Blended learning as a tool for professional training of specialists for the Arctic region: modern practices in the context of digitalization of education

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Abstract. Blended learning now is becoming a popular technology which combines the traditional methods and tools with modern e-learning strategies. This paper focuses on contemporary approaches applied in the sphere of professional training of specialists for the Arctic and examines the experience of the two leading Universities of Russia which train highly qualified personnel for the Arctic region. In the context of digitalization of education a combination of different elements of electronic information and educational environment has been created and is actively developing. The authors use the official data and methodological documents and describe the latest practices applied in educational process in the context of digitalisation of education. The educational practices presented by the researchers reflect the experience of using the information and training portal “Arctic Safe” created in Saint-Petersburg University of the State Fire Safety Service and show capabilities of the electronic educational environment including distance learning system "FARVATER" which is used in Admiral Makarov State University of Maritime and Inland Shipping. The represented systems provide the students and teachers as well as the administration with the effective tools to organize the educational process.

1. Introduction

Strengthening the position of the Russian Federation in the Arctic region is a strategic task of our state, which is interested in the development and diversification of the routes of the Northern Sea Route, the use of the unique mineral resource base of the Arctic zone, in ensuring the security of the state border passing through the Arctic Ocean for about 20 thousand kilometres. “The Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security for the Period until 2020” reveals significant shortcomings that pose a threat to the sustainable development of the region: a shortage of qualified personnel, the lack of an effective system for training specialists, an outflow of labour resources [1]. The solution of issues of economic stability and national security in the Arctic region can be provided with the high-quality training of specialists who are able to solve the problems of professional activity in difficult natural and social conditions. In addition, ensuring the national and foreign policy interests of the state in the information society is carried out through the use of information and communication technologies and involves the use of various types of Internet resources.

Federal Law of December 29, 2012 No. 273 - FZ "On Education in the Russian Federation" introduces the concepts of "e-learning", "distance educational technologies", thereby denoting the vector
of development of the higher education system in the era of global information challenges [2]. The change in the paradigm of higher education is determined by the following principles:

1. Humanization - expanding the boundaries of the availability of knowledge within the framework of the concept of lifelong learning (Lifelong Learning), which presupposes mastering the necessary competencies throughout the entire work activity;
2. Inclusiveness - involvement in the educational space of all categories of students, regardless of geographic location, social status, individual characteristics;
3. Competitiveness - compliance with the level of modern requirements of the world labour market, ensuring professional growth, a certain "social lift";
4. Socialization - integration into the modern socio-cultural space through the acquisition of the necessary competencies;
5. Individualization - orientation towards the personality of the student, manifested in the construction of an individual educational trajectory taking into account the interests, needs, inclinations of the subject of training and education.

The development of distance learning permits to solve many socio-economic problems: increasing the general educational level, expanding access to higher education levels, including residents of remote regions, meeting the need for additional competencies and improving qualifications. Electronic education including distance learning, reveals the creative, conscious position of a student, who masters the necessary competencies through social interaction, organizes the learning process and critically evaluates the degree of its success. In this regard, distance learning has a number of advantages [3]:

1) a high degree of adaptability of the proposed educational resources (the possibility of combining them with traditional forms of education);
2) combinatorial possibilities (the distance course can be presented in its entirety or in any combination of sections);
3) the ability to broadcast the training course in synchronous / asynchronous mode;
4) semiotic variability (various ways of encoding information are presented: texts, tables, graphs, audio and video materials);
5) functionality (a wide range of functions performed by electronic educational resources).

Over the past ten years, the development of distance learning in Russia is associated with the formation of the domestic segment of the Internet. As the researchers note, the rate of development of e-learning in Russia is 2.3 times higher than the global indicators [4]. Despite the fact that Russia is not among the leading countries in the dissemination of e-learning, Russian universities are actively creating and using innovative educational tools: the National Platform for Open Education, Online-MIPT, and the HSE Internet School. About 30% of Russian students study remotely. The rapid growth in the number of educational platforms, educational projects can be another manifestation of the new concept of economic development, "knowledge economy". The transition of the economy to a new qualitative state is manifested in the increased role of human capital, creativity, innovation. This process requires the development of an information infrastructure that combines the technological, pedagogical and institutional aspects of the educational process and turns it into an effective mechanism of socio-economic and cultural progress. Among the educational platforms the most demanded in Russia are Coursera, Arzamas, Lectorium, Universarium, PostNauka, edX. Such platforms are combined into the Massive Open Online Courses (MOOC) system, which allows to broadcast online courses, organize students’ interaction in various modes (individual work, group work, collective research activities), and structure the training course in accordance with the needs of students.

