

THE STUDY OF BLENDED LEARNING METHODS IN HIGHER EDUCATION INSTITUTIONS

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Abstract: *The relevance of the study is determined by the fact that the considerable attention to the problem of the training quality has been paid, because in recent years the employers appreciate an acute dissatisfaction with the training of graduates on labor market. A graduate of a higher educational institution of any qualification is required to possess not only theoretical knowledge, but also practical skills in solving problems in the professional sphere. The use of traditional learning (lectures, workshops, seminars) often leads to the passivity of students and does not cause much interest in the manifestation of their capabilities. Therefore, one of the tasks of modern education is to increase the interest on the part of students to acquire knowledge, on the other hand, to activate their activity in acquiring this knowledge independently. One of the important factors for improving the system of training professional personnel in higher education is the active use of more effective teaching methods and technologies in the educational process, in particular, e-learning, distance learning technologies. The combination of models, forms and methods of learning becomes relevant, blended learning acquires a special role.*

Keywords: Higher education institution, blended learning models, students, teachers, factors.

The blended learning system as an aggregate of elements united by constant interaction to perform the functions of the educational process, has the following aspects are important: institutional (the presence of an e-development strategy, in particular, blended learning at the university); managerial-technological (organization and management of the educational process, which combines traditional forms and e-learning); pedagogical (development of methods, models and teaching

and methodological support of the educational process in the electronic learning environment). Let`s consider them in greater detail.¹

Elements of blended learning should be reflected in the documents regulating the entire educational process in universities and documents devoted to the educational process in the electronic environment,² in particular, in the provision of the e-learning course, instructions on how to conduct certification of students in the form of electronic testing.³ Also, the teacher's responsibility is to carry out the learning process using e-learning should be specified in his contract with the university.⁴

The technological implementation of e-learning is carried out by means of the LMS (Learning Management System), which integrates the didactic and organizational functions of the learning process.⁵ Didactically, the LMS delivers information (electronic textbook, presentations, topics of test and coursework, etc.), communicates through a forum, chat, e-mail; organizes group and individual work of students, knowledge control through testing.⁶ Organizational functions

¹ J. Jung, M. Schütte, "An interactionist perspective on mathematics learning: conditions of learning opportunities in mixed-ability groups within linguistic negotiation processes", in *ZDM*, 50, no. 6, (2018), pp. 1089-1099; D. Rughetti, P. Di Sanzo, A. Pellegrini, B. Ciciani, F. Quaglia, "Tuning the level of concurrency in software transactional memory: an overview of recent analytical, machine learning and mixed approaches", in *Transactional Memory. Foundations, Algorithms, Tools, and Applications*, (2015), pp. 395-417; T. N. Bochkareva, E. M. Akhmetshin, A. L. Korotkova, N. L. Lyitkina, I. S. Nasipov, A. G. Khaliullina, "Research of students' cognitive activity", in *Espacios*, 38, no. 60, (2017), pp. 32-38; E. M. Akhmetshin, S. I. Makulov, I. A. Talysheva, S. Y. Fedorova, S. Gubarkov, "Overcoming of intercultural barriers in the educational environment", in *Man in India*, 97, no. 15, (2017), pp. 281-288.

² M. Andrieux, L. Proteau, "Mixed observation favors motor learning through better estimation of the model's performance", *Experimental Brain Research*, 232, no. 10, (2014), pp. 3121-3132.

³ M. van Someren, J. Surma, P. Torasso, "A utility-based approach to learning in a mixed case-based and model-based reasoning architecture", in *Proceedings of the II International scientific conference: "Case-Based Reasoning Research and Development"*, (1997), pp. 477-488.

⁴ J. C. Lester, B. A. Stone, G. D. Stelling, "Life like pedagogical agents for mixed-initiative problem solving in constructivist learning environments", in *Computational Models of Mixed-Initiative Interaction*, (1999), pp. 185-228.

⁵ L.-Ch. Chang, H.-K. Chiang, "Designing a mixed digital signage and multi-touch interaction for social learning", in *Proceedings of the VIII International scientific conference: "Transactions on Edutainment"*, (2012), pp. 77-87.

⁶ R. Masoud, M. Montazeri, H. Farrokhi-Asl, H. Rafiei, "A multi-objective genetic algorithm for a mixed-model assembly U-Line balancing type-I problem considering

include monitoring performance, generating reports and collecting statistical data.⁷

Information and communication technology (ICT) tools are often used that extend beyond LMS, Skype, mobile applications, and social networks are often used in blended learning.⁸

Cloud computing also extends e-learning.⁹ In particular, Google Apps and Microsoft Live@edu provide content placement tools, learning and communication controls similar to autonomous LMS.¹⁰ The implementation of e-learning requires special departments that provide software and hardware support and organizational support for the educational process.

