УДК 37.378.004
DOI: 10.36550/2415-7988-2025-1-217-239-244

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ВИКОРИСТАННЯ ІКТ В НАВЧАЛЬНОМУ ПРОЦЕСІ ПРИ ЗМІШАНОМУ НАВЧАННІ

На сферу вищої освіти лягає велика відповідальність за підготовку фахівців, здатні не тільки швидко включитися в роботу, а й розвивати науку, промисловість, які мають високий рівень інформаційної культури. В зв'язку з цим дослідження спрямоване на теоретичне обґрунтування, розробку та експериментальну перевірку методики застосування технологій змішаного навчання студентів ЗВО. Проаналізовано українські та зарубіжні дослідження щодо використання ІКТ у навчанні здобувачів освіти ЗВО. Вивчено різні способи подання навчальних матеріалів, можливості покращення та оцінювання вмісту. Вивчено досвід впровадження ІКТ у навчання таким чином, щоб це було не лише зручно, але і сприяло покращенню якості навчання, враховуючи власні темпи навчання здобувачів освіти, надаючи їм можливість задовольнити унікальні та різноманітні потреби у процесі навчання. Організація навчального процесу з використанням технологій змішаного навчання вимагає від викладача знань про доступні на сьогодні технології. При цьому вибір технологій завжди повинен здійснюватися з урахуванням ряду факторів. Серед цих факторів – можливості методики вчителя, кількість здобувачів освіти, які вивчатимуть курс, вимоги викладача до використовуваних технологій. В реальних умовах одні й ті ж самі методи викладач може використовувати по-різному, спрямовуючи діяльність студентів або на відтворення набутих раніше знань (репродуктивна діяльність), або на самостійне розв'язання нових навчальних завдань (творча діяльність).

На основі досвіду зарубіжних дослідників та на основі власного досвіду висвітлено проблеми, які виникають у процесі навчання з використанням змішаних методів навчання. Метою дослідження є адаптація систем реагування аудиторії та засобів інформаційних технологій для використання в освітньому середовищі закладів вищої освіти. Розглянуто класифікацію змішане навчання відповідно до частки контенту, що надається онлайн. Експериментально підтверджено ефективність змішаних методів навчання в процесі навчання здобувачів вищої освіти математичним дисциплінам. Висвітлено ряд проблем, з якими ми стикаємося під час змішаного навчання та надано пропозиції щодо їх подолання.

Ключові слова: *змішане навчання, виклики змішаного навчання, ІКТ навчання, ІКТ в освіті, методи змішаного навчання.*

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THE USE OF ICT IN THE EDUCATIONAL PROCESS DURING A BLENDED LEARNING

The sphere of higher education bears great responsibility for training specialists who are able not only to quickly join the workforce, but also to develop science and industry and have a high level of information culture. In this regard, the study is aimed at the theoretical substantiation, development, and experimental verification of the methodology for applying blended learning technologies to students of higher education institutions. In article have been analyzed Ukrainian and foreign studies on the use of ICT in teaching higher education institutions Various ways of presenting educational materials, and possibilities for improving and evaluating content, have been studied. The experience of implementing ICT in teaching has been examined in such a way that it is not only convenient, but also contributes to improving the quality of teaching by taking into account the unique pace of learning of education seekers and giving them the opportunity to satisfy diverse needs in the learning process.

The organization of the educational process using blended learning technologies requires the teacher to have knowledge about the available technologies today. At the same time, the choice of technologies should always be made, considering several factors. Among these factors are the possibilities of the teacher's methodology, the number of students who will study the course, and the teacher's requirements for the technologies used. In real conditions, the teacher can use the same methods in different ways, directing students' activities either to reproduce previously acquired knowledge (reproductive activity) or to independently solve new educational tasks (creative activity).

