Information and Communications Technologies Provision of Distance Learning in a Technical University

Vladimir Yavorskiy
Karaganda State Industrial University
Temirtau, Kazakhstan
e-mail: yavorskiy-v-v@mail.ru

Gulnar Zhaxybayeva
Karaganda State Industrial University
Temirtau, Kazakhstan
e-mail: gulnar.zhaxy@gmail.com

Anastassiya Chvanova
Karaganda State Industrial University
Temirtau, Kazakhstan
e-mail: mysteria-nastya@email.com

Natalya Baidikova
Karaganda State Industrial University
Temirtau, Kazakhstan
e-mail: ms.bnatalya@mail.ru

ABSTRACT
The paper discusses the main objectives of the distance form of learning. The possibility of organizing the training of students on the basis of industrial geographic information systems is considered. Model of adaptive testing is represented.

Keywords
Intellectual information technologies, distance learning, adaptive testing, engineering geographic information systems, educational process.

1. INTRODUCTION
The modern stage of development of higher school in Kazakhstan, the introduction of new educational standards, the country's entry into the Bologna process and other international agreements stimulate the formation of new approaches and the development of fundamentally new criteria of quality of education. New educational technologies based on effective use of modern means and methods of knowledge transfer in educational process of universities get more and more development.
The realization of the concept of blended learning as a process involving the creation of the comfortable educational information environment of the communication system that represents all the necessary educational information becomes the mechanism of the ongoing transformation.
Currently, the learning process is unthinkable without the latest educational technologies. These are primarily distance learning technologies, which are based on the use of electronic textbooks, training programs, telecommunications facilities the exchange of information between standards, university and teachers. In Kazakhstan, the application of information and communication technologies (ICT) in education, including in universities is carried out in the framework of the state policy of informatization of society and education.

2. PROBLEM DEFINITION
Active introduction of information technologies in education leads to the fact that the staffs of the universities are loaded with increasing volumes of new information. Moreover, the valuable knowledge accumulated by teachers in the past, remains unused, because there are no convenient and effective mechanisms for information retrieval. One of the most promising technologies allowing to solve this problem is the use of semantic technologies for information storage.
The aim of this work is to define the principles and methods of innovative technology focused on the organization of continuing education: blended learning, combining scientific and methodical benefits full-time and distance learning; actively using distance and e-technology.
This paper investigates the possibility of using semantic technologies for learning in mixed form. Examines the role of effective storage and presentation of educational resources, convenient and quick access to them.

3. INFORMATION TECHNOLOGY IN EDUCATION
3.1. The development of the content of lifelong learning
The development of the portal for blended learning involves the implementation of such characteristic features as individualization, relevance, and the relevance of the training, orientation of educational process to achieve specific practical results that are applicable in the professional activity of the student. The automation of the process of individualization of educational process in distance learning in the conditions of rapid technological development and increasing the volume of educational information should be implemented based on the results of the knowledge management process. The knowledge management is the process of creating conditions for identification, conservation and efficient use of materials for teaching and learning achievements. There should be implemented a strategy aimed at the rapid provision of the necessary educational information and controls to improve the process of corporate training. Obvious is the relevance of the management task. We propose the following functional architecture of Web-oriented system for lifelong learning (SSS), shown in Fig.1. Thus, the functionality of the system should be divided into two parts, each of which refers to one of the two key stages of system operation: 1) knowledge management; 2) organization of continuous learning. At the stage of knowledge management the expert carries out a formalization of knowledge that includes the formalization of educational information and formalization of knowledge about the professional competencies and job descriptions.
The result of this process is the knowledge base, functioning as a web-portal of knowledge. At this stage, tasks that are typical for knowledge management in the technological environment network WWW are solved.
The next step is the direct solution of the key tasks of lifelong learning in the context of its remote form – the

creation of individual educational information Web-resource that implements the didactic functions of learning support.
This is possible through the knowledge base obtained at the first stage of the work. Thus, the subsystem of lifelong learning receives inputs from the individual educational request of the student, expressing his educational goals.