Literature review

An analysis of publications on the use of e-learning technologies allows us to state that this type of education has certain disadvantages: lack of social contact with other participants in the learning process, the possibility of theoretical material misinterpreting by the student, the need for a high level of students' self-study.¹¹ The blended learning compensates these disadvantages.¹²

human-related issues, training, and learning", in *Journal of Industrial Engineering International*, 12, no. 4, (2016), pp. 485-497.

⁷ R. Balasubramanyan, D. Bhavana, W. W. Cohen, "From topic models to semi-supervised learning: biasing mixed-membership models to exploit topic-indicative features in entity clustering", in *Machine Learning and Knowledge Discovery in Databases*, (2013), pp. 628-642.

⁸ M. Saidane, Ch. Lavergne, "Learning and inference in mixed-state conditionally hetero factor models using Viterbi approximation", in *Computational Science*, (2006), pp. 372-379.

⁹ A. Welsher, L. E. M. Grierson, "Enhancing technical skill learning through interleaved mixed-model observational practice", in *Advances in Health Sciences Education*, 22, no. 5, (2017), pp. 1201-1211.

¹⁰ Yu. Du, Yi. Dong, Q. Zengchang, T. Wan, "Exploring market behaviors with evolutionary mixed-games learning model", in *Computational Collective Intelligence. Technologies and Applications*, (2011), pp. 244-253.

¹¹ R. Abramov, M. Sokolov, "Theoretical and methodological aspects of the formation of anti-corruption mechanisms in the system of higher education of the Russian Federation", in *International Journal of Environmental and Science Education*, 11, no. 15, (2016), pp. 7431-7440.

¹² J. Lang, Ch. Bory, "Statewide implementation and sustainment of evidence-based treatment using learning collaboratives: a five-year mixed-methods study", in *Implementation Science*, 10, no. 1, (2015), pp. 70-78.

There are many approaches to the definition of the concept of blended learning, most of which are descriptive.¹³ Here are some of them: this is a combination of traditional formal learning tools - working in classrooms, theoretical material study-with informal ones, for example, discussions via e-mail and Internet conferences; it is a combination of different ways of delivering educational content and an educational content management system; it is a combination of opposing, at first glance, formal and non-formal learning, face-to-face communication and online communication, guided actions and independent choice of the path, the use of automated references and connections with colleagues to achieve their goals and the goals of the organization; this is the use, in one way or another, of electronic and classroom learning.¹⁴

Blended learning is an approach that integrates traditional learning and computer-mediated learning in the teaching environment.¹⁵

Blended learning is interpreted as a purposeful process of obtaining knowledge and skills in the context of integrating classroom and extracurricular educational activities of subjects of the educational process based on the use and mutual addition of traditional, electronic, distance and mobile learning technologies in the presence of the student's self-control over time, place, routes and pace learning.¹⁶

The category "blended learning" is considered in a narrow and broad sense.¹⁷ In a narrow sense, we understand the purposeful process of obtaining knowledge and skills that is carried out by educational institutions of various types within formal education, part of which is implemented remotely using information and communication

¹³ S. E. Kirkley, J. R. Kirkley, "Creating next generation blended learning environments using mixed reality, video games and simulations", in *TechTrends*, 49, no. 3, (2005), pp. 42-53.

¹⁴ M. Ma, "Interactive mixed reality for muscle structure and function learning", in *Medical Imaging and Augmented Reality*, (2016), pp. 117-128.

¹⁵ A. J. Sedgewick, I. Shi, R. M. Donovan, P. V. Benos, "Learning mixed graphical models with separate Sparsity Parameters and stability-based model selection", in *BMC Bioinformatics*, 17, no. 5, (2016), pp. 170-175.

¹⁶ S.-J. Cho, A. P. Goodwin, "Modeling learning in doubly multilevel binary longitudinal data using generalized linear mixed models: an application to measuring and explaining word learning", in *Psychometrika*, 82, no. 3, (2017), pp. 846-870.