Based on the experience of foreign researchers and on own experience, the problems that arise in the process of learning using blended learning methods are highlighted. The purpose of the study is to adapt audience response systems and information technology tools for use in the educational environment of higher education institutions. The classification of blended learning according to the share of content provided online is considered. The effectiveness of blended learning methods in the process of teaching higher education students mathematical disciplines is experimentally confirmed. A number of problems encountered during blended learning are highlighted and suggestions are made to overcome them.

Key words: *a Blended Learning, challenges of a Blended Learning, ICT of learning, ICT in education, blended learning methods.*

Statement and justification of the relevance of the problem. Modern realities present us with many challenges. For quite a long time now, we have had to leave university classrooms but continue the learning process in a remote format. From personal experience, we can assert that this form of learning contributes to educational losses. The teacher's task is to minimize such losses, stimulate students to maintain interest in learning. Blended learning involves the integration of educational technologies into the learning process. Transitioning to blended learning is very easy to implement today. Over the past decade, many tools have been developed to support blended learning, an innumerable amount of tools and programs have exploded onto the education scene, presenting new ways of delivering, enhancing, and evaluating content. These tools are easy to use, intuitive, and many of them are free. The challenge is finding a way to delicately

infuse technology into our classroom instruction in a way that is not just convenient, but truly enhances the quality of students' learning experiences. We need to develop a blended, self-pace, mastery-base instructional model that will be able to help us meet the unique and diverse needs of all our students [4].

A blended learning approach, where students learn from a mix of computerized and in-person instruction, offers a promising alternative. For a teacher, the idea of transforming the very flow and function of a classroom can be a daunting task. It requires a full classroom redesign [4].

Analysis of recent research and publications. There are different approaches to defining the concept of a Blended Learning. Historically, the concept of a Blended Learning has changed and clarified.

The precise origin of the term "blended learning" is uncertain. However, one of the first occurrences that have been identified is its use in a 1999 news release from EPIC Learning, an Atlanta-based computer skill certification and software training business [5, p. 1].

The middle of the first decade of the 21st century marks a shift in the use of the term blended learning: The importance of this term in the higher education context (rather than industry and training) became clear, as did a broadly consensual understanding of its meaning. 2006 is the year of the publication of the first Handbook of Blended Learning, (Bonk, Graham, Cross & Moore), and a year later, the book Blended Learning in Higher Education: Framework, Principles, and Guidelines by Randy Garrison and Norman Vaughan appeared. The first of these books was introduced with a chapter titled "Blended Learning Systems: Definition, Current Trends, and Future Directions," by Charles Graham. This chapter works towards a definition of blended learning that has come to be widely accepted [5, p. 3].

The purpose of the article is to adapt audience response systems and information technology tools for use in the educational environment of higher education institutions.

Presentation of the main research material. A Blended Learning now:

- It refers to the combination of online and supervised workshop training where the knowledge theories are conducted through the internet and the supervised workshop training are conducted face to face [2, p. 3].
- Blended learning is a teaching and learning approach that demonstrates blend of different methods, technologies, and resources to improve student learning. Some examples of blended learning are flipped classroom, online interaction followed by face-to-face teaching, online learning supplemented by face-to-face practical, etc. [1].
- A formal education program in which a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path and/or pace, and at least in part at a supervised brick-and-mortar location away from home [8, p. 3].

The results of research

Blended learning is a teaching and learning approach that demonstrates blend of different methods, technologies, and resources to improve student learning. Some examples of blended learning are flipped classroom, online interaction followed by face-to-face teaching, online learning supplemented by face-to-face practical, etc.

Allen and Seaman's (2003) and Allen, Seaman, and Garrett's (2007) studies illustrated a prototypical course classifications and the proportions of online parts of the different learning and teaching environments. In their classification, they defined blended learning with reference to the proportion of the online parts in the content and claimed that substantial proportion (30 to 79%) of the content is delivered online and blended courses typically uses online discussions in addition to some face-to-face meetings. Table 1 will contribute to the in-depth understanding of the definition of blended learning as well as the other type of instructional environments that integrates the technology into its curriculum [3].

