

**DOI: 10.37943/AITU.2022.48.68.003****S. Toxanov**

Doctoral Student

sapar6@mail.ru, orcid.org/0000-0002-2915-9619

D. Serikbayev East Kazakhstan State Technical University, Kazakhstan

**D. Abzhanova**

General Manager

ivtwki@mail.ru, orcid.org/0000-0002-7988-3971

Toraighyrov University, Kazakhstan

**A. Faizullin**

Doctoral Student

faizullinadil@bk.ru, orcid.org/0000-0001-5644-9841

M. Kozybayev North Kazakhstan University, Kazakhstan

## DEVELOPMENT OF AN INFORMATION AND EDUCATIONAL PORTAL OF DISTANCE LEARNING BASED ON EDUCATIONAL DATA MINING

**Abstract:** Currently, there is an increase in demand for distance education programs, which actualizes the problems of organizing the educational process at universities using these technologies. The article highlights and describes the characteristic features and prospects of using the analysis of educational data in the information and educational portal of distance learning, in order to implement adaptive learning and learning in accordance with dynamically formed individual trajectories. The task is to create a fundamentally new information system of the university using the results of the analysis of educational data. One of the functions of such a system is to extract knowledge from the data accumulated during operation. Creating own system of this type is an iterative and time-consuming process that requires preliminary research and step-by-step prototyping of modules. The novelty lies in the fact that there is currently no methodology for developing such systems in Kazakhstan, so a number of experiments were conducted in order to collect data, select suitable methods for studying the collected data, and then interpret them. As a result of the experiment, the authors identified the sources of educational data available for analysis in the information environment of the university. The data of semester academic performance obtained from the Toraighyrov University information system, data obtained as a result of independent work of students and data obtained using specially developed Google-forms were taken as a basis. An information and educational portal was created for the automated collection, processing and analysis of educational data. Based on the study of students' behavior, it becomes possible to form recommendations for teachers to improve the content and structure, as well as recommendations for the training of students. The data contained in the activity logs are examined to obtain information, search for dependencies by filtering relevant logs, structuring information from them and providing data in a form convenient for analysis and drawing conclusions. The data of the main types of events generated as a result of recording user actions in the learning management system and scenarios for using the results of the analysis of these data are considered. The elements of the software implementation of this system are described in detail, conclusions are made about the availability of the data sources used, and conclusions are drawn about the prospects for further development.

**Keywords:** information and educational portal, data mining, Educational Data Mining, e-learning, learning analytics.

### **Introduction**

An effective structure for the introduction of new information and telecommunication technologies in education and the formation of a common university information space is an educational portal, which is a software and hardware complex designed for the effective management of the main business processes of the university, key information resources and services.

The analysis in the field of distance learning has shown that the widespread use of systems of this training gives researchers a significantly large amount of information compared to the traditional educational process. This is due both to the active use of various data collection technologies in e-learning, and to the large scale of the audience of electronic educational environments. The growth of data volume contributed to the emergence in the early 2000s of a new direction in the field of artificial intelligence - Educational Data Mining.

Educational Data Mining is a research area related to the application of data mining methods, machine learning and statistics to information produced by educational institutions [1, 2]. Educational Data Mining develops and improves methods of processing educational data, which often have several levels of semantic hierarchy, in order to better understand how people learn and how to make the learning process more effective.

### **Literature review**

The study of general theoretical and methodological issues of the use of distance learning at different levels of education was conducted by scientists such as Selim H.M. [3], Liaw S.-S. [4], Ozkan S., Koseler R. [5] and others.

A number of works (Zervas P., Kardaras V., Sampson D.G. [6], Maldonado U.P.T., Khan G.F., Moon J., Rho J.J. [7], etc.) consider the scientific and methodological foundations of designing information and educational portals.

The scientific works of D. Ray, M. Desmare, R. Almond, E. Millan, K. Vanlen consider issues in the field of student modeling, the study of Bayesian networks was conducted by such scientists as D. Pearl, R. Neapolitan, D. Heckerman, F. Jensen, the works of R. Baker, C. Romero [8], S.Ventura [9], E. García aimed at studying the intellectual analysis of educational data, the formation and evaluation of learning outcomes were described in the works of Shahiri A.M., Husain W., Rashid N.A [10], Asif R., Merceron A., Ali S.A., Haider N.G.[11]. In most of the works, the scientific and methodological foundations of the design of educational systems are considered.

However, a review of the research concerning the theory and practice of data mining allowed us to conclude that the aspect of its use has not been sufficiently studied, in particular, from this point of view, the problem of developing information and educational portal for distance learning by means of this technique is poorly covered.

### **Research methodology**

The solution of the set goal – to increase the efficiency of the education system of the Republic of Kazakhstan in distance learning with the help of an information and educational portal using the Educational Data Mining method [12,13], was due to a number of tasks that require solving, which include:

- analysis of the study of the problem of the formation of the distance learning system in Kazakhstan and neighboring countries;

- identification of leading trends, patterns, principles, methods and forms in the formation of components of the distance learning process, ways and means of increasing its effectiveness;
- development of the concept of the information environment of continuing education based on the distance learning system, methodology and technology of its use;
- design and development of an information and educational portal of distance learning using Educational Data Mining.

