Methods of Assessment and Diagnosis of the Quality of Knowledge in E-Learning

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Abstract: In the article the author analyses the main methods of assessment and diagnosis of the quality of knowledge in e-learning. Advantages and disadvantages of the study, conducted with the use of e-learning technologies. The author analyzes the methodological support of e-learning as a set of procedures with the educational process with the use of electronic means, also proposed a detailed examination of the electronic control systems distance learning, analyzed the main tasks that solve these systems. Special attention shall have control, assessment of knowledge, skills business training as necessary components of process diagnostics. Analysis of proposed pedagogical testing in higher education, analyzes its main interrelated functions: diagnostic, educational and upbringing. The paper also presents an analysis of regulatory programs as an effective means of evaluation and quality diagnostic expertise in e-learning. There are major benefits of monitoring programs to further their use in diagnosing students' knowledge.

Key words: E-learning, diagnostics, educational process, evaluation.

1. Introduction

The use of any new technologies in the transmission of knowledge almost simultaneously raises questions about the quality of both the process and result of educational influences. Today is a great focuses on quality assurance, supported by electronic technology knowledge transfer.

In Refs. [1-3], works analyze the advantages and disadvantages of assessment methods and quality diagnostic expertise in e-learning, mechanisms are considered specific disciplines. However, in the specialized literature is lacking a comprehensive consideration of the use of specific evaluation methods and quality diagnostic expertise in e-learning.

Under a comprehensive assessment of the quality of e-learning refers to assessment of their quality on set parameters: content, technical, technological, didactic, methodical and ergonomic design.

At present, e-learning is an integral part of the educational process. It is composed include e-courses,

e-libraries, new programs and training system.

In his study [3], the author identifies elements of e-learning, which is shared with remote:

• Content objects: learning material is divided into modules containing objects of different nature—text, graphics, images, audio, animations, videos and more. Typically, they are stored in a database and are available depending on the needs of teaching. The result is the individualization of learning—students receive only what they need, acquiring knowledge in a desired pace;

• Community: students can create online communities for mutual support and messaging;

• Expert advice online: teachers or experts (instructors course) available online for consultation, answer questions, organize discussion;

• Opportunities for cooperation, using the appropriate software can organize an online conference to work together on a project students are geographically distant from each other;

• Multimedia: modern audio and video technologies submission teaching materials to stimulate striving of students to acquire knowledge and

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enhancing learning efficiency.

2. Use of E-Learning Technologies

The benefits study, conducted with the use of e-learning technologies, includes [4]:

(1) Personification. Listener study, conducted with the use of e-learning technologies can be independent: to determine the speed of learning material; determine when he wants to be trained; determine what sections of educational material and in which order he must learn;

(2) Ability-training on the job;

(3) The possibility of combining educational content to create a variety of training programs adapted to the particular student;

(4) Possibility to get a lot more information needed to assess the knowledge, skills and skills acquired through the training. Including: time spent on the issue, the number of attempts, the issue or problem that caused the greatest difficulties, etc. Such information allows for much more flexibility to manage the training;

(5) Cost. Despite the need for high initial investments, training, conducted with the use of e-learning technologies, is much cheaper compared with traditional eye training;

(6) Using a wide range of different learning tools. All these tools can be used during a traditional full-time study, but more often it does not, and e-learning requires mandatory use them. As a result of this study, which is conducted using e-learning technology, it appears most often more efficient compared with traditional eye training;

(7) Ability to use for training persons with limited capabilities;

(8) Providing access to quality education for persons to it or other reasons, is unable to study full-time in the traditional form. For example, in the place of residence no quality institution;

(9) Building an effective learning management system, based on the possibility of a much larger collection of information of training students in comparison with traditional eye training.

Disadvantages study, conducted with the use of e-learning technologies should include [4]:

(1) Difficulty making operational changes, if the training has already begun;

(2) The need for formation extra motivation in students training that is conducted using e-learning technologies, compared to other forms of education;

(3) The need for high investments in the construction of e-learning environment;

(4) High dependence on technology infrastructure. Failure infrastructure can lead to reduced effectiveness or even disrupt learning;

(5) Lack of specialists in the field of e-learning technologies;

(6) High investments for changes in educational content.