¹⁷ J. Hommes, P. van den Bossche, W. de Grave, G. Bos, L. Schuwirth, A. Scherpbier, "Understanding the effects of time on collaborative learning processes in problem-based learning: a mixed methods study", in *Advances in Health Sciences Education*, 19, no. 4, (2014), pp. 541-563.

technologies and technical training tools that are used to store and deliver educational material, implementation of control measures, the organization of interaction between the subjects of the educational process (consultation, discussion) and during which it has the self-learner (student) with respect to time, place and pace of learning routes.¹⁸

In a broad sense, these are various options for combining forms and organizing methods of formal, non-formal, informal learning, as well as self-study, carried out to achieve a person's predetermined learning goals while maintaining a mechanism for controlling time, place, routes and pace of learning.¹⁹

By blended learning we mean a focused, organized, interactive process of interaction between students and teacher, which didactically optimally combines the technologies of traditional and online learning, which is based on information and communication technologies and is focused on the individual needs of students, regardless of their location in space and time.²⁰

Materials and methods

Analyzing the approaches to the definition of the concepts of distance, electronic, blended learning, we note that in modern literature there is a discrepancy in understanding the relationship of these types of training, which leads to the need to study their models to highlight the relationship between developed models and models that are implemented, the analysis of their classifications` basis, as well as model design activities.²¹

¹⁸ K. Zhang, Ch. Xiaoyan, H. Wang, "Research on the mixed-learning model and the innovative talent cultivation mechanism based on computational thinking", in *Recent Developments in Intelligent Computing, Communication and Devices*, (2019), pp. 59-65.

¹⁹ W. Xiangrui, N. S. Chaudhari, "Recurrent neural networks for learning mixed K-th-order Markov chains", in *Neural Information Processing*, (2004), pp. 477-482.

²⁰ H. Rohbanfard, L. Proteau, "Learning through observation: a combination of expert and novice models favors learning", in *Experimental Brain Research*, 215, no. 3, (2011), pp. 183-197.

²¹ A. P. Koshkin, R. A. Abramov, E. Y. Rozhina, A. V. Novikov, "Role of social representations in student motivation for acquiring further education" *Interchange*, 49 (2018), no. 3, p. 313-341.

Without dwelling on the review of approaches to the definition of selected concepts, we define the dominant features of each of them.²² Distance learning implies remoteness of the teacher and the student, when the transfer of educational materials occurs through any means of communication; e-learning is treated as a learning based on electronic means; blended learning assumes the presence of an invariant component, it is also a combination of the classroom and distance components, presented in different proportions, using various means of training and management of educational activities (the ratio of the selected components is determined either by the student himself or with the teacher in the process of joint communication (agreement) based on the psychological and pedagogical characteristics of each student.)²³

That is, the mixed and distant learning are combined by the e-learning, and elements of e-learning can be included in traditional learning.

Results and discussions

Foreign authors identify blended learning models depending on the ratio of study time spent on traditional and network-based learning, and the degree to which e-learning reduces the time spent in the classroom²⁴ (Schneider, 2017).

The percentage of ICT as part of blended learning can range from 30 to 79 percent in the educational process. This range makes it possible to create mixed courses with a predominant classroom component (30% – 50% of ICT in the training course) and remotely one (50% – 79%). The next category, from 0 to 30 percent, includes both ICT-enabled training courses and training, in which they are completely not involved. Online learning involves the use of more than 80% of ICT.

The model of blended learning:

Let's summarize the model of blended learning, considered by foreign researchers.

²² A. Balczyk, "ALEX: mixed-mode learning of web applications at ease", in *Leveraging Applications of Formal Methods, Verification and Validation: Discussion, Dissemination, Applications*, (2016), pp. 655-671.

²³ Ch. Orliac, Ch. Michel, S. George, "An authoring tool to assist the design of mixed reality learning games", in *21st Century Learning for 21st Century Skills*, (2012), pp. 441-446.

²⁴ B. Schneider, "Preparing students for future learning with mixed reality interfaces", in *Virtual, Augmented, and Mixed Realities in Education*, (2017), pp. 219-236.

-The "Face-to-Face Driver" model, in which the main part of the curriculum is studied in the classroom with direct interaction with the teacher, and e-learning is used as a supplement to the main program (most often, work with electronic resources is organized at computers during study classes).

-In the "Rotation" model, study time is divided between individual e-learning and classroom training with a teacher who can also provide distance support during e-learning.

-In the "Flex" model, most of the curriculum is mastered in e-learning, and the teacher accompanies students remotely, to work out issues that are difficult to understand, organizes classroom consultations with small groups or individually.

-When implementing the "Online Lab" model, the curriculum is mastered in the conditions of e-learning, which is organized in classrooms equipped with computer equipment and accompanied by a teacher (in conjunction with training in the traditional form).

-Within the "Self-blend" model, students themselves choose courses that are supplementary to the basic education conducted by various educational institutions.