The theoretical and methodological basis of the study was the work of domestic and foreign scientists on the problem of organizing a distance learning system, the experience of its creation in foreign countries and the Republic of Kazakhstan, legislative and regulatory documents on distance learning of the Government of the Republic of Kazakhstan and the Ministry of Education of the Republic of Kazakhstan.

The information base of the study was made up of statistical data on the use of distance learning technologies in universities of Kazakhstan and abroad, periodical publications, materials of international conferences, scientific and theoretical monographs, author's research and surveys conducted during the preparation of this work.

Research on distance learning and its promotion has achieved certain results.

Moreover, at present, there is a situation in which the Republic of Kazakhstan can generalize the accumulated experience of the formation of distance learning around the world and make a breakthrough in its own development, without repeating the mistakes of other countries.

During the study, after analyzing all the information and educational portals of universities for distance learning in Kazakhstan, it was concluded that there is not a single portal using the Educational Data Mining method. These portals use the learning management system: they track data on when a student gets access to a particular educational object, how many times students accessed this object and how many minutes the object was displayed on the student's computer screen, in what sequence test tasks were performed, grades that the student received for this or that a different course, etc. But then no one else works with this information, and no analysis of this data is carried out.

Based on the information received, it was decided to develop and implement an information and educational portal in the educational activities of the university using the Educational Data Mining method, in order to improve the educational process (Fig. 1).

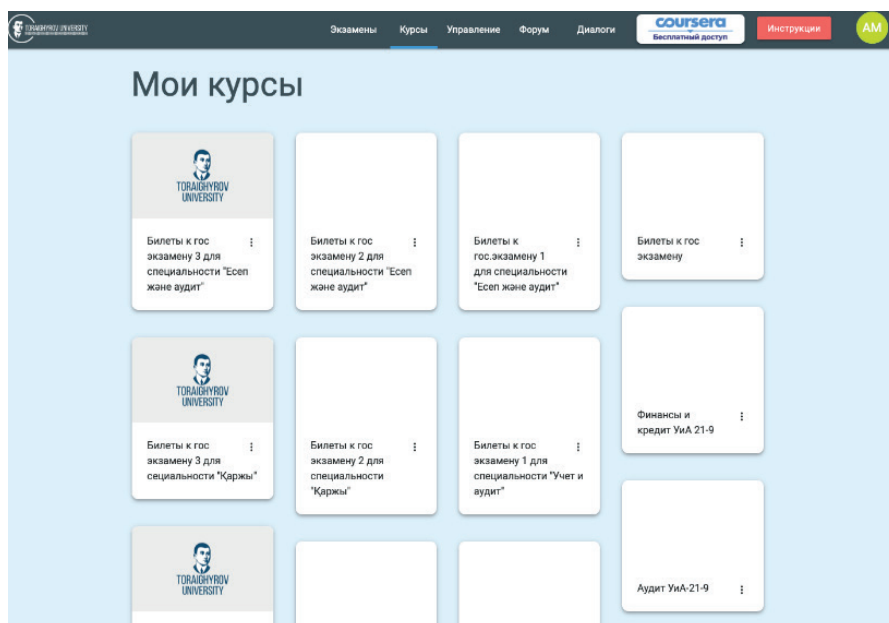


Figure 1. Teacher's personal account

When developing the information and educational portal of distance learning, the PHP programming language, the Laravel framework were used, as well as for the frontend - the HTML markup language, the Javascript programming language, the jQuery Javascript framework, the CSS MaterializeCSS framework, the Twig template engine.

The Laravel framework is designed for the development and use of the MVC (Model – View – Controller) architectural model (Fig. 2).

The “Model” module based on a database (DBMS) implements an information model of the data that are located on the portal. The functions of the user interface are performed by the “View” module, and this module also provides the user with the database in the mode of viewing and displaying data [14,15].

The process of interaction of the above modules is executed by the Controller module, and also forms the final data structure for the user.

Controllers were created for each portal page, that is, for courses, categories, chat, forum, home page, testing, lessons, profile, authorization and user pages.

Authorization is registered in the authcontroller.php file. The postLogin function has been developed, which is responsible for logging in. If the login and password are entered correctly, the login occurs, and if the password or login does not match, an error message appears.