Table 1

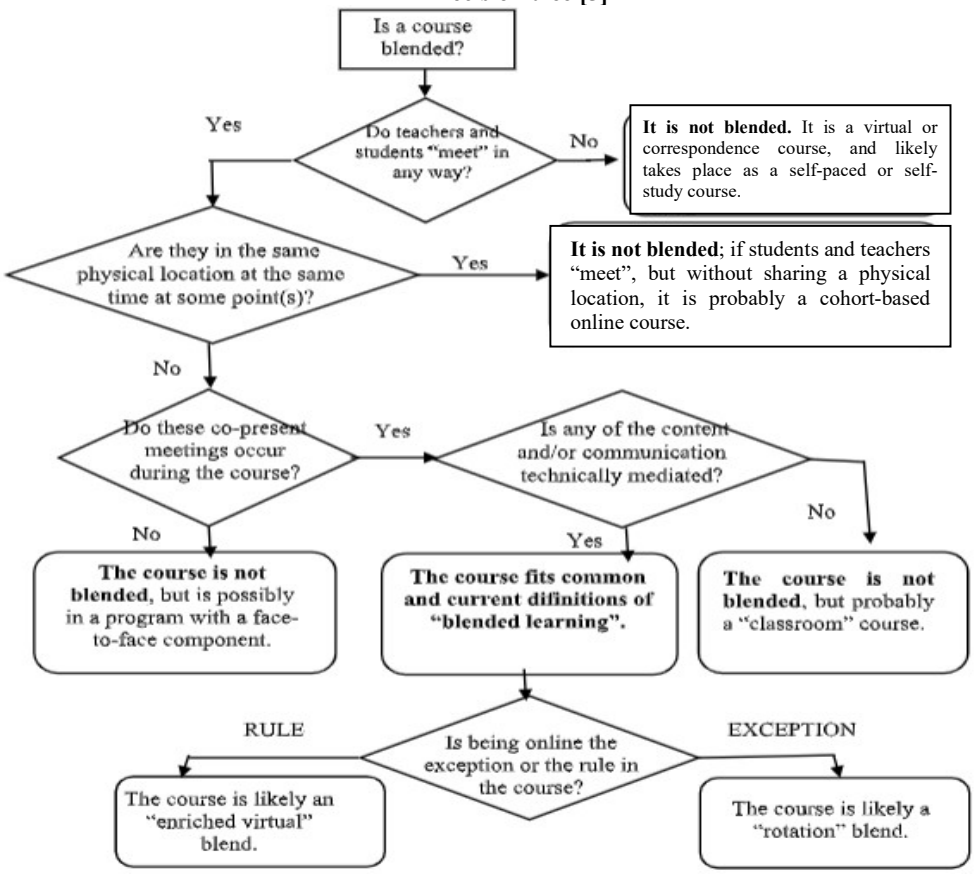
Classifications of blended learning.

Proportion of Content Delivered Online	Type of Course	Typical Description
0%	Traditional	Course with no online technology used—content is delivered in writing or orally.
1 to 29%	Web Facilitated	Course, which uses Web-based technology to facilitate what is essentially a face-to-face course. Uses a course management system (CMS) or Web pages to post the syllabus and assignments, for example.
30 to 79%	Blended	Course that blends online and face-to-face delivery. Substantial proportion of the content is delivered online, typically uses online discussions, and typically has some face-to face meetings.
80+ %	Online	A course where most or all of the content is delivered online. Typically have no face-to-face meetings.

The taxonomy provided by Stalker and Horn, together with the other definitions and contexts provided above can be combined in a decision tree (Chart 1). The process it describes is assumed to apply to courses with significant online components, and it may thus serve as a heuristic for determining whether a course is blended or of another kind altogether. At the same time, it may fulfill a more analytical purpose: to isolate the decision points, or the occasions of convergence or divergence, that may occur in defining blended learning or determining the "blended" status of a given course [5].

