System models of distance learning management considering the individual characteristics of students

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Abstract[1]

The article is devoted to the development of a decision support system in the distance learning management considering the individual characteristics of students. It deals with the concept and principles of distance learning, its advantages and disadvantages. Decomposition of the process of distance learning is considered. The approach to improve the efficiency of the distance learning management by in corporating personalization stages of learning and classification of students is proposed.

1. Introduction

Distance learning has become an accomplished fact, not only abroad, but also in our country. The Ministry of Education of the Russian Federation is working on establishing a unified system of the distance education in Russia. As part of this program it is planned to establish the Russian State University for Distance Education. The problems of providing quality information and software tools for educational purposes are also solving. For this purpose a range of regulatory and technical documents for quality assurance and certification educational purposes was developed and implemented. The draft standard of distance education quality named "Distance Education. Monitoring and evaluation of the quality of the distance education" was developed. However, the introduction of new forms of education in Russia is extremely slow, significantly lagging behind the developed countries. This is caused by the necessity to solve the problem in a qualitatively different approach to the distance education and its organization.

2. Problem Statement

There are many definitions of "the distance learning." For example, it is a set of technologies which provides students the transfer of a basic size of the studied material, interactive action between the students and the teachers in the studying process, providing students the possibility to an individual work upon the development of the studied material, as well as in the learning process. In the distance education the following principles must be respected:

1. The learning process is based primarily on individual cognitive activity of the student.

2. Students' cognitive activity should be proactive;

3. The distance learning should be student- centered.

The organization of the distance education requires scrupulous and detailed planning of the student activities, its organization, a strict statement of goals and objectives of education, the transfer of necessary training materials, which should provide interactivity between the student and teacher, a feedback between the student and the learning materials, and also provide the ability to study in a group. An effective feedback allows the student obtain information about the correctness of his progress along the path from ignorance to knowledge. And itis necessary to provide the invariant component in the development of distance learning courses.

Effective learning requires the implementation of an information system of distance learning(SDL), which would provide the necessary actions for the organization and training services. Modern distance learning systems provide:

- Automated management training;

- Quick and efficient allocation and provision of educational material for students;

- A unified platform to address major challenges in planning, implementation and management of all training activities in the organization;

- Support for the modern standards in the field of distance education technologies;

- Personalization of the learning content and the possibility of the repeated use;

- A wide range of means of interaction between all participants of the educational process.

The organization of the distance education raises questions of different nature: methodological, legal, psychological, etc. For example, the problems of taking into account the individual characteristics of students while creating educational and material support of distance education; teachers' training distance learning. One of the problems is the lack of elaboration of effective tools, methods, models, which could support the management of distance studying students.

Therefore, in our research as the object of study is considered the administration support of training students. The subject of the study are the special mathematical and algorithmic support components of the system of the administration of training students support, and the structure of the informational-analytical systems, algorithms and methods for distance studying students monitoring. The aim of the study is a systematic analysis of the administration of training students for the improvement of its effectiveness. To achieve the goal it is necessary to solve several problems, one of which is to identify the goals, objectives, functions, structure of information and analytical support system for the administration of training students.

3. Proposed Approach

Traditionally distance education management of the learning process involves: the assignment of courses (individual and group, automatic with described in the rules, according to the results of testing or other forms of assessment); completion of the course; timing control study (sending out notices, analytical reports).

The educational process of the distance education is provided by the following specialists: teachers, course developers and instructors, consultants (tutors); administrators, heads of departments and system administrators of information resources; designers and programmers; technical support personnel.

In distance education of the students it is necessary to provide the subsystem of the personalization of the studying process. The appointment subsystem of the personalization is the selection of the individual studying plan, which takes into account such factors as:

- student's will ingness to the distance studying;

- student's representative system.

The measure of the effective management of distance studying:

- formed competence(the result of the control of knowledge);

- moral satisfaction with the studying process.

To ensure quality education, the university should organize the process of the distance studying of students in a way when it could be so effective as it is possible. This requires informational-analytical support system for the administration of training students, which will perform the following problems:

1. The placement of educational content

- Curriculum Development

- Development of teaching materials

- Development of the Fund of assessment tools

2. The personalization of learning content and presentation of his trainees

- Classification of students

- Development of effective methods of selection of a training plan target class

3. The organization of interaction between the participants of the educational process

- Organization of training events

- Organization of group training

- Organization of communication

Such a system will include three subsystems: LMS Moodle (problem solving: Placing of the educational content and organization of interaction between the participants of the educational process), Classification of the students (classification according to various criteria), Personalization of learning (development of effective methods of selection of a training plan) (Fig. 1).