Constituents electronic distance learning is its methodological support. It is built so that students with high quality and in optimal time mastered the necessary knowledge.

Support provides a set of procedures with the educational process with the use of electronic means. Among these procedures is particularly relevant:

Formulating goals and objectives of education;

Selection of effective methods and forms of education;

Selection or development of the necessary electronic courses;

Development of methods and sequence supply electronic teaching material;

Monitoring the learning process;

Tracking and learning outcomes.

The rapid development of fundamentally new direction in education inevitably led to numerous problems. The speed of the further development of e-learning technologies largely depends on how successful will be solved the problems existing today. There are the following main problems in the area of e-learning technologies:

- The problem of the definition of equivalence recognition distance learning courses and distance education along with traditional eye education;
- Language problem when importing (exporting) education. Distance courses are designed in one language will require significant investment for their translation into another language, including the need to take account of the social, cultural and other characteristics of the region where the study will be conducted using distance learning technologies;
- The uneven development of information technology, especially in terms of data transmission channels. Insufficient bandwidth data links severely limit the use of e-learning;
- The lack of a sufficient number of specialists in the field of e-learning technologies, with the necessary level of competence;
- The high cost of developing and maintaining up to date distance learning courses;
- The difference in time in case of distance learning over large areas. This is especially significant which is using e-learning tools that function in real time;
- A lot of misconceptions that accompany the study, conducted with the use of e-learning technology, formed, including through a large number of organizations that use distance learning, but do not have adequate competence in this area [4].

Educational resources used in e-learning, ranging from simple graphics and video clips, interactive animations and models, illustrated text materials to interactive books of problems that include a themed set of tasks means automatic inspection and testing organization and control work support certain trajectories and fully electronic study courses that combine other types of digital resources in different combinations.

Developing tools for conducting classes online, so-called "virtual classroom" webinars that allow the help of synchronous video to create the illusion of the presence of students, sitting at their computers, the real training workshop. However, widespread implementation webinars prevents low bandwidth Russian channels Internet connection. An alternative to this technique is video lectures.

Accommodation as video lectures can increase the speed of formation of new training programs because the course is ready to withdraw easier than to prepare appropriate material for publication on the site. But it is connected with certain difficulties.

Lectures last for at least 45 minutes — it's not easy to understand video format on the web, so developers need to complement their various services, such as presentation capabilities simultaneously view the Exchange or other related educational facilities.

Analysis of e-learning educational resources presented at various educational sites shows that most multimedia lessons available there—a linear representation of educational information.

However, e-learning is effective only when the media objects are integral components of electronic lectures, interactive tolerated when part of the seminars, there are opportunities middleware monitoring of student learning using a remote computer testing, virtual lab and implemented workshops to consolidate the theoretical material.

From project objectives and audience of e-learning depends on which part interactive study students in free mode, and the percentage of online courses conducted in strict accordance with the sequence of passage learning paths.

One of the obvious problems of e-learning is to support the independent work.

Means of modern search solutions, information richness of the Internet and developed LMS-teachers the tools open up even more opportunities motivating students, communication with them and conduct interesting discussions than the traditional classroom work.

In Western educational science, there are several approaches to the issue of a detailed study of e-learning technologies and compare them to select

the most effective. A number of scientists consider the issue only in general, but because in the evaluation of technologies guided by the following criteria [2, 5]:

• Flexibility: adaptability how easy it is to adapt the technology to implement a variety of functions (teaching, presentation of new material, discussion, knowledge control, including examination, communication students);

• Compatibility: compatibility; technology and software compatibility with existing office equipment products and operating systems installed on your computer;

• Estimates for teachers/students: the magnitude of costs for the use of technology.

Consider the most popular technology, guided by these criteria (Table 1).

Control system by the electronic controlled from distance studies provide organization of co-operation of teacher and students. Such systems are decided by such basic tasks:

Providing of different types of communications is between students and teachers;

Storage and delivery of electronic educational materials;

Analysis of processes of studies;

Control of progress;

Construction of accounting.

Modern control system by the studies of scalable, list them functional possibilities wide and easily broadens on module principle.

The evaluation of knowledge's of students, as a rule, is carried out as a result of study of educational material of every module of the controlled from distance course (current module control) and controlled from distance course of educational discipline on the whole (final control).