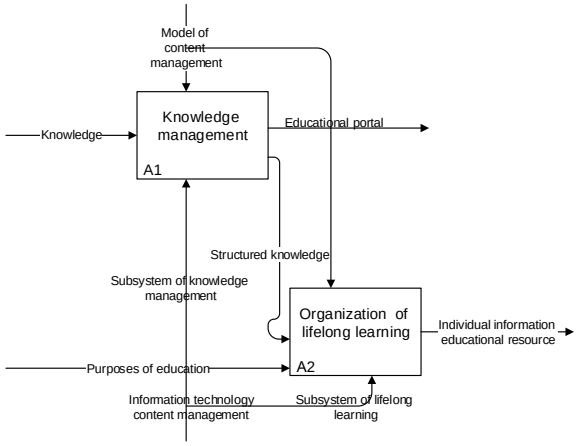

Figure 1 - Functional model of blended learning portal

Next is generation of an individual set of educational web content and giving the learner the necessary functional characteristic of distance learning process (Fig. 2).
Knowledge management is the first phase of work with support system of continuous learning. This process consists of the following components:
1) create the hierarchical structure of the content;
2) establishment of non-hierarchical relationships between the content items;
3) create a taxonomy of subject areas (theme groups);
4) establishment of links between the subject areas and the content;
5) formalization of the meaning of the content and the conceptual component selection using semantic maps of concepts and semantic abstracts;
6) create a hierarchical structure of professional competences;
7) establish a relationship between the content and professional competences.
Creating a hierarchical structure of content involves downloading the educational-methodical information in the system. Training manuals, developed courses, reference books and other educational-methodical information can serve as starting materials. Content items are typed, which will take them to one of three key types: semantic block, list, the usual information element.
Installation of non-hierarchical links in the content is the use of associative relations and relations of aliases between the content items.
Associative connections give a possibility to provide additional semantics of the structural elements of content and to organize on this basis additional navigation capabilities within a Web-resource. Relation alias makes it possible to place the finished items in other places of the hierarchy, thus making the content tree a directed acyclic graph.
The creation of a taxonomy of domains and aggregating content into thematic groups represents additional semantic information about the content and expands the navigation capabilities. The creation of a taxonomy of the subject areas is provided by the tools for editing the tree structure.
With each of the elements of the taxonomy an arbitrary number of content items can be mapped. However, this takes into account the type of content item. Thus, attribution to a certain subject area of the semantic block correlates with this region all data elements in this unit.

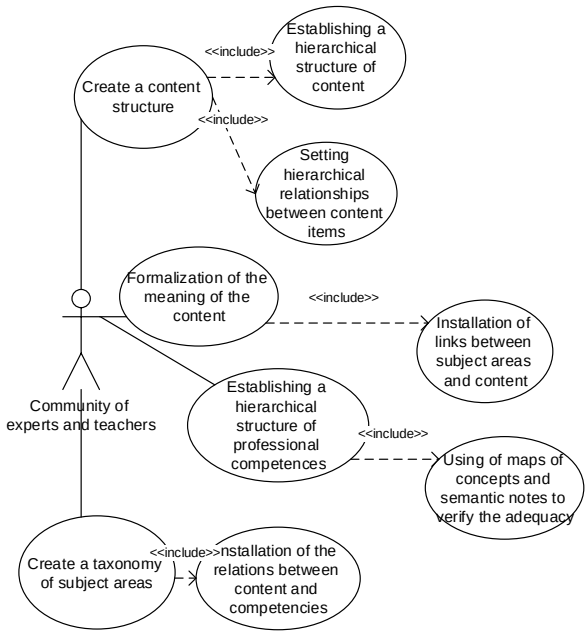

Figure 2. Use case diagram for teachers by the development of the content for the enterprise portal

Connection with subject areas while displaying pages, allow to access content items containing information on the same topic, even if those elements belong to other courses and are in other places in the hierarchy of the content. In addition, a set of subject areas is displayed in a tag cloud, providing a clear visualization of the thematic content and additional navigation scheme of the portal.
The content of the subject area of the semantic unit of a particular discipline is the training documentation. In the framework of the educational portal educational-methodological materials are presented in the form of electronic educational-methodical complexes [1].
Electronic educational-methodical complex of the disciplines must include mandatory and optional sets [1].
a) the mandatory set contains the following:
– model curriculum (if applicable);
– work study program, including course content, the calendar-themed plan, list of recommended literature (basic and additional), the modular partitioning of the discipline, the schedule of carrying out remote consultations;
– electronic abstract of lectures;
– materials for practical and seminar classes;
– laboratory practical work (assignments, examples, guidelines);
– tasks for independent work of student and independent work of the student under the instructor's supervision;
– materials on organization of boundary control (control works, tests, individual tasks, etc.);
– materials on the organization of the final control (test exam, questions, exam tickets, examination).
b) an additional set can include methodical instructions on performance of course work; computer program training: trainers, tutors, guidance materials, multimedia versions of educational and methodical manuals and other materials that help the learning of the discipline. Training and methodological support should be sufficient for autonomous and independent work and prepare for assessment of students. The functionality of electronic educational-methodical complexes must meet the state educational standards.
For students of technical specialties special role is played by laboratory facilities which allow us to perform various

experiments and modeling of manufacturing processes. To ensure the most effective training of specialists, representatives of employers are invited. While, on the one hand, students need practice and training in existing companies - companies today are reluctant to let students into their territory and especially not allow them to work with real production equipment.

The movement towards the resolution of this problem is possible when using in the educational process the industrial geographic information system base of the company (IGIS). [2]. Such a system, if present on the enterprise, allows us to study its infrastructure without the need for direct presence in the enterprise.

Industrial engineering geoinformation systems [2] are created primarily to describe the enterprise infrastructure. Such infrastructure includes visual, geometrical and attributive description of technological processes, engineering and transport networks, the main bases of logistics, etc. Full of information about these objects is essential for the sustainable functioning of the enterprise, its development and monitoring, repairs and liquidation of emergency situations. It is obvious that it is crucial to use the IGIS toolkit to expand practical training bases.

3.2. The formation of the knowledge base of educational achievements

Continuous blended learning can only be achieved through a comprehensive use of information and communication technologies for educational information, training, and practical training, and monitoring of educational achievements. In the process of learning it is useful to use and analyze the achieved results of the study subjects of the earlier study period.