-The "Online Driver" model assumes mastering most of the curriculum with the help of electronic resources of the information and educational environment; classroom meetings with the teacher are periodic (procedures for classroom consultations, examinations are obligatory). The basis for highlighting the presented models of blended learning is the variant of the ratio of the traditional form of education with e-learning and the degree of independence of students in mastering educational material and the choice of sections of courses for independent study.

Let's consider how the described models can be integrated into the traditional educational process of the university.

In addition to the transfer of theoretical information, the lecture develops an interest in learning activities in general and in a specific academic discipline in particular, forms guidelines for independent work on the course. Therefore, it is impossible to put all lectures into electronic format fully while introducing blended learning. As a blended learning model for organizing lectures, we can offer the *rotational model* "Flipped-Classroom" ("Inverted Learning"). For each module, you must provide two or three classroom lectures, which alternate with electronic ones. In addition, the Self-blend model is very promising. As we see, there is a large number of blended learning models: simple, complex, more and less popular, etc. There are blended learning models that are

destructive to the traditional class. They do not include traditional training in its full form; they offer new and more reliable benefits.

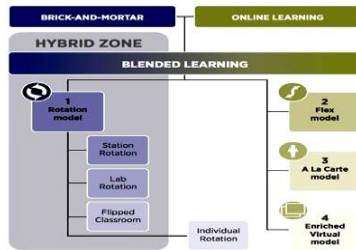


Figure 1: Models of blended learning

Most blended learning programs resemble one of four models: rotation, flexible, La Carte, and enriched virtual (Fig. 1). The rotation model includes four sub-models: rotation by work areas, laboratory rotation, inverted class, and individual rotation. Each zone in the class fulfills its role in accordance with Bloom’s taxonomy (Figure 2).

Rotation model:

Rotation model is a course or lesson in which students move according to an established schedule or at the discretion of the teacher between teaching methods, at least one of which is distance learning. Other conditions may include such measures as work in small groups or in the classroom, group projects, individual lessons and written work.

Students study mainly on campus and at home.

The rotation of work areas is a course or lesson in which students move through fixed time intervals between different places of study, where at least one is distance learning. Other places may include work in small groups or in the classroom, group projects, individual lessons and assignments.

Rotation Lab is a course or lesson where distance learning is carried out in a computer lab.

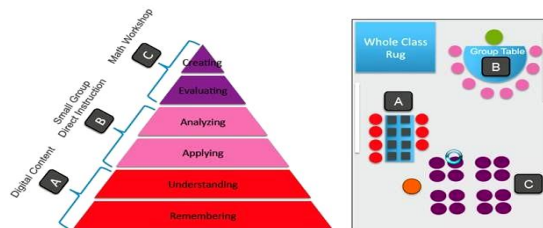


Figure 2: Rotation zones and their roles

Inverted class is a course or a lesson when students remotely study theoretical material instead of the traditional homework, and then do practical work in the classroom.

Individual rotation is a course or lesson where each student has an individual work schedule.

The flexible "Flex" model is a course where distance learning is basic with some face-to-face meetings. Students work on an individual schedule using various teaching methods. The teacher accompanies each student remotely to work out topics that are difficult to understand, he organizes face-to-face consultations with a few groups or individually.

Meanwhile, it is noted that video lectures are not the best option for all students. In the inverted class, instead of video lectures, you can use any educational material of varying complexity, depending on the purpose of training. At the same time, it is necessary to take into account primarily the motivation of students, and then their level of preparedness and ability to take notes on various educational and scientific materials.

Model "Intensive" residency:

-one semester is conducted traditionally (usually in summer), and the rest ones are completely online;

-traditional sessions are provided for one week or on weekends for practical and laboratory work, and the rest ones are on-line;

-sometimes classroom lessons are reduced from three "credit" hours per week to one or two hours, giving students more time to study online.

Model "self-blending":

The model is traditional for higher educational institutions of America. Students independently choose additional courses to the basic education. Suppliers of educational content can be various higher schools and educational institutions.

Enriched virtual model:

Students divide their time between visiting the campus and learning remotely using online content delivery. This model differs from an inverted class in that students rarely visit campus.

"Teleschool" additionally uses models that implement a personalized approach (Autonomous group, Personal Choice group, New profile model, Individual curriculum, Interschool group).