Despite the significant advantages of distance learning, a complete rejection of the emotional component of the educational process is not possible. Modern information and communication technologies are a tool for pedagogical design that expands the boundaries of the educational space and qualitatively changes the ways of presenting and structuring the content of education.

Blended learning is a purposeful organization of the educational process that provides various degrees of combination of traditional and e-learning forms (30% - 79%) - allows to solve a number of didactic tasks: 1) ensuring the procedural aspect of the educational process using Wiki technology; 2)
broadcasting the content of the training course or its individual sections in the form of video lectures, webinars (TED talks); 3) organizing feedback when using online tests and simulators; 4) managing independent work of students with the use of electronic memorization tools, mental, cognitive maps (Quizlet, www.visualthesaurus.com, www.mindmeister.com, www.piktochart.com, worddle); 5) developing the creative potential of students in the framework of project activities using blog services (www.Livejournal.com, www.blogger.com, www.blogspot.com) [5].

Within the framework of blended learning, the degree of integration of electronic educational tools into traditional practice can be different [6]:

1. "Technology laboratory" (Lab Rotation) allows students to work remotely or in the classroom in accordance with the sequence determined by the schedule.
2. "Virtual model" (Enriched Virtual) assumes a combination of independent work of students in the framework of a distance course and teacher’s advice.
3. "Flexible model" (Flex) is to create an individual training course, the distribution of teaching hours between classroom and distance work taking into account the specific needs and interests of the student.
4. "Integration model" (Flipped Classroom) organizes independent study of theoretical material remotely and the implementation of practical tasks in the classroom under the guidance of a teacher.
5. "Project-Based Model" offers special opportunities for organizing joint research activities of students in a distance mode.
6. "Autonomous model" (Self-Directed) assumes full educational autonomy of students who independently plan the stages of mastering the training course in a distance or traditional mode.

In Russia, two leading Universities (Admiral Makarov State University of Maritime and Inland Shipping, and Saint-Petersburg University of the State Fire Safety Service of EMERCOM of Russia) offer the opportunity to get higher education for the specialists to work in the Arctic. They also provide specialists with additional professional education. Their experience is of a particular interest in the context of blended learning.

From 2015 to the present, an information and training portal, created as a part of the implementation of federal target programs, has been operating at the St. Petersburg University of the State Fire Service of the EMERCOM of Russia. The portal is designed to manage distance learning according to advanced training programs for EMERCOM specialists and to present information about the Arctic region on the Internet. The information and training portal "Arctic Safe" performs the following functions: 1) informational (presentation of data from Arctic rescue centres on the territory of the Russian Federation; communication of information on safety measures and the basics of survival in a critical situation); 2) organizational (placement of requests for travel services); 3) communication (exchange of experience about travel in the Arctic zone); 4) training which is implemented using the following components of the training module:

1. System for storing and editing training programs, didactic materials, test items.
2. System for constructing a training trajectory.
3. Testing system.
4. System of diagnostics and control of the process of mastering competencies.