For such a repetition, it is natural to use the previously obtained educational achievements already put the student work. However, such materials are often lost after the surrender of student discipline. Creation of the knowledge base of educational achievements (BSEA) involves not only providing students educational materials for learning the subjects as part of individual plan and control the execution of tasks within the personal sections of the educational portal. BSEA is actually a system of student sites. Introduction of an individual student interactive site provides an implementation of such features of learning an individual approach and relevance training [3].

The proposed system also enables to control the functions from the administrative resources of the university. This will make the learning process more transparent to evaluate not only students but also teachers. Given the large amounts of data that circulate in the educational process, it is necessary to consider the work with the proposed system from the perspective of big data technologies [3].

Currently an automated information system "Platonus" is actively used by the universities of the Republic of Kazakhstan. This system allows to automate the management of educational process on the basis of the educational portal. In addition to storing teaching and installation documentation, the system allows to organize the assessment of knowledge of students on the basis of different levels of testing. In the process of creating tests, you must specify its name (usually matches the name of the course or individual topics), the type and complexity of the question. The system provides questions of three difficulty levels (easy, medium, difficult). Each question is evaluated in 1,2,3 points respectively. The number of correct answers to the questions of each level is multiplied by the corresponding score. The number of points for each type of questions is summed and divided by the maximum possible number of points. This system is quite convenient, especially with large groups of students. However, it does not imply the individualization of the assessment process knowledge.

One of the directions of further improving the effectiveness of evaluation and monitoring of the level of knowledge is associated with the creation of systems able to take into account the individual characteristics of the student and level of knowledge [4].

The system of control of students ' knowledge (SCSK) can be viewed as a subsystem of management of educational process of the University. SCSK is an automated system designed for collecting, storing, processing, transformation and delivery of information concerning the conduct of test and evaluation procedures, as well as for direct carrying out of monitoring and evaluation activities. The most effective way of constructing a test to assess knowledge is an adaptive approach. Its essence lies in the fact that the system produces each following question not randomly, as usual, but purposefully, depending on the student's response.

The testing process begins with the fact that the subject is offered a task (set of tasks) with a medium level of difficulty. Further, depending on the rightness or wrongness of the answer (answers), the test serves a task (set of tasks) from the other group challenges. At each following step, a rule of dividing the scale of difficulty in half is used, that is, each time the level of difficulty of the proposed task is the average between the level of task that the subject performed correctly, and the level of the task which he failed. The main advantage of this method is that it allows you to quickly identify well-prepared and poorly trained subjects.

Processing algorithms responses issued by testing, are built depending on the structure of the questions used in the testing programs [4]. The scheme, which presents methods of processing of responses for questions with closed answers is represented.

To organize the adapted system of evaluation of knowledge and skills, students need a means to analyze the operation of the system with a view to its reconstruction in accordance with the purpose of the educational process. This tool is an adaptation block, which on the basis of statistical data accumulated by the system, the teacher gives recommendations on the issues that cause the boundary values of the evaluation function.

Each answer is proposed to put a particular weight. To organize the file with the questions the answers should be placed in descending order of weight.

This method of classifying questions allows you to implement:

- possibility of forming weight coefficients of issues;
- ability to break questions into groups in accordance with the level of complexity;
- in the event of incorrect assignment question one group or another, possibility of automatic repair;
- is also possible implementation of the weighting coefficient is not only the question but the answer.

Implementation of all the proposed methods will improve the effectiveness of knowledge assessment, to analyze the shortcomings of the educational process, make it more personal and directed.

4. CONCLUTION

For Kazakhstan large-scale introduction of efficient technologies, continuous mixed education is a topical problem. Their introduction is an important solution to social problems given the large territory and low population density. In our conditions – this is probably the only way to resolve the issue of granting the opportunity to complete professional education. Blended learning actively uses

distance educational technologies to support and update the full-time basic education.

In the study, the following tasks are posed and solved:

1. The features of methodological, information, technical and organizational support of blended learning are defined.
2. Organization structure of the portal for blended learning is represented. The subsystem of work with educational-methodical information is described. Database structure of educational process for distance component of the blended form of learning is introduced. A system for content management portal is also described.
3. Possibility and efficacy of industrial GIS for learning are investigated.
4. A methodology has been developed for adapting the testing systems to ensure the individualization of the knowledge assessment process.

REFERENCES

[1] V. Yavorskiy, R. Poshanov, A. Sergeyeva "Using of active methods to implement a mixed form of training", *International journal of experimental education*, pp.554-556, 2015.

[2] M. Ibatov, V. Yavorskiy, "Using the engineer geoinformation systems for learning ", *International journal of experimental education*, pp.108-111, 2014.

[3] V. Yavorskiy, A. Sergeyeva "Using of active methods to implement a mixed form of training", *Bulletin of KSIU*, pp.106-110, 2015.

[4] V. Yavorskiy, A. Ashkenova, A. Bashirov " Models for adaptive computer-based testing ", *International journal of experimental education*, pp.39-41, 2016.