Chart 1

Decision tree [5]



During programmer development and course planning we must consider all factors [9]:

At the operational level, online and blended learning require faculty to bring online elements into their programme development and course-planning processes. It is important that these processes are aligned with many possible upstream frameworks, both external and internal, such as national qualifications frameworks, subject-specific quality standards, institutional vision and frameworks on teaching and learning, and so on.

Eventually, online and blended learning modalities should be reflected in different parts of all programme and course profile documents that are developed.

As part of setting expected learning outcomes, whether through online or offline learning, the end results should be the same or, if not, should include relevant online-related objectives and outcomes. The same is true of modules of learning. The most relevant parts are modalities of delivery, pedagogical considerations and assessment of learning achievements as well as the availability of online learning resources. The percentage of online and offline learning should be decided depending on the nature and needs of the study programs and courses. Online learning pedagogy should be developed properly, taking into account the evolving dynamics between students, teachers, learning materials, parents, local communities, and so on.

Online-learning assessment is quite different from in-person assessments and concrete techniques should be developed to deal with these challenges. Faculty may also need to contribute to and make the most of available online open educational resources to benefit more students in their local education systems and beyond.

To overcome the gaps in delivering high-quality teaching and learning, institution-supported rapid innovation is more critical than ever.

There are three major challenges we will need to overcome [4]:

1. Retaining Teacher Authenticity. With technology in the classroom, it's easy enough to sit students down in front of pre-made instructional videos with an endless stream of pre-written questions. However, is it effective? Knowing that the educator is the most important agent of change in the classroom, teachers need customizable instructional delivery models designed to retain the teachers' authenticity.

When using outsourced content, educators naturally take a back seat, and students may question whether their teacher is truly invested in their education. The rote use of technology therefore erodes at an educator's ability to build meaningful relationships with students.

2. Creating an Effective Self-Paced Learning Environment. Self-pacing, a key principle of many blended learning programs, is built on the notion that some students require more time than others to learn skills. Nevertheless, like any academic skill, self-direction is hard and must be scaffolded for students. Otherwise, students who are great at self-management flourish, while students that aren't only fall further behind. This leads to a highly unequal classroom where successful students learn fast and independently through an online portal, while unsuccessful students fall quickly through the cracks and feel lonely and lost.

3. Building Student Authentic Mastery. Getting students working independently using computers is one thing – but how did we ensure that students truly learned? Many computer-based programs allow students to speed through requirements without truly mastering the content or skills they need to succeed. These approaches had the potential to increase learning gaps and expose students to too much screen time.

Hofmann Jennifer in her book solves 10 Challenges of Blended Learning [6]:

A. Technology challenges: 1. Ensuring your participants can be successful using the technology. 2. Resisting the urge to use technology simply because it is available.

B. Organizational Challenges: 3. Overcoming the idea that blended learning is not as effective as traditional face-to-face learning. 4. Redefining the role of the facilitator. 5. Managing and monitoring participant progress.

C. Instructional/Design Challenges: 6. Looking at HOW to teach, not just WHAT to teach. 7. Matching the best delivery medium to the performance objective. 8. Keeping online offerings interactive rather than just "talking at" participants. 9. Ensuring participant commitment and follow through with "non-live" elements. 10. Ensuring all the elements of the blend are coordinated.

Disadvantages of blended learning exist but they are not unsurpassable. The negative impact can be minimized or even channeled into productive activity if the instructor keeps an eye on student feedback, improves technology skills and delivers quality courses. Many teachers, may have already cut their teeth on blended learning, so they can give a few pointers. That said, every experience is unique and can hardly be duplicated under different conditions. Every learning methodology has its pros and cons. As always, you need to measure your requirements against existing options. An unrestrained and versatile educational environment may be an invaluable motivational factor for some, and a source of cognitive dissonance for others [7].