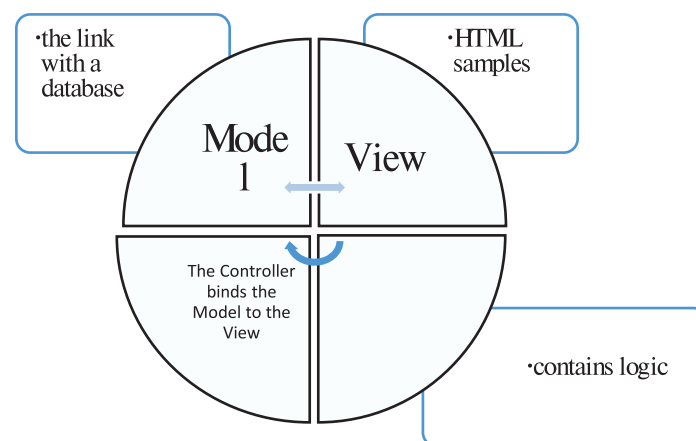


Figure 2. The MVC architectural model

### Main part

Based on the proposed architectural model, the architecture of the database of the information and educational portal of the university has been developed and classes and properties for the implementation of this model have been determined.

The developed portal uses MySQL 8.0.23 as a DBMS, and the database that is stored in it contains 20 tables. Figure 3 shows a fragment of a diagram of the relationships of these tables, through which, when selecting certain information, through the use of intelligent analysis, it is possible to form an individual trajectory of a student’s learning.

This database contains the “Students” table, which interacts with the “Courses” table through the connection with the “Registration” table. The student is assigned a certain set of disciplines by the beginning of each semester. The determination of the successful/ unsuccessful completion of any disciplines by students takes place through the “Results” table, which contains estimates of their academic performance.

The identification number, name and detailed data of the specialties that are included in the educational program of the university contains the “Specialization” table. It interacts with the “Students” table by means of the “Students-Specialization” link, which connects students with their specialization.

Logs: user activity; frequency of visits to the portal; duration of visits; feedback; grades; attempts – can be obtained through the LMS, which provides logging of all student actions. Information about the source of actions is contained in the action log. In particular, the value “browser” implies a particular user action, and the value “server” is an LMS event, for example, checking the user’s response. The service data about a certain action is located in the fields that are contained in the log records [2]. Descriptions of the following types of actions are used.

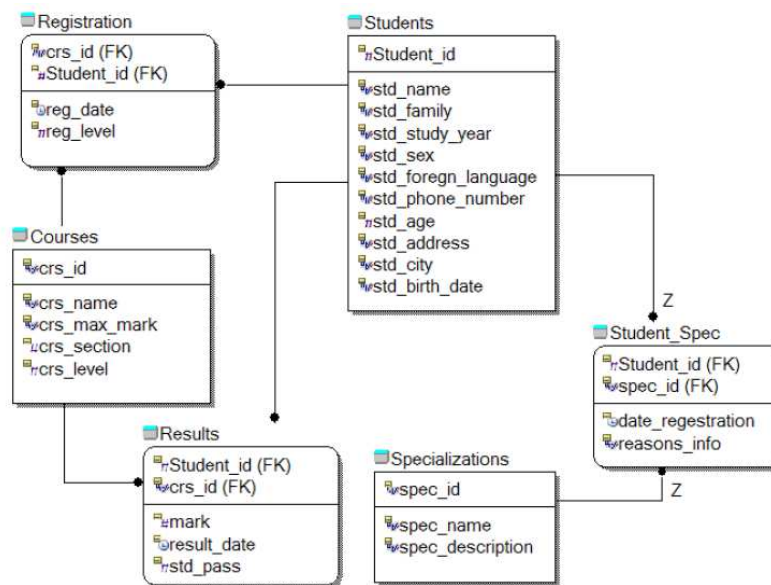


Figure 3. Fragment of the structural model of the University website database

### Actions of movement in the educational portal.

For example, when a student clicks on an object or link (navigating through the course), a log record is implemented that corresponds to this event.

Action source: browser.

Fields in log records (all types of movement actions, which are presented in Table 1, contain identical fields):

- us\_goto is launched when the user moves between pages in sequence;
- us\_next is launched when the user moves to the next page in sequence;
- us\_prev is launched when the user moves to the previous page of the sequence.

Table 1. Details in the Movement Actions field

Field	Type	Details
start	integer	For us_goto. Index of the page from which the move was made.
present	integer	For us_goto. Index of the page to which the move was made.
id	integer	Tour ID sequences

**Actions of interactions with the video.** After the student turns on the video viewing on the portal or interacts with the video in some other way, a log record of this action is made.

Action source: browser.

Actions that can be performed:

- stop\_video starts when the user pauses the video;
- active\_video starts when the user turns on (resumes) video viewing;
- rewind\_video starts when the user rewinds the video;

– rate\_video starts when the user changes the video playback speed.  
 All of the above actions are based on the fields listed in Table 2.

Table 2. Details of the video action fields

Field	Details
present_time	The current time on the video at which the user changed the playback speed.
start_speed	The speed of the video at which it was originally played.
choice_speed	The speed selected by the user

**Actions for working with PDF documents.** The fields shown in Table 3 are available for data on interactive textbooks (pdf format) that the LMS contains.

Action source: browser.

Table 3. Details of the action fields for working with PDF documents

Field	Type	Details
class	string	«gotopage», «prevpage», «nextpage»
start	integer	The number of the page from which the transition was made
present	integer	The number of the page that was clicked on

**The action of checking the correctness of the answer.** Server action of monitoring the student’s response. The actions refer to the fields that are listed in Table 4.