Knowledge's of student from educational discipline of the controlled from distance course are estimated, as a rule, after by a 100-ball by a scale.

Current module control (evaluation) of knowledge's is carried out as a result of study of one module.

A teacher takes into account thus:

• Systematic character and activity of work of student is from the study of themes of the educational module of the controlled from distance course;

• Implementation of tasks is from the separate themes of the educational module: lead through of calculations; writing of abstracts; a grant of answers is for tests.

Results on these indexes in the cut of themes estimated a teacher, as «reckoned» or not «reckoned». On the whole a student can get to 10 marks which are added to the lump sum of marks.

During accompaniment of study of the controlled from distance courses students implementation of organizational requirements has an important enough value to pedagogical logistic of main steps of the controlled from distance studies and reflection in electronic information of results of current and final control (evaluation) of knowledge's.

Facilities informatively communication technologies appear the instruments of realization of

Table 1 Technologies for e-learning.

Technology	Adaptability	Compatibility	Estimate
Videoconference	—	—	—
Audio and video learning tools	+—	+—	+—
Online publication	+	+	+
Offline publications	—	—	+—
Internet programming	+	+	+
"Regular" programming	+	—	+
Software tests	+—	+—	+—
Content system	+	+—	+—
Online learning Environments	+—	+—	+—

the systems of the opened and controlled from distance studies. In this context there are new necessities and calls, new professional and educational aims, related to modern development of informative society status.

Innovative educational technologies must satisfy with certain system pedagogical and informatively technological to the requirements which are dictated the level of scientific and technical progress and maximally to answer principles of the opened education among basic from which mobility of students and teachers, equal access to the educational systems, forming of structure and realization of educational services.

The user of educational technologies can be presented complex. Above all things it is a teacher the primary purpose of which is achievement of educational aims and forming for the listeners of the set sets of jurisdictions. A teacher uses technology under the name "EMS (electronic mean of studies)" and that is why, fully logically, must estimate its quality.

Other category of user—it that, who is taught. It or gets in the sphere of activity of teacher that applies EMS, or the electronic transmitter of knowledge's uses independently. After be what terms it also is under an obligation to come forward as a subject which estimates quality of EMS.

The third category—a system that is interested in the organization process of studies (higher educational establishment) or interested in end-point studies (state, society). In last case specific technologies must be exhaust from the estimation of quality of application of EMS.

In electronic studies informatively communication technologies are executed by different functions, in particular, come forward as an educational information generator, by a visual aid, trainer and mean, for diagnostics and control.

Diagnostics is fixing and clearing up of all circumstances of flowing of didactics process, exact determination of his results. Without diagnostics effective didactics process control, achievement of optimum for present terms results, is impossible [1].

Control, assessment, skills training subjects included in the diagnosis as necessary components [1].

We examine didactics control as an original method of studies. It must have the brightly expressed educational, developing orientation, unite with self-control, be necessary and useful foremost to the subject of studies [1].

3. Diagnosis of the Quality of Knowledge in E-Learning

The system diagnostics evaluation as a means of stimulating acquires new qualities. First results of diagnostics that can be used value judgments (points), promote self-determination of the person in a competitive society is an important factor encouraging.

Complemented principle of voluntarily of studies (and and to control), an estimation grows into the method of rational determination of the personal Rating - index of meaningfulness (scales) of subject of studies in the civilized society [1].

For diagnostician of quality of knowledge's of students it is possible to use the row of computer tests which differ one from other after the level of complication. Possibilities informatively communication technologies allow students at a necessity to return to the level which answers them by theoretical knowledge. In the same time a teacher by IKT can look every student after achievements.

In the early 20th century in the methods of measurement and evaluation of learning, particularly in developing tests differentiation observed psychological and pedagogical trends. Development of the first pedagogical test belongs to the American psychologist E. Thorndike. Exactly with development of testing mathematical methods which influence on development of facilities of the programmatic engineering in the conditions of application of modern educational technologies in an educational process more high begin in psychology and pedagogics to be used. This period is characterized the increase of

interest to testing, as to the mean of estimation of academic capabilities. From this moment, testing develops on two main directions: creation and use of tests of intellectual development and questionnaires on the basis of psychology-pedagogical methods [5]; creation and use of pedagogical tests, academic capabilities and knowledge's intended for an estimation.