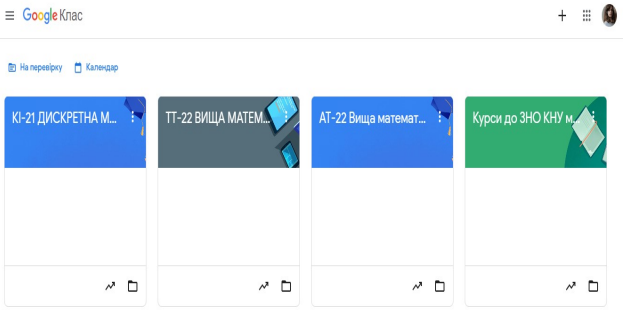
The success of any blended learning implementation is determined in the planning stage. When we plan for technical, organizational, and instructional challenges, we will reap the benefits of investing the time and resources in creating a well-equipped workforce. [6]

We have previously described our experience of implementing LMS in the process of teaching mathematics to engineering students at a technical university. Then the decision was made to use Moodle in teaching engineering students at Krivoy Rog National University. We have created courses in mathematics that help students to improve their knowledge of course, check their level of preparedness for the classroom lessons, writing module works. The created tests made possible to find the gaps in students' knowledge on a specific topic of the course [10].

Now we would like to share our experience in using the cloud service for organizing distance and blended learning. Google Classroom (Chart 2) is all-in-one place for teaching and learning. It easy-to-use and secure tool helps educators manage, measure, and enrich learning experiences.

Chart 2

Distance courses developed



Google solutions create the powerful computing infrastructure that keeps today's higher education communities humming. Students and faculty can collaborate easily and securely across disciplines and campuses. Google for Education productivity solutions fit seamlessly alongside higher education tools and systems, helping students and faculty be more efficient and productive.

There are many positive factors that influenced the choice of this service (Chart 3):

all-in-one place, all our learning tools together and manage multiple classes in one central destination; easy to use: our students can get up and running with Classroom in minutes; built for collaboration: working simultaneously in the same document with the whole class or connect face-to-face with Google Meet; access from anywhere: empower teaching and learning from anywhere, on any device, and give your class more flexibility and mobility.

Chart 3

Study material in distance learning courses

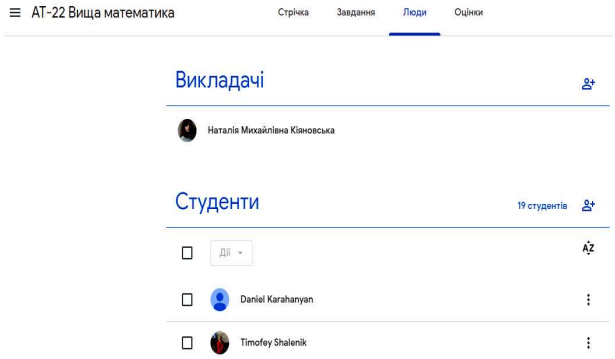
You can use Classroom in your university to streamline assignments, boost collaboration, and foster

communication. Classroom for teachers is (Chart 4): to start a video meeting; to create and to manage classes, assignments, and grades online without paper; to add materials to your assignments, such as youtube videos, a google forms survey, and other items from google drive; give direct, real-time feedback; use the class stream to post announcements and engage students in question-driven discussions; invite parents and guardians to sign up for email summaries with a student's upcoming or missing work.

Classroom for students is (Chart 4): track classwork and submit assignments; check originality, feedback, and grades; share resources and interact in the class stream or by email. Classroom for guardians is: get an email summary of your student's work; review announcements and activities. Classroom for administrators is: protect data and set permissions for your users; set up classes and rosters; add or remove students and teachers from classes; get 24/7 support.