Action source: server.

Table 4. Details of the Response Correctness Control action fields

Field	Type	Details
answer	object	The ID of the control type and the response to it in the form of a name/value pair. For a component with multiple questions, all pairs are listed
try	number	The number of attempts of the student to answer the question
control_id	string	ID of the control type
correct	string	Correct/Incorrect

The actions described above were obtained in the form of a JSON data structure (JavaScript Object Notation) data structure from the Toraighyrov University information and educational portal.

The details of the actions are individual for any type of actions. Actions can be divided into categories: student navigation, working with videos and documents, answering questions, working with subjects.

A separate module is written for each type of action, since the data in them is often heterogeneous. The DBMS selected for data storage is PostgreSQL. Figure 4 shows the schema of the database (DB) in which data from user logs is saved. A corresponding table is created for each category of actions, since the types of actions are divided into categories. To determine the type, there is an action type field in the tables. The corresponding fields link the fields of users and disciplines. Actions that do not fit any kind are recorded in the “Others” table, in order to monitor the student’s activity as a whole.



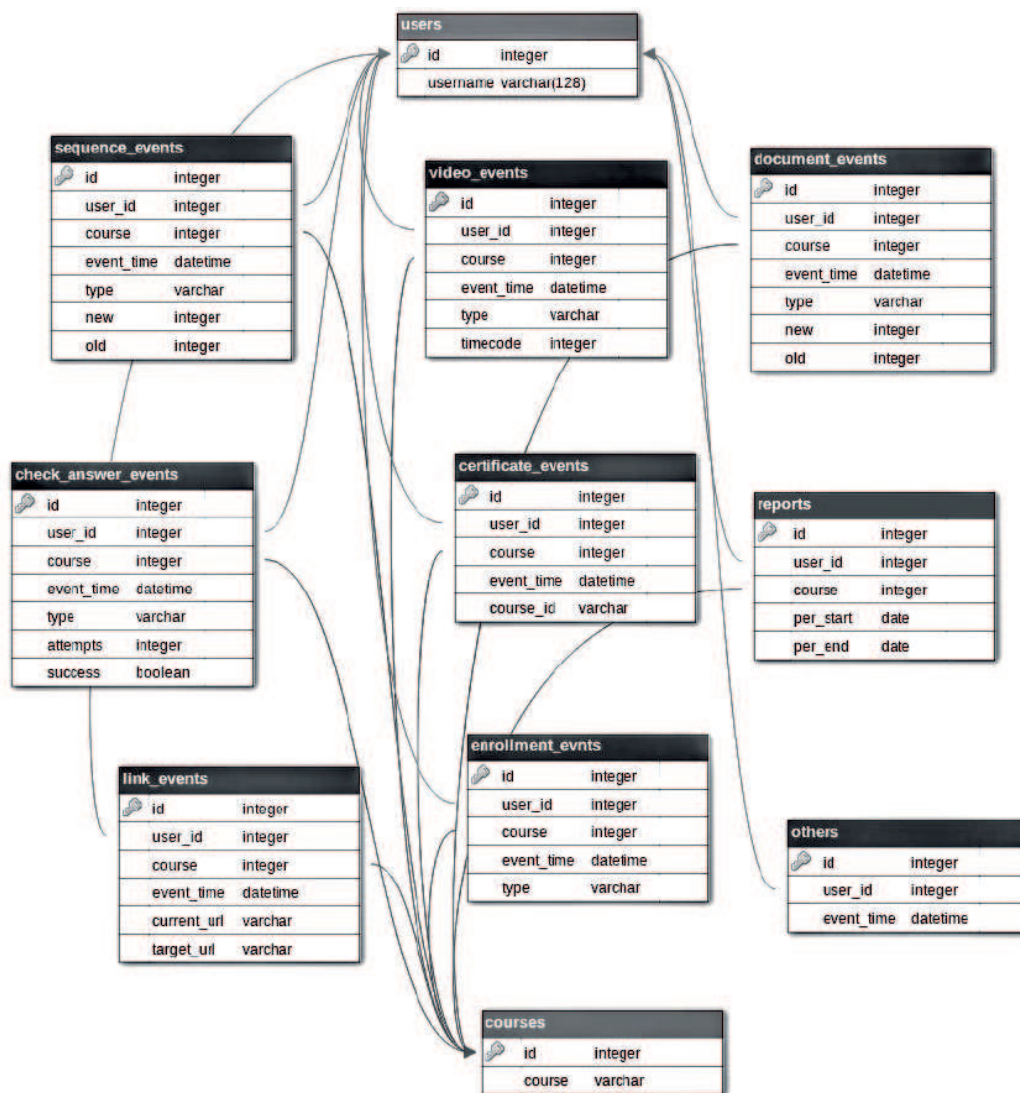


Figure 4. Structural database model for storing data from logs

The portal's formation of an individual educational trajectory for a student depends on the prevailing type of information perception – visual, auditory or kinesthetic, based on the received learning models and processing of the log database.

