tumblr) – 2.7%; virtual reality – 1.4%. Such responses indicate that despite the popularity and rapid spread, virtual reality technology has not yet become sufficiently widespread in the organization of distance learning. Respondents also noted that the assessment of learning outcomes was carried out mainly in the following ways: submitting the completed tasks by e-mail to the teacher – 43.2%; automated testing – 24.3%; online conferences – 18.9%. Almost all students are satisfied with taking their exams distantly – 95.9%.

The following feedback was received in the comments to the survey:

Blended learning is appropriate, especially under the conditions of lockdown restrictions and if it sticks to the individual learning plan.

I really like blended learning because the time is not wasted.

Per-to-per learning allows us to develop communication skills.

Many employed students do not always have time for blended learning.

Distance learning is better than blended learning.

This is a better option for distance learning.

During blended learning I am more focused, and after it I am less tired, it is comfortable and convenient.

It is easy and provides the opportunity to choose time to execute the tasks.

Although traditional learning allows you to communicate with teachers "face-to-face", but the teachers of MSPU offer quality materials in various formats.

It was clear that some teachers and group mates were not satisfied with this form of education, not all effectively taught and studied distantly, but as for me it was quite easy and comfortable to do most of the courses.

Therefore, the majority of students positively evaluated the experience gained during blended learning based on the proposed generalized model. At the same time, there were separate critical reviews, for example: "Many employed students do not always have time for blended learning," "Distance learning is better than blended learning." In our opinion, this is caused by the following factors: some students did not sufficiently understand the peculiarities of blended and distance learning; a number of students were focused specifically on distance learning, so other forms of education were perceived critically. This encourages us to improve the model and determine more effective ways of its implementation.

The results of the survey are valuable, taking into account the fact that during their university studies students had the experience of learning in traditional, distance and blended learning modes. This allowed us to draw more reliable conclusions from the research of the results of the implementation of a blended learning generalized model in higher educational institution, which is not limited to only two modes of learning.

Since during the survey we studied only the attitude of students to the blended educational process, it is advisable to conduct an experimental study in the future to check the effectiveness of the implementation of the author's model.

The presented results have been obtained in the process of solving individual research tasks: formulation of the general research idea (V. V. Osadchyi, O. M. Spirin); reviews and analysis of literary sources (K. P. Osadcha, I. V. Krasheninnik); development and theoretical justification of the model (K. P. Osadcha, V. V. Osadchyi, O. M. Spirin); organization and survey of students (K. P. Osadcha, V. S. Kruglyk); processing, generalization and visualization of empirical data (V. S. Kruglyk, I. V. Krasheninnik); analysis of the results and general editing of the paper (R. M. Horbatiuk).

3. CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

Analysis of the research on the implementation of blended learning in higher educational institutions allowed us to identify 2 models of blended learning according to the sequence of actions in the learning process and 6 models from the point of view of students. Taking into account the conditions of organization of education in higher educational institutions of Ukraine and our own experience in the implementation of blended and distance learning, our own generalized model of blended learning in higher educational institution has been proposed. The model is a variant of a consistent model of blended learning and is aimed at in-depth study of educational materials taking into account the individual needs of students for the organization of their learning activities. The study of the results of the implementation

of the generalized model of blended learning was carried out by means of doing a survey and analyzing its results. It allowed us to prove the positive attitude of most students to the implementation of blended learning on the basis of the proposed model. In the future, it is planned to conduct an experimental study aimed at checking the effectiveness of the organization of the blended educational process based on the proposed model. Further research perspectives include the improvement of the proposed model through the use of adaptive learning technologies, individualization and personalization of learning.

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МОДЕЛЬ ЗМІШАНОГО НАВЧАННЯ У ЗАКЛАДАХ ВИЩОЇ ОСВІТИ: РОЗРОБКА, ВПРОВАДЖЕННЯ ТА ОЦІНЮВАННЯ

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Анотація. У статті розглядається проблема моделювання змішаного навчання для забезпечення якісної професійної підготовки майбутніх фахівців різних профілів у закладах вищої освіти України. Мета дослідження: розробити модель змішаного навчання для закладів вищої освіти і проаналізувати результати її впровадження в освітній процес. На основі аналізу наукових публікацій зроблено висновок, що існує досить багато підходів до побудови та практичної реалізації моделей змішаного навчання, які враховують концептуальні погляди авторів та особливості певного освітнього середовища. Змішане навчання розглядається у статті як доцільне поєднання традиційного освітнього процесу в аудиторіях з дистанційним навчанням, самостійною роботою студентів і використанням цифрових технологій, яке відбувається за певною схемою. Проаналізовано поняття «змішане навчання» та «гібридне навчання», а також декілька існуючих моделей змішаного навчання. Розроблено узагальнену модель змішаного навчання в закладах вищої освіти, а також її візуальне подання. Впровадження цієї моделі дозволяє поєднувати різні види навчальної діяльності (набуття знань, формування практичних умінь, самостійне навчання, оцінювання тощо) під час очних та дистанційних занять саме в тій комбінації, яка необхідна для досягнення очікуваних результатів в умовах конкретного закладу вищої освіти. Наведено результати опитування, проведеного в Мелітопольському державному педагогічному університеті імені Богдана Хмельницького. Під час опитування було приділено увагу таким аспектам: як студенти розуміють сутність змішаного навчання, а також відмінність між використанням елементів дистанційного навчання під час очного навчання та повним використанням технологій дистанційного та змішаного навчання під час карантину; ставлення студентів до традиційного, змішаного та дистанційного навчання; як студенти сприймають навчальний процес, організований на основі запропонованої узагальненої моделі змішаного навчання. Окрім того, було з'ясовано, які цифрові технології використовуються в закладах вищої освіти для організації змішаного навчання. Загалом, за результатами опитування, підтверджено доцільність застосування розробленої моделі та визначено перспективні напрями наукових розвідок у царині змішаного навчання.

Ключові слова: вища освіта; модель змішаного навчання; дистанційне навчання; інформаційно-комунікаційні технології; ставлення студентів.