The supra system of the developing informational-analytical support system of the management processes is a system of the university' distance education, whose aim is to provide quality education graduate students using distance education technologies.

The appointment of personalization subsystem is a selection of the individual studying plan, which takes into account different factors such as the readiness of students to distance learning and student representative system. The formed competencies (the result of the knowledge control) and moral satisfaction with the studying process of the students can be regarded as the criteria for effective management of the distance education.

The global objective of developing informational-analytical support system of management processes is the organization of effective distance learning of students through personalization and individualization of their activities on the basis of the preliminary classification and selection of the profile of the student.
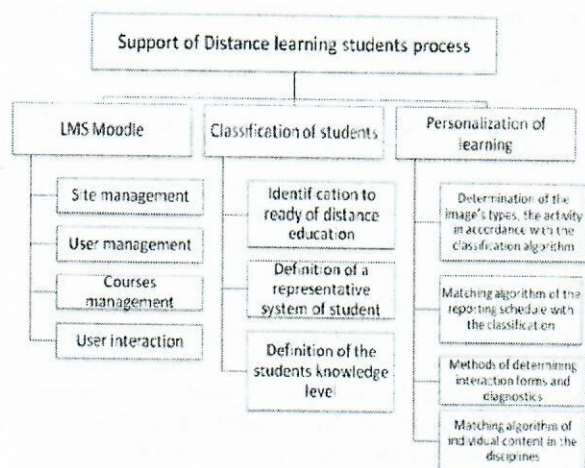
Fig. 1. The structure of the information and analytical support systems management processes

Fig. 2. Class diagram of the informational-analytical system

4. The Methodology of Object-oriented Design of the Information System

Diagram of Variants of use is a reflection of the subjects (actants) who interact with the system, and the response of program objects on their actions. From the above reference conditions one can define the list of subjects:

Student: Registration; Studying on courses; Passage of testing.

Teacher: Setting and adjustment of assessments; Electronic communication with students, sharing information, files; Analytics of studying process; Sending information to groups of students.

Methodologist: Accounting students, personalization and access rights to educational materials; Managing the studying process, taking into account the results of training and testing; Preparation of operational and analytical reports; Construction of individual training programs.

Course development: Teaching materials editing; Tests editing; Creating a dynamic, interactive content.

Administrator: Access control / security; Backup; Accounting for changes in the system (logging); Resource Monitoring / boot.

Fig. 2 shows a class diagram of the developed informational-analytical system support of the administration of training students.

The appropriate diagrams of interaction are used to simulate the interaction of objects in the UML (Fig. 3). Objects' interaction can be considered in time, and then a sequence diagram is used for the purpose of representing the temporal characteristics of the transmission and reception of messages between objects. Interacting objects are exchanging between themselves some information. Herewith this information takes the form of complete messages. In other words, although the message has information content, it acquires an additional property to provide directional influence on its recipient.
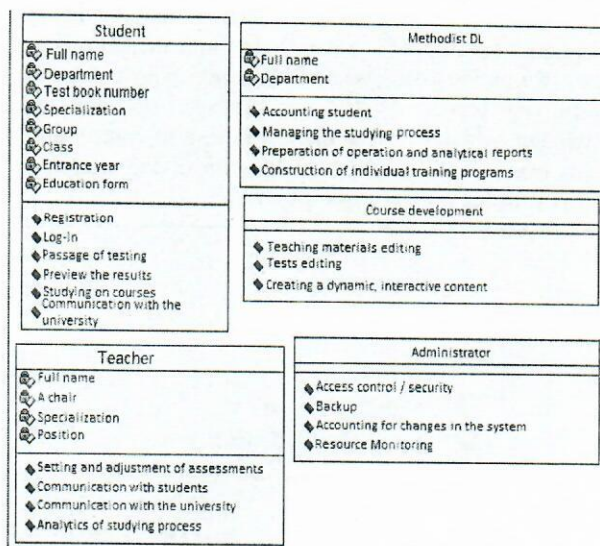
In the distance education system student addresses to the course catalog and selects the desired course (discipline) in accordance with his individual plan. A particular course teaches a specific teacher, who communicates with the student (specifies tasks, deadlines, etc.). Student sends to a teacher completed tasks, who marks a result of the execution in the log.
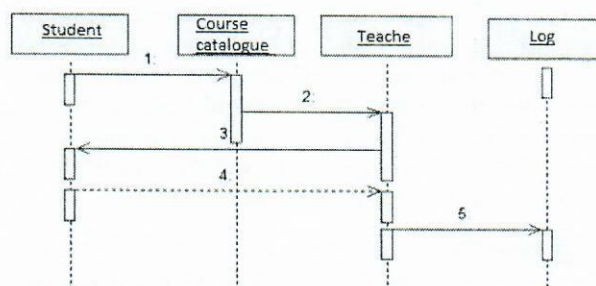