Chart 4

Data on students and teachers of distance courses



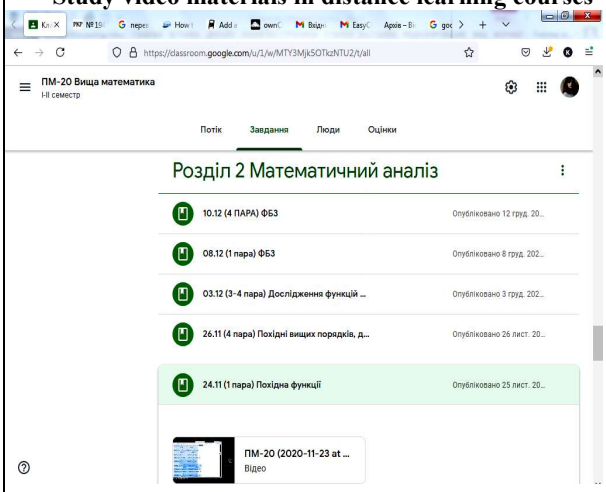
For saving time and simplifying everyday tasks you can in free edition switch from class to assignment to student in just a few clicks; track student progress in your gradebook and export scores to your student information system (SIS); keep grading consistent and transparent with rubrics displayed alongside student work; store frequently used phrases in a customizable comment bank

You can enhance student learning experiences:

- give students the ability to adjust accessibility settings so they can learn in the way that works best for them – even in multiple languages;
- keep everyone on track with student to-do and teacher to-review pages, and due dates that automatically appear on student calendars when classwork is created;
- upload documents automatically as templates to give each student their own copy of an assignment when it is created;
- enable students to check their own work for recommended citations;
- allow students to snap and submit a picture of their paper homework quickly and easily with improved image capturing;
- upload video of meetings for students to watch at any time convenient for them (Chart 5).

Chart 5

Study video materials in distance learning courses



We make video conferencing available to everyone. Educational institutions can to host meetings with up to 250 users (organization employees and external participants) and broadcasts with up to 100000 viewers in the domain.

Conclusions and prospects of further exploration of the direction. The organization of the educational process using blended learning technologies requires teachers to know about the technologies available today. At the same time, the choice of technologies must always be made taking into account a number of factors. Among these factors are the capabilities of the teacher's technique, the number of students who will study the course, and the teacher's requirements for the technologies used.

We opted for the Google Classroom, because with the use of this service we were able to solve all the necessary tasks in the educational process. Even with only a telephone, we have the opportunity, if necessary, to organize the educational process not only in the classroom, but also in distance learning courses.

Of course, working with students at a distance also posed some problems. Among them were difficulties with the Internet connection, and problems with working on an interactive whiteboard, and the need for students to learn, in addition to the educational material on the subject, and knowledge about the work of the implemented technologies.

Another challenge in organizing online meetings is keeping all students active. It is especially difficult to track the activity of students in the absence of video communication with them. When the screen sharing mode is turned on, the teacher loses visual contact with the students, which in some cases leads to a decrease in students' attention. In our case, in order to maintain the attention of students on the educational material, we conducted a survey on the studied block of material, thereby keeping the attention of students.

It should also be borne in mind that holding remote meetings in Google Meet using the phone excludes the possibility of making a recording of the meeting. We would like to note that in the organization of the educational process in the mode of online meetings, it was the recordings of the meetings that played an important role. According to the students' feedback, they repeatedly looked through the

recordings of meetings to complete their individual work.

The last thing we would like to note is that it does not matter which information technologies you choose for organizing blended learning, the main thing is that these information technologies are understandable and simple for you and your students. You can find a lot of advice on the convenience of certain services, but the final choice is always yours.

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ВІДОМОСТІ ПРО АВТОРІВ

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Стаття надійшла до редакції 09.02.2025 р.

УДК 378.02:372.8
DOI: 10.36550/2415-7988-2025-1-217-244-250

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