The pedagogical testing in higher educational establishment executes three basic interrelated functions: diagnostic, educational and educate:

• Diagnostic function is to identify the knowledge and skills of students. This is the main and most obvious function of testing. For objectivity, breadth and speed of diagnosing, testing is superior to all other forms and methods of pedagogical control;

• The educational function of testing consists in reason of students to activation of work from mastering of educational material. The primary purpose of work of teacher is not control (measuring of level of knowledge's), but effective process of studies. Testing procedure allows to the examinee independently find out admissions in the structure of the knowledge's, accept measures for their liquidation, to ladle necessary information. Considerable educational potential of test tasks, practical realization of principle of unity and interrelated functions studies and control, appears in such cases;

• An educate function appears in periodicity of test control. It disciplines, organizes and sends activity of students, forms aspiration to develop the capabilities [4].

In pedagogical researches and in school practice divide two groups of tests:

(1) Tests of mental gift (to the intellect);

(2) Tests of educational progress (mastering of knowledges).

The tests of mental gift, as a rule, are used for testing of level of intellect of children of preschool age and students of junior school. For determination of level of mastering of knowledge's at senior school use the tests of progress.

A test of progress is an aggregate of specially neat tasks for the exposure of knowledge's of students which need short synonymous answers [6].

The tests of progress classify after different signs (by a purpose, maintenance, form of construction, and others like that). Most widespread is classification of tests on a form a construction, namely: tests with the constructed answers and tests are with selective answers.

Characteristic for the first type of tests is that students make short synonymous answers independently. These answers are founded, as a rule, on the requirement of recreation of the studied material, on comparison, comparison, systematization of his elements. The separate varieties of such tests are required by fillings of certain admissions in the offered text of tasks. It should be noted that their failing is that they are not comfortable at statistical treatment of results.

Tests with selective answers do not give possibility of the free constructing of answers, limiting a student in formulation of these answers. It is offered to it from a few answers to choose correct.

Such method of verification at sufficient efficiency requires little time on realization of account of knowledge's. It is the first advantage by comparison to other classic methods of control of knowledge's.

There is a defect of low degree of objectivity of account of knowledge in the traditional methods of verification. The account of knowledge only then acquires objective character, when it is conducted on the basis of measuring of level of progress and quality of knowledge of students. Unfortunately, the degree of exactness of account of results at the traditional methods of verification is high not enough and to a certain extent depends on the subjective reasoning's of teacher. Test verification of knowledge allows avoiding this defect.

Advantages of tests consist in possibility to check up the state of mastering of considerable part of

educational material, simultaneously to overcome plenty of students, provide objectivity of evaluation of knowledge. Tests are economies in time: it will not be to squander time a student on the independent drafting, formulation of answers, and on widespread writing exposition them, it concentrates its attention on deliberation of answer in essence. A test does not give possibility to deviate from illumination of basic questions of this section or theme, that is fully possible in the case of free written or oral answer. Verification of test works does not need considerable efforts and time, the unambiguity of right answers is facilitated by an evaluation. Students through short time hear about the results of the answers, that prevent memorizing of erroneous positions. All it goes to show that the use of tests of progress at school is instrumental in creation of systematic feed-back, which an educational process cannot successfully be without.

The method of tests enables to have quantitative indexes of progress of students which can be mathematically processed. Testing (by comparison to other methods of verification) gives the exact enough picture of mastering of educational material students.

However to the tests peculiar and certain failings [3]. They foremost do not give possibility to a full degree to check up the degree of understanding the students of the studied material, as not motion of thought, not process of mental work, but their results, appears testing. It is needed to remember, that test control fixes the formal result of activity of students, not figuring motivation of choice of answer only. Therefore, when a student gets a wrong answer, a teacher must find out essence of error and offer to the student to execute a new task, to fasten the correct current of thought. It means that for greater efficiency, a testing method needs to be reasonably combined with other methods of study.

The main argument of opponents of selective method is reference to possibility of random selection of right answer. There is a danger, that a student will give a fictitious right answer and will get a satisfactory estimation without sufficient grounds.