Fig. 3. Diagram of the student's passage testing sequence

5. Proposed Model

Let's consider the process of distance learning students (Fig. 4). It can be seen that in the input there is an information about the applicants, who are the consumers of the distance studying, and in the output there is an information about diplomas of graduates.

At the same time the managing acts are the Education Act, the Order of the Government of the Russian Federation on the procedure for the development and use of distance studying technologies, the Charter and other regulations of the university, and the used mechanisms are a faculty, staff special services of the university: selection committee, teaching management, information technology center and others; hardware and software, which is used for the process of distance learning: servers, computers, licensed software, etc.

In the standard process of the distance studying in an educational institution one can divide into the following stages: formation of individual education plans; directly the studying process of students; control on the level of knowledge, which includes the submitting of control and course works, tests, exams; completion of the studying process with the issuance of diplomas.
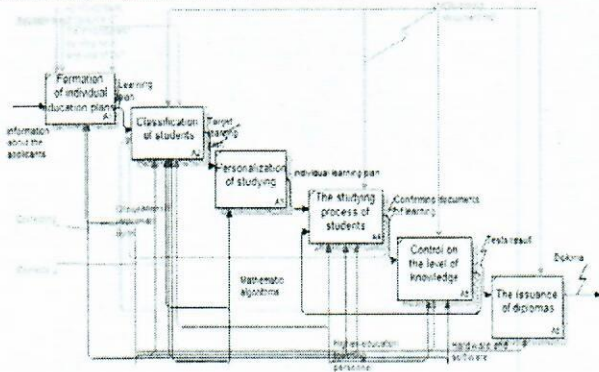

Fig. 4. Organization of the process of distance learning students

We have proposed a model in which a process of distance studying in an educational institution one must add the personalization stages of studying to improve the effectiveness of training, and prior to that, students should be classified according to various criteria. Therefore, the decomposition graph one can distinguish the following stages: the formation of the standard individual education plans; classification of students; personalization of studying based on the selected target classes; directly the studying process of students; control on the level of knowledge, which includes the submitting of control and course works, tests, exams; completion of the studying process with the issuance of diplomas.

6. Conclusion

Thus, the system of the distance education in a university consists of a set of elements (subsystems), and these elements are interconnected and in stable contacts, which are ensuring the functioning and development as a whole. Only due the integration of all subsystems into a unified system, an effective distance studying of students because of personalization and individualization of their activities on the basis of the preliminary classification and selection of the profile of the student can be organized.

The informational-analytical system for supporting the administration of training students is a complex system, because it consists of a large number of interacting subsystems of different physical nature: subsystems of forming a training plan, determination of the formation level of students' competencies, content management, course management, etc.; it has a hierarchical structure; it is characterized by a large number of parameters: the set of disciplines, the various forms of presentation of educational material, the initial level of students' knowledge, the level of development of competencies during the monitoring, the various representational systems of students, etc.

The implementation of such a system involves the use of a wide range of tools of the artificial intelligence methods.

References

1. Abdulaev, S.G., Abasova, S.E.: Problems of evaluating the effectiveness of distance learning. Information technology modeling and management. №4 (56), pp. 484-492 (2009)

2. Bikkulova, G.R.: Russian distance learning. Distance and virtual learning. №4, pp. 4-13 (2009)

3. Yamenko, O.P.: Information and communication technologies in DL, Modern problems of science and education. №4, 2013, http://www.science-education.ru/110-9791

4. Molinari A., Trevizan I., Bogdanova D., Akhmetova Y.: Classification of students on the basis of fuzzy logic to develop individual training plans. Vestnik USATU, № 6(59), pp. 35–38 (2013)

5. Bogdanova D.R., Netsvetaeva K.M., Akhmetova Yu.F.: Coordination of expert opinion for assessing the level of students knowledge's in the distance education.Vestnik USATU, № 5(66),pp. 102–104 (2014)