Blended learning as a promising direction of informatization of higher education

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Abstract. The article discusses possible options for transitioning from the traditional form of organization of the educational process to blended learning at the university. The author reveals the advantages and disadvantages of blended learning organization models, which allow combining traditional face-to-face learning with the self-study work of students in a digital environment that corresponds to a new generation of professionals. The advantages of the models include the formation of educational routes for students, taking into account the goals of education, changes in the speciality and the labour market, and great freedom of the student when he can choose a convenient time, place and pace of learning; motivating students to study in traditional classes with a teacher, reducing the percentage of failed courses. Keywords: informatization, higher education transformation, blended learning models, learning trajectories.

1 Introduction

The term "blended learning" was first used in the 1960s. It was vague and covered various pedagogical forms, methods and means [1].

In 2006, this term is still not specific: blended learning systems are defined as systems that combine face-to-face learning with computer learning [2].

This definition does not reveal the differences between computer and face-to-face learning. For example, disciplines related to programming can be taught as part of a traditional full-time education when both the teacher and students are in a computer lab within the university's walls.

Currently, the concept of blended learning, developed by the Clayton Christensen Institute (CCI) [3], has been adopted. It defines blended learning as a formal educational program in which a student learns:

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- Partially online - self-study work of the student on educational and methodological content posted on the Internet, when the student himself decides on the time, place, route and pace of learning;
- Partly away from home - traditional full-time synchronous learning within the university walls, during which face-to-face interaction of participants in the educational process is carried out.
- Along a Learning Path - interactive online interaction between a teacher and a student (students), carried out in real-time on the Internet.

As we can see, in blended learning, in addition to the full-time part and distance work of students, there is a mandatory virtual component - e-learning to support student self-study.

By e-Learning, we mean the transfer of knowledge and skills, management and support of students in the learning process using a computer, laptop or mobile phone based on an online platform and various Internet technologies.

Blended learning [4]:
- It is personalized, taking into account the individual characteristics of students, when students can choose where, how and what they learn, what, when and how to do;
- is competency-based or mastery-based, when the transition to the study of new material is carried out only after the student has fully mastered the educational materials necessary for this;
- is carried out in an environment of high student achievement, when each student has both the ultimate learning goal to which he aspires and the opportunity to change his individual educational trajectory (route) to achieve this learning goal;
- assumes that the student is personally responsible for choosing the method and place of study for the learning outcomes.

So, let us define blended learning as a technology for organizing the educational process, which combines the forms and methods of traditional face-to-face learning, modern e-learning tools and technologies, and synchronous and asynchronous distance learning elements.

2 Materials and methods

The study and analysis of pedagogical literature and information sources on the Internet allows us to identify several effective blended learning models for higher education [5, 6, 7, 8, 9].

Let us consider them.

2.1 Rotation models

Rotation models are a series of models (station rotation, lab rotation, flipped classroom, individual rotation) that change how students learn.

For example, at the beginning of the semester, according to a fixed schedule or at the teacher's discretion, second-year students study face-to-face, and third-year students study online. Then, in the middle of the semester, there is a rotation – second-year students begin to study online, and third-year students study full-time with a teacher. Or students of one group begin to study the first discipline in person and the second discipline online. After a certain period, there is a rotation – a change in the way of teaching (in-person and online) of the first and second disciplines.

This model is expedient within the framework of one discipline when the teacher controls both classroom work and the organization of self-study work of students in a group.
The teacher determines the criteria for division into subgroups depending on the pedagogical tasks being solved.

Within the framework of the flipped classroom model, the primary learning activities are reversed. What was classroom work is transferred to home conditions, and what was self-study (home) task becomes the subject of group (within the university) consideration. This is where the flipped class metaphor comes from.

Students get acquainted with the new educational and methodological content at home at a convenient time for them.

To do this, teachers develop and post on the university portal: lecture materials, practical work, and assignments for self-study work, and also offer links to thematic presentations and videos posted on the Internet.

The students themselves perform practical work and assignments for self-study work in the classroom under the guidance of a teacher.

At the same time, it is advisable to use active forms and teaching methods: discussions, brainstorming, case studies, and training projects.

Under the individual rotation model, the student can choose to study individually.

The model allows students to choose academic disciplines and the most convenient forms and methods of organizing the educational process.

This model is appropriate for students with special educational needs (gifted, limited mobility students); students living in other cities or remote villages, and athletes who are away for competitions and cannot attend all face-to-face classes at the university.

Within the framework of this model, a student studies an academic discipline on an individual but clearly fixed schedule.