The advantage of this system lies in its adaptability, in the possibility of combining offline and online modes, combining with other didactic tools. The distance learning system allows registering employees of the Ministry of Emergency Situations as students in advanced training programs, creating an individual sequence for mastering the course content, posting didactic materials and tests, advising students, and managing educational resources of the portal. Mastering theoretical knowledge and developing professional skills which are necessary in the process of conducting search and rescue operations in the Arctic region is the first stage of the full-time-distance education in the framework of advanced training of the EMERCOM of Russia employees. It involves two-year distance learning. The distance learning system "Arctic Safe" demonstrates an effective combination of traditional and electronic learning technologies. It also allows to implement the principles of professional orientation, systematicity, and accessibility in the process of training highly qualified specialists.
The Admiral Makarov State University of Maritime and Inland Shipping is one of the leading universities in the field of training specialists for work in the Arctic region. To organize the educational process in accordance with the requirements for the implementation of educational programs, an electronic information and educational environment have been created and are actively developing. In accordance with Federal Law No. 273-FZ dated 09.12.2012 "On Education in the Russian Federation", when implementing educational programs for training personnel for the maritime industry, the University uses various educational technologies including distance educational technologies, e-learning [7].

The University has created specific conditions to implement educational programs using an electronic educational environment. This environment includes electronic information resources, electronic educational resources, a set of information technologies, telecommunication technologies, appropriate technological means providing students with educational resources regardless of the location. In order to ensure the implementation of educational programs at the University, an electronic library environment has been formed including electronic libraries that provide access to professional databases, information reference and search systems, as well as other information resources.

The components of the electronic information and educational environment are:
- system of remote content delivery (Educational portal);
- distance interaction system (distance learning system "FARVATER");
- electronic library environment of the University;
- integrated information and analytical control system;
- reference and legal system "Consultant +";
- corporate portal of the University;
- official website of the University, the website of the admissions committee and other websites (website of the University journal, website of the library complex, etc.);
- corporate email.

The expansion of the electronic information and educational environment enables the students to use a complex of "cloud" resources, educational and reference resources, electronic library resources of the Internet.

To implement e-learning, the Educational Portal is used together with the distance learning system "FARVATER" and the Intranet circuit of the electronic library system [8].

The educational portal was created in order to fulfil the requirements of the Federal State Educational Standard to ensure access of students / cadets to the content of academic disciplines via the Internet and information support of educational activities at all levels and forms of education. The educational portal provides: publication of educational and methodological content; delivery of content to students; a system of information exchange between teachers and students; the work of the news service and announcements.

The distance learning system "FARVATER" was created in order to fulfil the requirements of the Federal State Educational Standard. It provides students with access to the content of academic disciplines via the Internet and the organization of educational out-of-class independent work of students. The FARVATER system presents a wide range of opportunities for teachers to create electronic courses: development of lectures and a bank of test tasks; remote control of students' knowledge; organization of testing and questionnaires, placement of educational and methodological documentation [9].

The electronic library environment was created in order to provide information and library services for students in accordance with the requirements of the Federal State Educational Standard and to meet the needs of the teaching staff and administration of the University.

"Cloud" technologies are focused on providing students with access to computing resources located in the virtual environment which the student can use remotely. In particular, the University, together with the Transas group of companies, develops simulators in accordance with the requirements of international and national standards and rules (including STCW, SOLAS, IMO model courses) [10, 11, 12].
The above-described components make it possible to provide all students, including students of the Arctic Faculty of the University and specialists who receive additional professional training, with modern resources that allow them to receive high-quality training in the chosen professional area. They all are successfully used and have become an essential part in blended learning practices.

2. Methods
Basic points of blended learning technology and of the general theory and methodology of education, the results of fundamental and applied research in the field of digitalization of education have formed the theoretical base of the study. The analysis of publications and the review of the contemporary research in the field of education allowed us to figure out the directions of the study and helped to systematize the tools and methods used by the practitioners in the sphere of education. Within the framework of this study the experience of the two leading Universities in Russia which offer the opportunity to get higher education for the specialists to work in the Arctic has been examined. The official analytical data and methodological documents have been studied and provide us with the latest practices applied in educational process in the context of digitalisation of education. The elements of electronic information and educational environment, distant learning systems which are used at the Universities have been analysed.

3. Results
The educational system which has been outlined in this paper incorporates effectively the technology of blended learning. The electronic educational environment has become the essential part of blended learning technology.

In Saint-Petersburg University of the State Fire Safety Service from 2016 to 2017 the potential of the information and training portal “Arctic Safe” was tested. It was done for the first time with a group of EMERCOM specialists from the scientific training centre “Vytegra” within the professional development program [13].