The theoretical part intended for teaching visual students is designed in the format of text, video lectures or html documents, for audio students - in the format of video with audio accompaniment, for kinesthetic students - in the format of an interactive lecture, which is divided into several parts, including the following materials:

- text block (lecture);
- a test implemented using Drag-and-drop technology.

It should be emphasized that the function of applying this test is not to control the student's knowledge, but to involve the kinesthetic student's motor skills during the study of theoretical material, in order to increase the effectiveness of assimilation by students.

Another way to build an educational trajectory in the educational portal is an approach through the formation of the results of the student's entrance test control, which is aimed at determining knowledge of subjects that preceded the discipline being studied [13]. Based on the results of the testing, the student has access to the theoretical block according to the first paragraph of the lecture in one of three versions: option A – a short presentation of the lecture material; option B – presentation of the lecture material with the use of additional materials

and examples; Option C – a detailed presentation of the lecture material. The alternative of version that is available to the student is based on the percentage of points received for the entrance test control: version A – 85-100%, version B – 66-84% and less than 65% - version C.

After the student has studied the lecture material of the paragraph, he needs to pass a test task. If the test is positive (from 50% and above), the student has access to the study of the following paragraph. The alternative of version of the following paragraph is based on the number of points scored.

If students receive less than 50% of points for a test task, they are redirected to re-study the lecture block.

In the developed information and educational portal, the results of the test control for the compliance of the answers of the subjects with the reference answers are formed using operations on fuzzy sets.

Let's consider the steps, using the example of two variants of possible situations most characteristic in practice, a method for determining the correctness of the received answer to the test questions and the coefficient of correspondence of the answer to the reference one using the algebra of fuzzy sets.

At the first stage, we use formula 1 to calculate the significance of the answers to evaluate  $\tilde{A}$  subset of the reference answers, where the i-question should consist of a set of answers  $X = \{x_1, x_2, \dots, x_n\}$ :

$$\tilde{A} = \{x_1 * 0.99, x_2 * 0.0001, x_3 * 0.98, x_4 * 0.0001, x_5 * 0.99, x_6 * 0.97, x_7 * 0.0001\} \quad (1)$$

The value of the coefficients tending to 1 corresponds to the degree of correctness, and the value that tends to 0 corresponds to the degree of error of the answer.

The student gave the following subset of answers to the i-th question from the proposed ones:

$$\tilde{B} = \{x_1 * 0.99, x_2 * 0.99, x_3 * 0.98, x_4 * 0.99, x_5 * 0.0001, x_6 * 0.0001, x_7 * 0.0001\} \quad (2)$$

Then the next step is to determine by formula 3 the degree of correctness of the answer in accordance with the above formulas (1-2) transformations:

$$\mu(\tilde{A}, \tilde{B}) = \bigwedge_{x \in X} (\mu_A(x) \leftrightarrow \mu_B(x)) = (0.99 \leftrightarrow 0.99) \& (0.0001 \leftrightarrow 0.99) \& (0.98 \leftrightarrow 0.0001) \& (0.0001 \leftrightarrow 0.99) \& (0.99 \leftrightarrow 0.0001) \& (0.97 \leftrightarrow 0.0001) \& (0.0001 \leftrightarrow 0.0001) = 0.01, \quad (3)$$

that is, fuzzy sets are not equal.

If the answers to the i-th questions are answered by reference, then a subset of the answers of the subject may have the form:

$$\tilde{B} = \{x_1 * 0.99, x_2 * 0.001, x_3 * 0.98, x_4 * 0.001, x_5 * 0.99, x_6 * 0.97, x_7 * 0.0001\}.$$

Then the degree of correctness according to formula 3 will have the form:

$$\mu(\tilde{A}, \tilde{B}) = \bigwedge_{x \in X} (\mu_A(x) \leftrightarrow \mu_B(x)) = (0.99 \leftrightarrow 0.99) \& (0.0001 \leftrightarrow 0.001) \& (0.98 \leftrightarrow 0.98) \& (0.0001 \leftrightarrow 0.001) \& (0.99 \leftrightarrow 0.99) \& (0.97 \leftrightarrow 0.97) \& (0.0001 \leftrightarrow 0.0001) = 0.97, \text{ that is, the fuzzy sets are equal, which means that in the second option the student answered correctly, and in the first one – no.}$$

With the help of the method under consideration, the degree of compliance of the test subject's response with the reference one recorded in the test is determined.

Further, to clarify the absolute score of the answer in points, you can enter the coefficient K, and calculate it using the formula 4:

$$K = N_c / N_e \quad (4)$$

where  $N_c$  is the number of correct answers of the subject,  $N_e$  is the number of correct answers ideally.



Then you can calculate the number of points for the answer to the  $i$ -question using the formula 5:

$$B_{result} = B_e * K \quad (5)$$

where  $B_{result}$  is the total number of points for the answer,  $B_e$  is the reference number of points.

Figure 5 shows the method of determining the correctness of the answer.