### 2.2 Flex model

The main idea of the Flex model is that students are not limited in time and place to perform one or another type of educational activity. They study on an individual, flexible schedule, changing different ways of learning.

The teacher is constantly at the workplace at the university. He works (face-to-face or online) with small groups or individual students: lectures, give advice, and also answers questions from students, for example, using modern achievements in mobile communications based on mobile messengers (https://www.inetgramotnost.ru).

Students study in a digital information environment. In their work, they use the online platform of the university, which contains: a schedule of mandatory full-time and online classes, educational and methodological content, questions and tasks to control knowledge and skills. As necessary, both students' own (home) computers and laptops, computer classes, and educational laboratories within the university's walls are used.

### 2.3 Self-Blend model

The modern Self-Blend model assumes such an organization of the educational process when a student, forming his own learning path, can, in addition to the traditional educational process, choose one or more online courses offered at the university.

At the same time, as a rule, a full-time teacher is also an online course teacher. That is, students can change their place of study.

For example, in the process of remote classes, students can visit the city library, stay at home, and also study in a computer class within the walls of the university.

Students can communicate with the teacher in person in the classrooms of the university or study online using electronic educational and methodological content.
The educational process at the university is organized in such a way that students can attend both the main classes at the university and additional online classes.

2.4 Model a la carte

The modern model “A LA CARTE” allows students to independently design their own educational trajectory (learning path). Students choose additional academic disciplines based on one or more universities or massive open online courses (MOOC) on popular online platforms.

For example, a student enrolled in the professional educational program “Information Technology” wants, in addition to the main educational work performed at the university, to master the massive open online course "Japanese for Beginners" posted on the popular MOOC platform Coursera (https://www.coursera.org) and take the distance course "1C: Accounting 8.1" at the National Open University "INTUIT" (https://intuit.ru).

Massive Open Online Courses are a new form of online learning, which is based on the idea of making education mass and public.

The abbreviation MOOC consists of four separate terms [10, 11]:

The term "Massive" refers to a significant number of students who are not limited by geographic location; for example the most popular massive online courses gather hundreds of thousands of students.

The term "Open" means free or shareware content; as a rule, there are no fees for attending a course and for participating in assignments, fees are charged for the certificate of completion of the course, which is incomparable with the more significant costs of full-time training.

The term "Online" means that all courses are for distance learning; course content is presented in electronic form, usually videos, text files, forum discussions, links to other sources of information, which can be accessed using online communication tools.

The term "Course" implies a structured and orderly presentation of information with specific goals, rules of work and time constraints, which may vary for each individual student.

The labor market is developing rapidly. Massive open online courses are changing rapidly, reflecting changes in specialties and the labor market. At the same time, a large percentage of courses remain incomplete [12].

Under the A LA CARTE model, university attendance is optional. Students can change their place of study. They can study face-to-face with a teacher, visit the educational laboratories of the university or study at home only on online courses using electronic educational and methodological content.

Students can interact with teachers, who teach courses, or students can only communicate with the teacher virtually, or students may not communicate with the teacher at all. Students can also get online advice from other professionals working in the same specialty.

Students are not limited by the curriculum; they can study in their free time.

At the same time, each student studies the educational material at a convenient pace, some topics are given more attention, and some topics are studied at a faster pace.

2.5 Enriched virtual model

This blended learning model is an alternative to the traditional face-to-face organization of the educational process; it allows students to do most of the learning work online.

The model has a wide range of different implementation options. Most often, it is implemented within the framework of any discipline to the educational needs of students.
For example, for 2nd-year students who want to study the discipline "IT and Digital Culture" based on traditional groups, new interfaculty groups are created and selected according to the levels of computer proficiency.

Students’ levels of knowledge and skills are determined by input computer testing.

The same students are divided into groups for studying the discipline "Professionally oriented English" according to the levels of English proficiency, which is determined by the questions of entrance testing.

The composition of the groups for the first and second disciplines does not match.

The degree of control over the process of studying disciplines by each student in the framework of this model is high.

Teachers provide students with constant consulting support.

3 Discussion

The online platforms Moodle (https://moodle.org) and We.Study (https://we.study) can be used to organize blended learning. They support various types of online classes, allow you to place online courses, text content, computer tests, combining them in a single system that involves students in the learning process.

Online platforms such as Schoology (https://www.schoology.com), Google Classroom (https://classroom.google.com/h), and Blackboard CourseSites (https://blackboard.coursesites.com) allow educators communicate with students; post educational and methodological content; collect and evaluate assignments completed by students.

The online platforms LearningApps.org (https://learningapps.org) and Lectorium (https://www.lektorium.tv) are designed to create and post your own interactive teaching and learning materials on the Internet.