The model "Autonomous group" is used in the case when students in a class vary greatly in their psychological characteristics, level of motivation, ICT competence formation, and regulatory universal

learning activities. In this case, the class is divided into groups, in one of which the main training is conducted online, and personal interaction with the teacher is used for counseling, group or individual. In another group, basic training is conducted in the traditional form, and e-learning is used to support and develop skills. The spatial organization of the class should have two zones - for the traditional lesson and the zone of online classes. While working in this model, the teacher must have the skill of distributing his attention between the two groups, be able to organize the cognitive activity of students through the system of individual or group tasks, acquaintance with the new educational material, performing the function of an assistant in the performance of tasks.

The models of the "Personal Choice" group are suitable for high school students who have a high motivation to learn, the level of ICT-competency, personal and double subject skills. Within this group, responsibility for the results lies with the student, because the process is built primarily using an electronic educational resource. The task of higher education in this case comes down to the provision of temporary (provided in the schedule hours for on-line courses) and spatial (room with a computer and Internet access) resources, as well as psychological and, if necessary, pedagogical support. Under certain conditions (arrangement in the schedule of subjects implying a visit to a higher school) a student can master on-line courses outside of higher education.

The models of this group differ only in ***the way the study groups are formed:***

- within one higher school with a fixed set of courses for online study - "New Profile";
- within one higher school with a different set of courses for studying online - "Individual Curriculum";
- within the same age of different schools for studying a specific on-line course - "Interschool group".

For all models, it is important to help students transfer information from short-term memory to long-term memory. This process includes:

- use real-world scenarios to capture students' attention and their interests;
- inclusion of the student in the student survey scripts (what they will do and how they can help the process);
- encouraging investigations and research in a safe environment with coaching support;

-promoting knowledge sharing, because the experience of colleagues can strengthen learning;

-stimulation of mental activity, to give impetus for reflection or to solve problems that do not have one correct answer.

-encouraging students to compete in achieving goals.

Before you begin to use the inverted class in the learning process, you must answer a number of ***questions to simplify the process of creating a class***:

- 1) What will you invert?
- 2) Who will make your videos?
- 3) What software will you use?
- 4) How can your students access the software?
- 5) How will you check that your students viewed online content and what were the results?
- 6) How will you communicate with your students regarding how to access your upside-down content?
- 7) How will you teach your students to track and understand video content?
- 8) How will you communicate with your students?
- 9) How will you communicate with parents (if necessary)?
- 10) How will you use extra time?

Inverted learning is a pedagogical approach, in which direct instruction moves from the group learning space to the student's individual space, as a result of which the group space is transformed into a dynamic, interactive learning environment in which the teacher guides students' activities.

The students' goal is to get acquainted with the topic, learn new concepts and, if possible, get skills in applying the educational material, then return to the class with questions to clarify the quality of their understanding and reinforce their skills. In the absence of motivation, some of these tasks will not be solved.

It is worth considering that students are not accustomed to complex activities that require taking responsibility for their own learning. Therefore, when organizing an inverted study, it is necessary to explain new methods and apply them, conduct conversations with students and analyze the results obtained with them.

Critical success factors are:

-To get students interested in ideas and concepts that fit their experience.

-To show students their new level of competence in using these ideas.

-To show structures, constantly remind students of their competence, encourage them, demonstrate these aspects of competence.

Inverted learning methodologies:

Inverted learning is based on four basic concepts and is an approach that allows teachers to implement various methodologies in their classes:

1. Flexible space:

-the teacher establishes timelines for interaction and reflection as necessary;

-the teacher constantly monitors and controls the students and makes the necessary adjustments with

-a mandatory explanation;

-the teacher provides students with various ways to master the content and demonstrate skill.

2. Educational culture:

-the teacher allows students to participate in the conduct of constructive activities without his participation;

-the teacher analyzes this activity and makes it available to all students through differentiation and feedback.

3. Content:

-the teacher sets the priorities for the concepts;

-the teacher creates and deals with relevant content for students;

-the teacher differentiates the content and makes it accessible and relevant to all students.

4. Professional teacher:

-the teacher is available to all students in real time as needed;

-the teacher evaluates the class by observing and recording data for future learning;

-the teacher cooperates with other teachers.

What you can and should do:

-to develop for students the author's materials in the form of video presentations, on which they could study outside the classroom (students highly value the personal contribution of their teacher); make a choice in favor of one of the educational process management systems and stick to the chosen system;

-to set specific deadlines for the tasks and stick to them;

-to provide access to digital materials for students who do not have access to the Internet from home;

-to send e-mail letters to parents of students, and clarify the meaning of the new learning model; be ready to answer any questions you may have.

The success of the implementation of the methodology, in general, will depend on how parents of schoolchildren believe in its effectiveness.

What is not recommended to do:

1) Do not expect that students watch and read the materials you compiled just because you said so. It is necessary to upload the relevant tasks together with the presentations and check them before class in the class or conduct surveys.