The test results are stored in the database. Proposed and implemented in the portal, the modular control unit forms the final data of the knowledge control carried out. The number of points obtained by the model during computer testing of  $B_{result}$  is reduced to the same, according to the absolute number of units per  $B_m$  module, according to the formula 6:

$$B_{result} = B_{result} * (B_i/B_e) \quad (6)$$

where  $B_{result}$  is the resulting score for the module,  $B_m$  is the absolute number of units per module,  $B_e$  is the reference number of points in computer testing.

This also applies to the data of computer testing results obtained with the help of computer training and testing programs external to the system, if the latter have the ability to save the results on any platforms.

As a basis for the development of a subsystem of computer testing of knowledge, an abstract model of a subsystem of computer testing (PKT) was developed and formally it can be represented as a processing system:

$$PKT = \{M, S, L\},$$

where  $M$  is a set of incoming, outgoing and intermediate representation models, structured computer test data and test results;  $S$  is a set of software processors (services) that provide the creation, processing and transformation of models;  $L$  is a set of formal languages for user interaction with the system.

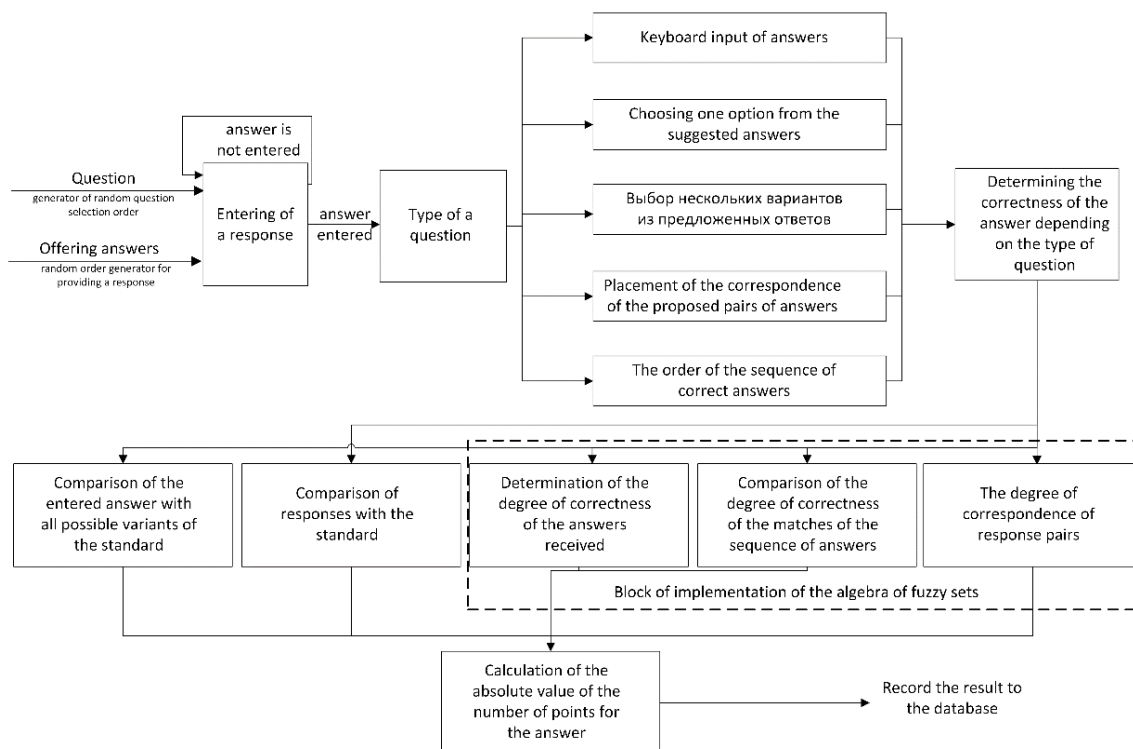


Figure 5. The model of the method for determining the correctness of the answer, taking into account the “hard” and “soft” calculations of the assessment

Figure 6 shows an abstract model of an open subsystem of computer testing. Graph nodes correspond to domain objects (models  $M$  with their most important methods  $f$ ) and formal languages. High-level  $S$  services provide the transformation of the corresponding models and the interpretation of formal text (symbolic) and/or dialog languages.

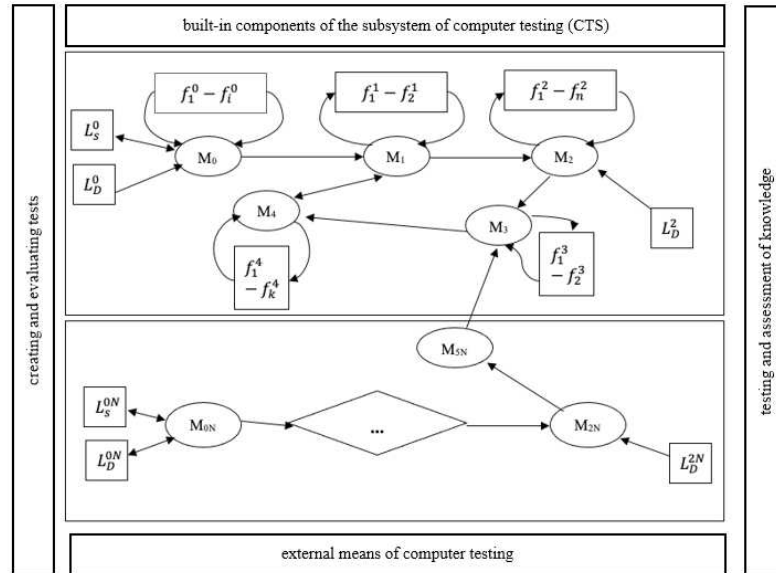


Figure 6. Abstract model of an open subsystem of computer knowledge testing

The main (built-in) components of the abstract model include:

$M_0$  - input model of the test representation (test designer model);

$M_1$  - internal model of text representation (in storage formats);

$M_2$  - initial model of test tasks (the model of the test interpreter);

$M_3$  - model of internal presentation of test results;

$M_4$  - model for evaluating the quality of test tasks;

$f_1^0 - f_i^0$  - methods of verification (formal verification of correctness) of the input test model;

$f_1^1, f_2^1$  -  $M_1$  model editing methods;

$f_1^2, f_n^2$  - methods of setting up and managing the testing process of the  $M_2$  model;

$f_1^3, f_2^3$  - methods for analyzing the results of knowledge control of the  $M_3$  model;

$f_1^4, \dots, f_k^4$  - methods for assessing the quality of test tasks of the  $M_4$  model;

$L_D^0$  - interactive language for describing and registering tests;

$L_S^0$  - symbolic language for describing tests;

$L_D^2$  - dialog speech of user interaction with knowledge control tools (speech of the interpreter of test tasks).

Model transformations are performed by high-level services:

$S_S^0, S_D^0$  - services that provide translation of formal test descriptions into  $M_0$  input model formats;

$S_{01}$  - service responsible for implementing the transformation of the input model of tests into a model of the internal representation of knowledge diagnostics;

$S_{12}$  - service turns the internal  $M_1$  model into the  $M_2$  interpreter model;

$S_{22}^D, S_{24}$  - services that turn the  $M_2$  model into the  $M_3$  results model;

$S_{14}, S_{34}$  - services that provide quality control of test tasks based on data from the internal  $M_1$  model and the  $M_3$  results model;

$S_{53}$  - special service that, in postprocessor mode, provides the conversion of external testing results ( $M_{5N}$  models) into  $M_3$  result model formats.

External computer testing tools are represented in the model by the following components:

$M_{5N}$  - a set of models for presenting the results of knowledge control using external testing tools;

$M_{0N}$  - multiple incoming models of external testing tools (test constructor models);

$M_{1N}$  - multiple output models of external testing tools (text interpreter models);

$L_D^{0N}$  - a set of dialog languages describing external testing tools;

$L_S^{0N}$  - many symbolic languages for describing external testing tools;

$L_D^{2N}$  - multiple dialog languages of user interaction with knowledge control tools (test task interpreter languages);

$S_{0N}^S, S_{0N}^D$  - services that provide translation of formal test descriptions in external testing tools into  $M_{0N}$  constructor model formats;

$S_{2N}^D, S_{2N5N}^D$  - services that turn the interpretation data of external tests into  $M_{5N}$  result models.

Setting up a subsystem to include new external computer testing tools needs to expand the functions of the  $S_{53}$  service to support the conversion of external formats for the presentation of knowledge control results to the formats of the  $M_3$  part model.

The portal gives teachers the following information:

- when creating a course, based on the analysis of the created courses, teacher will be able to predict the behavior of the students and adapt the material for them;

- during the course, the teacher receives a reaction about the learning process (for example, an integral assessment or the dynamics of student assignments);

- with the help of additional parameters, for example, viewed topics, previous grades, etc., it can be understood the reasons for students' mistakes.

This portal gives the university management the opportunity to evaluate the structure of the course content and its effectiveness in the learning process. Based on data about teachers and students, it is possible to select the best student-mentor combinations, which should increase the memorization of the material.

## Results

To study the effectiveness of using the information and educational portal using Educational Data Mining, research was conducted during the 2020-2021 academic year, where the portal was introduced into the educational process of distance learning at Toraighyrov University. The study involved students of the 2nd year of the specialty "Accounting and Auditing" of distance learning in the number of 278 people. The experiment was conducted on the course "Finance and credit". Each group was divided into subgroups of 12-13 people in each subgroup. Control and experimental groups of 12-13 people each were formed from the subgroups.

In the control group, when teaching the subject, students used the current university portal. The experimental group used a developed portal with Educational Data Mining technology.

To empirically confirm the experimental methodology, as well as to confirm the theoretical results, testing was conducted with students before and after the experiment. The test results of one of the groups are shown in Table 5. In determining the validity of coincidences and differences, we used a methodology for experimental data measured in the scale of relations [8].