VoiceThread (https://voicethread.com) is an online interactive collaboration platform that provides a cloud-based tool for all students to present and defend their work in front of experts and peers. For teachers, it provides for moderation of access to viewing content and leaving comments. The training content of the service can be used both in asynchronous learning and in the face-to-face model. This means that this platform can be used for blended learning.

In blended learning, online learning platforms are needed to:
- register teachers and students of the university;
- provide them with the possibility of regular authorized access to the online platform of the university;
- provide teachers with the ability to upload files with educational and methodological content to the online platform;
- collect the content of training courses from separate files, computer tests, and homework, including in the SCORM format;
- provide students with the opportunity to download files with educational and methodological content;
- store and analyze the learning outcomes of each student;
- provide protection mechanisms necessary for a networked environment of blended learning.
Table 1. Elements online learning platforms included in Blended Learning Models.

<table>
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<tr>
<th>Blended learning models</th>
<th>Regular authorized access of teachers and students to the online platform</th>
<th>Teachers upload files with educational and methodological content to the online platform</th>
<th>Downloading files with educational and methodological content by students</th>
<th>Storage and analyze of the learning outcomes of each student</th>
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<td>Station Rotation</td>
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The range of technological solutions of online platforms used to support blended learning is quite broad - it can be the author's software products, learning management systems, or content management systems. In the simplest case, an online platform is a website and mobile application.

For example, in BSTU "VOENMEH" named after D.F. Ustinov and WKATU, named after Zhangir Khan, the LMS Moodle learning management system (https://moodle.org), are used to support blended learning.

When choosing a platform for blended learning, you need to make sure that it allows you to combine synchronous and asynchronous learning within the same curriculum.

4 Results

So, *blended learning* has several advantages and disadvantages:

The advantages of such a technology for organizing the educational process include the following:

- online learning (as well as distance learning) allows the learning process to go beyond classrooms; allows the teacher to teach more students at the same time;
- modern e-learning tools and technologies provide the student with greater freedom when learning can be carried out at any time and anywhere when the student can choose various sources of educational and methodological content, as well as the pace, time and place of study;
- at the same time, *traditional classes* within the walls of the university create a favourable educational environment for the interaction of the teacher and students, as well as students among themselves, increasing students' motivation for learning;
- mobile communication and global Internet technologies allow participants in the learning process to receive quick feedback when using a mobile phone and the WhatsApp application; they can discuss educational material with the teacher and students of the group, ask questions and quickly get answers;
online testing partially reduces the teacher's time to check student progress.

The disadvantages of blended learning include the following:

- different levels of knowledge of information and communication technologies by teachers and students;
- students' dependence on technology and software, from having access to the global Internet.

Possible obstacles to the introduction of blended learning:

- the rigidity of existing forms and methods of teaching;
- modern reporting formats and content;
- difficulties in creating electronic educational and methodological content (video materials, training and testing programs) that meet state educational standards and the author's teaching methods;
- possible decrease in students' motivation and operational control in the learning process.

## 5 Conclusion

As part of blended learning, several modern models for the effective organization of the educational process have been developed.

Rotation models are similar - they change the way students learn: with a teacher and online learning. Models of alternating stations and changing laboratories differ in the first model; students move within the same classroom or one computer class. The second model is implemented using several classrooms: a lecture room, a computer class, or an educational laboratory. In implementing the flipped classroom model in the classroom, the focus shifts from an overview of a new topic to its joint study and research work. The individual rotation model differs from other rotation models in that the student does not have to move on to every discipline topic or learning mode.

The Flex model is one of the most challenging models to implement. It considers each student's cognitive needs as much as possible, allowing you to deploy learning in the direction of personalization.

The Self-Blend and A LA CARTE models allow students to master additional disciplines of their choice and form student learning paths, taking into account changes in the speciality and the labour market. Within the framework of the first model, the student studies within the walls of one university. In the Second model, the student's educational trajectory can be designed based on several universities or MOOC platforms.

The defining term for the predominantly virtual model is flexibility. Although attending classes at the university is mandatory for students, there are not many such classes, and the basis of the educational process is online and e-learning. This model differs from the flipped classroom model, as students do not attend university daily. It also differs from the Self-Blend and A LA CARTE models in its comprehensive approach to learning, as opposed to its complementary course approach.

Thus, it can be argued that one of the promising areas of digital transformation and further informatization of higher education is the transformation of traditional face-to-face education into a blended learning format by combining traditional face-to-face forms and classroom methods with self-study work of students in a digital environment corresponding to a new generation of specialists.
References