2) Do not expect that all students will be better able to cope with classroom tasks if they have access to study materials while still at home. There is an increasing need for differentiating tasks according to levels of complexity, since some students will be able to perceive the full amount of information, but others may not cope.

3) Do not expect from your colleagues unconditional agreement with the principles of the new methodology and support in the educational process.

4) Do not forget that the classroom format provided by the new model does not meet the standard requirements for the teacher. This should be taken into account when conducting open seminars.

5) Do not think that the presentation material developed by you will remain relevant for many years. The new technique is effective only in the case of constant updating of information, taking into account the requirements and wishes of students.

The term "micro-education" was first proposed in 2004 in the work of Gerhard Gassler. Micro-learning is a way in which concepts and ideas are presented in very small fragments, provided too short time intervals, if necessary or in conditions of ensuring maximum susceptibility. The term and concept attracted the attention of specialists training, design courses and customers for various reasons:

-the growth of mobile devices and widespread network connectivity;

-large flows of information and a decrease in concentration;

-the need to deliver information in time for the work;

-the emergence of platforms for collaboration in the organization;

-the need for collaboration in the network.

Patterns of user behavior on the network show that:

-62% of smart phone users tend to take immediate action to solve a problem or a new task;

-90% of users used a smart phone to achieve a long-term goal or a multistep process in small steps;

-91% of users said that they are looking for new ideas on mobile devices while performing routine tasks;

-YouTube users used more than 100 million hours to view instructions for performing operations.

Examples of micro-education:

Currently, knowledge is becoming obsolete in 2.5 years, on the other hand, only 15% of users constantly use modern knowledge in their activities. Therefore, it is necessary to form a constant need to learn from employees. Developers of micro-lessons should know the needs of the audience, provide lessons in a timely manner, and be able to work with information. Micro-learning can be considered as a separate learning strategy, it can be integrated into any learning, for example, be part of blended learning, MOOC or a strategy for the formation of fundamental knowledge. The examples are:

-work in twitter for a short trip or waiting;

-view recent blog posts during breaks;

-watching a video (for example, about the method of buying a train ticket);

-comment classmates to work together;

-e-mail with instruction on micro-learning;

-repetition of small sections of the course and preparation for the exam.

Thus, micro-learning is a way to deliver content in small, very specific doses and to teach students with control.

If a micro lesson contains specific goals, this is formal learning; if a micro lesson is determined by our needs at the moment, it is non-formal learning; and if learning occurs as a by-product of some other activity, it is random learning.

Micro-education can be built on the basis of a traditional curriculum. At the first stage, this course is deformed, micro doses for the construction of micro-learning are allocated. Then from the received blocks a new curriculum is formed, which can be personalized for the specific needs of the student. A regular linear tutorial turns non-linear and easily adapts to learning.

Characteristics of effective Micro-learning:

Micro-education works is suitable as a component of non-formal education, when a student chooses exactly what he needs to solve a problem. Micro-learning is effective when it has these characteristics:

-for learning it is necessary to learn individual facts, episodes;

-it covers part of the process or action;

- simple or not very difficult training is necessary;
- learning takes place while working together in a discussion forum;

- technologies provide access anytime, anywhere.

Forms of micro-learning:

- To read text, email, blog;
- To listen to the podcast;
- To watch infographics;
- To get tested;
- To play a micro game;
- To watch the video;
- To participate in tweet chat;
- To participate in the simulation;
- To receive assistance in the work;
- To receive assistance in the benefit;
- To view presentations in Power Point, etc.

Characteristics of learning environment for micro-education:

We can use various forms of micro-education to create a learning environment that will have these characteristics:

1) Consistency: all learning processes are recorded sequentially daily.

2) Accessibility: students have access to their documents, data or video from anywhere. This information is provided on the basis of their requests.

3) Immediacy: students can immediately get any information and quickly solve problems. Or, the student can write down the question and look for an answer later.

4) Interactivity: students can interact with experts, teachers or peers in the form of a synchronous or asynchronous mode.

5) Learning can be embedded in everyday life.

6) Adaptability: students can get the right information in the right place in the right way.

Innovative features that make micro-learning successful:

- Seamless integration: learning is part of work and practice;

- Peripheral consumption: full attention is not required, many tasks consist of several ones, tasks partially overlap, include searching, filtering and information evaluating, as well as the creation and distribution of information by the author;

- Motivation: learning situations are not predictable; the student chooses a micro lesson on his own.

The main steps in creating micro-learning:

1) Map. Training card to identify students' needs for training and for the implementation of training activities.