According to the results of testing of EG students, the average percentage of mastering the material of the course "Finance and Credit" at the end of the semester was 80.3% (as of May 2021). This is 11% higher than the indicator of CG students (Fig. 7), i.e. there was a qualitative increase in student academic performance when using an information and educational portal using Educational Data Mining.

At the end of the academic year, an analysis of the results of students studying various topics of the course was carried out, which revealed issues requiring the refinement of educational materials and the redistribution of study hours between topics. An analysis of the efficiency of the use of resources and elements of the course was also carried out. The analysis of the rhythm of activity showed that they work evenly throughout the semester, but not effectively enough. On average, about 75% of students complete tasks on time.

Table 5. Results of testing of students of the control and experimental groups before and after the experiment

№	The number of points scored before the experiment		The number of points scored after the end of the experiment	
	CG	EG	CG	EG
1	51	55	67	91
2	42	48	62	87
3	53	39	70	62
4	49	42	73	68
5	48	53	65	86
6	41	44	56	90
7	56	48	79	84
8	49	58	84	78
9	44	46	62	76
10	47	41	71	85
11	55	57	75	71
12	38	43	66	79
13	51	43	72	88

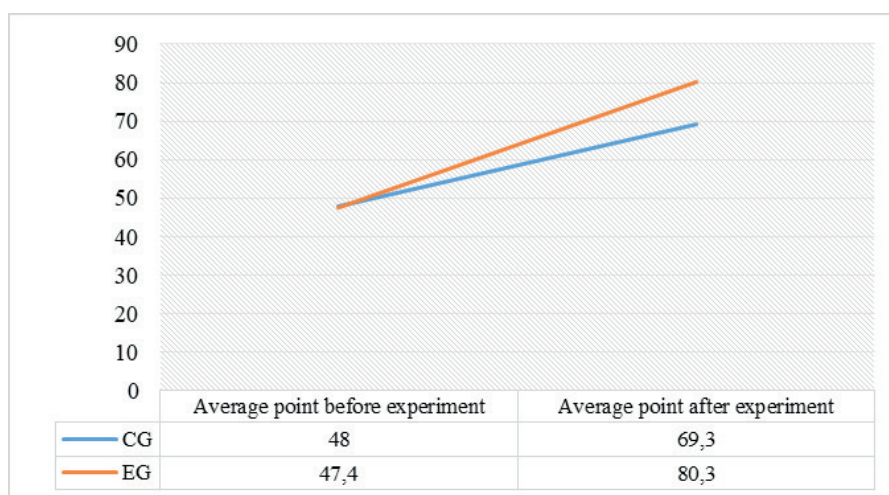


Figure 7. Results of testing of students of the control and experimental groups before and after the experiment

At the end of May 2021, a study was conducted on the basis of the university on the success of the introduction of an information and educational portal into the educational process using Educational Data Mining.

The results of questionnaires and surveys of students, as well as university teachers, indicate that the introduction of this portal has significantly improved the quality of education.

Among the survey participants who have completed distance learning on the implemented portal, 79% reported that they have made progress in the learning process.

## Discussions

During the coronavirus pandemic, the universities of Kazakhstan switched to distance learning technology by creating an electronic information educational environment that includes a wide range of tools: feedback lectures, webinars, video lectures, logic circuits, adaptive test trainings, testing and certification programs, Internet consultations, synchronous and asynchronous interaction of participants in the educational process and the formation of electronic portfolio students, which gave great prospects for the developed portal, since all universities in Kazakhstan have platforms for distance learning, and for the most part there is the delivery of the content of traditional lectures, the use of testing systems via the Internet, in some cases proctoring systems are used, but not one using the analysis of educational data.

In general, higher education in Kazakhstan has not become significantly more innovative in terms of online education tools and IT solutions but has advanced in terms of management technologies. Universities have become more aware of the mechanisms for building online courses into curricula, the regulatory framework, and the need to change business processes.

Thus, the data obtained indicate the need to introduce an information and educational portal of distance learning using Educational Data Mining in all higher educational institutions of the country.

## Conclusion

For students, the information and educational portal of distance learning using Educational Data Mining helps to adapt the course studied to their capabilities (features of perception and processing of information, the current level of knowledge).

This portal gives teachers the opportunity to get information that will improve the quality and content of the course. So, on the basis of data on the frequency and distribution of errors made by students (as well as additional information that includes viewed topics, previous grades, etc.), it will be possible to understand the causes of these errors and make adjustments to the course. In this way, you can get feedback. A comprehensive assessment of students' work on the course (the number of completed tests, homework, etc.) allows you to dynamically control the learning process. The teacher can adapt the material to the needs of certain students, based on the information collected by the portal. Teachers can also define their own indicators that show the degree of satisfaction of the student, the participation in the development of the course material and allow to control the learning process.

The portal will allow the university management to evaluate the structure of the course content and its effectiveness in the overall educational process. In front of them is a complete picture of what is happening on the portal. They also receive new tools for evaluating teachers, curricula, and how to use more productively available resources (teachers, materials). Faculty leaders can track students who are at risk of being expelled long before the exams and assist them adjust their learning process.

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