“Specific characteristics of search and rescue operations in the Arctic” was delivered to the students in the form of a distance learning course which is accessible at http://arctica.igps.ru/edu/start. The educational module can be accessed only by registered and authorized students who are provided with login details and a personal password. The educational module includes the following elements:

- Learning process administration;
- Students management;
- Educational resources storage;
- Educational content storage;
- Academic performance assessment;
- Learning process control.

The personal area contains educational materials, reference resources, glossaries. In this virtual environment students are also enabled to get tutorials in synchronous mode. The professional development programme “Specific characteristics of search and rescue operations in the Arctic” encompasses the following thematic parts:

- Fundamentals of integrated security and safety in the Arctic;
- Radio communications;
- Apparatus and vehicles in the Arctic;
- Tactical and special training;
- First aid;
- Psychological training;
- Airborne training.

Upon the completion of each part the students are supposed to have an online test to assess their overall performance. The educational course culminates in the final test which comprises 30 questions covering all the parts of the programme.
In Admiral Makarov State University of Maritime and Inland Shipping all disciplines of the Arctic faculty have the digital support: [https://farvater.gumrf.ru/](https://farvater.gumrf.ru/) (distance learning system "FARVATER"); for the Arctic faculty a set of disciplines is presented here: [https://farvater.gumrf.ru/course/index.php?categoryid=3](https://farvater.gumrf.ru/course/index.php?categoryid=3).

Students study:
- Hydrography
- Geodesy
- Marine meteorology
- Oceanography
- Modern acoustic equipment
- Cartography
- Radio communications
- Safety and first aid
- Psychology
- English

Students and cadets combine classroom learning with distance learning.

In the distance learning system "FARVATER" teachers
- place educational and methodological documentation;
- develop lectures and a bank of tests,
- use remote control of students' knowledge;
- check and assess the knowledge of students through testing taking into account the settings: test time, grading scale, monitoring results;
- communicate with other teachers and students;
- organize the surveys for students.

Students have
- access to educational and methodological documentation;
- complete assignments in the discipline;
- training and control tests;
- feedback monitoring of the results;
- opportunity to communicate with teachers and other students;
- materials for verification by teachers;
- regular surveys.

The review of the electronic educational environment used in both Universities, allowed us to identify the following common elements and their functions presented in Table 1.

| Function         | Module         | Method                                      |
|------------------|----------------|---------------------------------------------|
| Communicative    | Interactive    | Tutorials, e-lectures, webinars             |
| Cognitive        | Content        | Bank of resources, tasks, exercises, tests |
|                  | Reference      | Electronic library resources, glossaries   |
| Organizational   | Guidance       | Registration, administration of the portal, learning process management |
|                  | Control        | Regular and final assessment of the learning outcomes |

Blended learning needs the effective combination of different elements, methods of learning and teaching. The system created in the Universities provides the students and teachers as well as the administration with the effective tools to organize the educational process. Blended Learning based on the combination of traditional tools and methods and modern digital technologies facilitates and improves the educational process having as its ultimate goal the training of highly qualified personnel including specialists for the Arctic region.
4. Conclusion
The concept of blended learning implemented at both educational establishments (the Admiral Makarov State University of Maritime and Inland Shipping and the Saint-Petersburg University of the State Fire Service of the EMERCOM of Russia) has demonstrated its potential in training highly-qualified specialists with the purpose to develop their competences in different dimensions: 1) theoretical (deep knowledge of the subject field); 2) practical (hard and soft skills required in the targeted professional area, valuable hands-on experience); 3) personal (motivation and personal involvement in the professional activity, personal focus on life-long development and successful career growth).

As the experience has shown, the methods put into practice at two leading universities of the Russian Federation, represent a harmonious combination of the best features of live instruction and innovative electronic tools which constitute a constructive approach to competitive specialists training. The organic integration of traditional instruction and online technologies empowers students of different specialties through both personalized learning and group interaction. Thus, the students can benefit from the flexibility of blended learning and, in this way, mold their unique learning trajectories.

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