2) Understanding. Understanding the needs of students in the micro-moment, when they need access to knowledge, assess and understand how to make the learning process more specific.

3) Context. Analysis of the context, time and place of the micro-moment for the delivery of customized e-learning experience.

4) Optimization. Optimize your e-learning experience.

5) Measurements. It is necessary to measure every minute when it is possible, and use the best estimates when an accurate measure is not available.

When creating micro-learning you need to consider:

1) Microdose should have one educational purpose.

2) It is advisable to use video.

3) Training material must be of high quality.

4) Timing is everything. Video must be 5 minutes or less.

5) Prove that the training took place. Instead of multiple-choice tests, ask students to demonstrate their knowledge.

One of the main elements of micro-learning are video fragments up to 5 minutes long. This is due to the fact that: YouTube videos are one of the most visited; video is the most effective means of transmitting information; videos are easy to create.

The ***creation of micro-lectures based on PowerPoint*** consists of the following steps:

1) Slide preparation. Slides should contain a minimum amount of text and not contain extra graphics. The combination of text and animation causes cognitive dissonance. Animation must be accompanied by voice message.

2) Voice support. The text should not be read from the screen, it must be prepared in advance.

3) Webcam. The demonstration by the teacher through the camera improves the quality of the lecture, but when explaining the diagrams, diagrams, and other difficult parts of the course, it should be turned off.

4) Pointers. The indicator in the general case may be a mouse pointer, sometimes in the recording preparation program there may be its own pointers. You can and do handwriting on the slides.

Edynco and MOOC as tools for creating a micro-lesson:

One of the possible tools for creating a micro-lesson can be ***Edynco*** (<https://www.edynco.com/>).

Micro-learning is widely used in the latest versions of **MOOC**, it is:

- Short videos and other learning resources are the most popular form in most MOOC and other resources, supporting materials, documents, podcasts and even short interactive e-learning events;

- Separated repetitions and practical activities;

- Communication and collaboration platforms. MOOC can include discussion boards, question and answer sessions, Twitter feeds and other social media tools for communication and collaboration.

- Micro-learning is an ideal gamification environment.

The use of MOOC and micro-training in corporate training requires a complete rethinking of on-the-job training and its support of modern technologies. Companies are moving away from traditional models, moving in training to building competence to support productivity. In a corporate environment, micro-learning must be dynamic, flexible, scalable, and available upon request, when and where it is needed. The benefits of micro-learning are:

- learning is a way to improve student's thinking;

- the more a student knows, the more he remembers;

- micro-courses are focused and practical knowledge;

- micro courses are available online anytime, anywhere;

- micro courses teach, but not report.

NOOC:

Nano massive open online course (nano MOOC or simply NOOC) allows students to gain skills, competencies and a certificate (icon) in a small area of knowledge within 12 hours of study or less. One or more tutors can make each NOOC.

NOOC attracts students by allowing them to focus on a small but important study piece and gain the necessary skills. According to the sequence of such courses, an individual trajectory of studying a particular discipline can be formed; teachers, which facilitates the process of creating a course through a sequence of small NOOCs, which require 1 – 2 weeks to create. NOOC designing provides flexibility and the ability to form full-fledged credit rates.

Student academic efforts are assessed using a credit system based on the total number of student hours needed to achieve learning outcomes. 20 – 40 hours of student study time is estimated as a single loan. A typical course of 3 credits is 60 – 120 hours of student time, including attending lectures, seminars, reading textbooks, conducting research, laboratory work, completing assignments, projects and tests, and learning the assigned learning resources.

At NOOC, student time is 5 – 10 times shorter, does not exceed 12 hours and provides micro-experience. NOOC should be open, free for everyone and scalable with respect to possible mass character (registration of more than 1000 students). All NOOC materials must be licensed under a Creative Commons license. If this is part of an organization’s training course, then it must be certified by that organization. Such a course is hosted on the LMS and all interaction takes place over the Internet. If necessary, it can be an integral part of blended learning, for example, be used in an inverted class model.

NOOC designing can be carried out in a simplified manner using various pedagogical approaches (behaviorism, constructivism, connectivism) that are best suited to achieve the goal. As a result of combining several NOOCs, it is possible to obtain a much more effective credit training course. Combining several NOOCs at MOOC and using educational analytics will allow you to determine the reasons for students to stop studying.

Table 1: NOOCs components

Features	Necessarily	Freely
Promo-video (1-3 minutes) for each NOOC	+	
Record of webinars (1-2 sessions)	+	
1-5 minutes of video lesson		+
Presentation/ Notes	+	
Questionnaire and Forum	+	
Guard		+
Internet resources		+
Social media (Facebook, Google, Twitter)		+
Individual knowledge	+	
Group forming		+
Colleagues` assessment		+
Testing(understanding check)	+	
Gamification		+
Final exam (On-line)		+
Icons (badges)		+
Sertificate	+	

Table 2: Planning of NOOC activity

Learning activities	Study	Tool	Method of assessment	Time of study

Entry-Video (Promo) - tutor introduces himself and the subject of study at NOOC	-	Video	-	5 min.
Icebreaker - Students introduce themselves and tell what they want to know.	-	Padlet Forum	-	15 min.
Social media - To communicate, collaborate and initiate a community of practice, consider using various social media tools for strengthening of capabilities.	-	Facebook Twitter LinkedIn Instagram	-	1 5 min.
Textbooks, shortvideotutorials, infographics, webresources, notes, etc.	+	Video infographics, articles	Mini-text	15 min.
Internet forum – discussing of issues and problems	+	Internet forum	Forming	30 min.
Internet Webinar (1 or 2) Tutor discusses and explains the theory. Students participate in the discussion via chat. In the 2nd session of the webinar, it is recommended to hold a discussion or invite an expert	+	Web- conference	-	60 min.
Internet tasks - Tasks allow you to assess whether students have achieved learning outcomes at the NOOC: 1) a report of 200 - 500 words; 2) reflection on the blog 3) video recording to demonstrate what has been learned (upload to YouTube, and then share the Internet link).	+	Presentations of assignment	Colleagues' assessment	30 min.
Final Test (certification) -	+	Text	Internet	15

10-20 closed questions to assess the level of assimilation of the student theme NOOC.			text	min.
Results - Tutor conducts video discussion (5-10 minutes) and briefly summarizes	+	Video	-	10 min.
Together			Minutes	<u>180</u>

As an example, you can consider *the plan of the course "Creating a micro-lesson"*, which should be conducted by a team of tutors in different languages:

- 1) watch the promo video about the course;
- 2) tell about yourself in the dating forum;
- 3) to face the theory of micro-learning (video);
- 4) select a micro-lesson topic, give a brief description;
- 5) to post information about the planned development of a lesson in social networks and with the help of colleagues to find analogues, meet them;
- 6) to face Bloom's taxonomy theory (video);
- 7) to determine the purpose of training and its level for Bloom's taxonomy;
- 8) to create test items using Bloom's taxonomy;
- 9) to execute and post on the network a report for evaluation by colleagues (use badges for evaluation activity and quality);
- 10) to participate in the webinar on the analysis of the lesson scenario (make an analysis);
- 11) to face the tools for creating a lesson (maybe video) and choose useful for creating a lesson, to provide for the use of a smartphone for training. (create a page with links to tools);
- 12) to describe and justify the instrument used for the micro-lesson in the forum;
- 13) to prepare text and graphic material of the lesson;
- 14) to create a micro lesson and post it in the course for evaluation. (use badges for evaluation activity and quality).

Blended learning will improve efficiency and practical and laboratory classes, it will allow teachers to apply new methods and forms of organization of training, and students working with electronic resources on-line course, both to study the theory and to develop practice, it will allow a more holistic view of being studied. The Station

Rotation blended learning model provides a greater flexibility in combining traditional methods with e-learning in organizing practical exercises, but with each student having access to a personal computer, tablet, mobile devices. Then the teacher will be able to dynamically switch students from frontal work to individual work with online course materials, Internet services and other electronic resources. The teacher will have time for individual counseling.

For the magistracy, in which the vast majority of students combine study with work, such blended learning models are effective, in which the main focus is on independent e-learning with organized remote interaction of the teacher with students, supplemented by classroom lessons and consultations, in particular, "Online Driver". But the effectiveness of this model depends on the quality of the educational content of the online e-course and on the teachers' using of distance learning technologies.

The creating of an educational process based on blended learning is optimal for the effective transfer of knowledge, it will help improve the quality of student training, develop independent creative activities, and stimulate the acquisition of additional knowledge and their consolidation, which makes it possible to prepare competitive specialists.

The model of blended learning at the university is formed as a system that includes the following elements: the university's strategy for the development of e-learning, the organization of the educational process by means of ICT with the support of special services to support learning, the implementation of interaction between teachers and students using e-learning methods and content. Promising areas in the study of the organization of blended learning is the study and analysis of e-learning methods, the possibilities of social networks, cloud computing, mass open courses and the development of methods for their use in the educational process.