The analysis of scientific researches allowed to set, that for realization of computer technologies, namely network technologies in professional preparation of future specialists most perspective is the use of control system by the studies of LMS (Learning Management Systems), a confessedly leader among which is an informative environment of Moodle. Educational possibilities of informative environment of Moodle lately are actively probed and come into question on scientific conferences and seminars. The main difference of Moodle is support of modern standards of electronic network studies of E-learning 2.0 and orientation on pedagogics of constructivism, which foresees the active bringing in of students in the process of forming of knowledge and co-operate between itself. One of basic in the informative environment of Moodle there is a concept of course as a mean, educational material organization of process of studies and environment intended for presentation, for network intercourse of participants of course.

In accordance with it electronic support of the professionally oriented tests was developed on the base of the system of the controlled from distance studies of *Moodle*, programmatic realization of which purchased the form of modifications to the main system, with which it is possible it will be to work by Web of browser, without an address to the paper transmitters of information. Modification will allow to define propensity of personality to the certain values, to set professional capabilities and others like that. Development of modification for *Moodle* was executed concordantly to the formulated requirements to the professionally oriented tests, questionnaires.

One platform of Moodle keeps and serves categories:

• web page—represents be what text with images, tables and hyperlinks;

• file allows a teacher to load a file on a server and give students possibility to load it on the computer (the followings types of files are more frequent all used: documents of Microsoft Word, presentations of

PowerPoint, images (in the format of GIF or JPEG), audio files (mp3) and videos, are files);

• a hyperlink is on a site allows to make reference out of course on be what site in the Internet;

• lecture—allows to represent material in the ramified kind; elements are for intercourse (forum—allows to conduct a discussion be what theme;

• a chat is intercourse of students between itself (or students with a teacher) real-time;

• internal system of exchange messages—very look like an e-mail, but operates only inwardly Moodle);

• elements are for collective work (forum—allows to tack files to the reports and discuss achievement of students;

• seminar—allows students to estimate work each other);

• elements of control of knowledge of students (testing is control of knowledge of students and automatic receipt of estimation);

• a task is possibility to take writing works (abstracts, control, course) over students;

• a forum is possibility to estimate the report of other users (teachers and students).

Also by effective addition in an educational process can become instruments of Web 2.0, which open new possibilities not only for a receipt but also for creation of educational content, in a that number by students, and in a great deal move control focus after an educational trajectory from a teacher and administration on a student. At that for most modern students of robot with the tool of Web 2.0, the conscious plugging in their educational environment will request from them certain efforts in relation to self-organization. Simple in the use instruments and general social co-operation of students and teacher result in an interesting and useful result: by a collective mind new rich in content is created. It confirms once again, that Web from a platform for a transmission and consumption of information in the Internet grows into an environment, where content is constantly created

and transformed. In application to the studies of possibility of Web 2.0 mean passing to such model, when a student, which not only becomes more autonomous from point of control after an educational process but also more active in creation of educational information and co-operating with other participants of studies, appears in the center of pedagogical design.

For example, in Ref. [1], a method is offered "Square of capabilities of personality" (Fig. 1) which finds out directions of development of man, that to promote them to subsequent perfection or to correct them.

Based on computer questionnaire can conclude the most advanced capabilities of the individual and those who do not need development. The computer allows you to get after passing test coefficient calculated orientation abilities of the individual (physical, sporting, organizational, mathematical, engineering, technical, emotional and figurative, actor, communicative, musical, artistic, visual, literary). It is believed the closer the resulting ratio is close to 1.0, the higher the level of display capabilities specific direction.

This information provides social teachers the opportunity to understand the structure of individual skills and simultaneously identify the level of their display to direct the development of the individual in the required direction.

Option "Help" in an accessible for future social workers mode provides tips on conducting surveys, results output to screen, review the current version of the program, maintaining their results on the server and familiarization with the results of other students. For the best mastering computer technology was developed "to create a new test mode" that allowed the program to fill new shell, but similar tests, questionnaires or questionnaires to suit different psychological and pedagogical methods.

For the criteria concerning the validity of the approach of the system of assessment and diagnosis of the quality of knowledge in e-learning can be defined parameters that characterize the quality of students knowledge extraction:
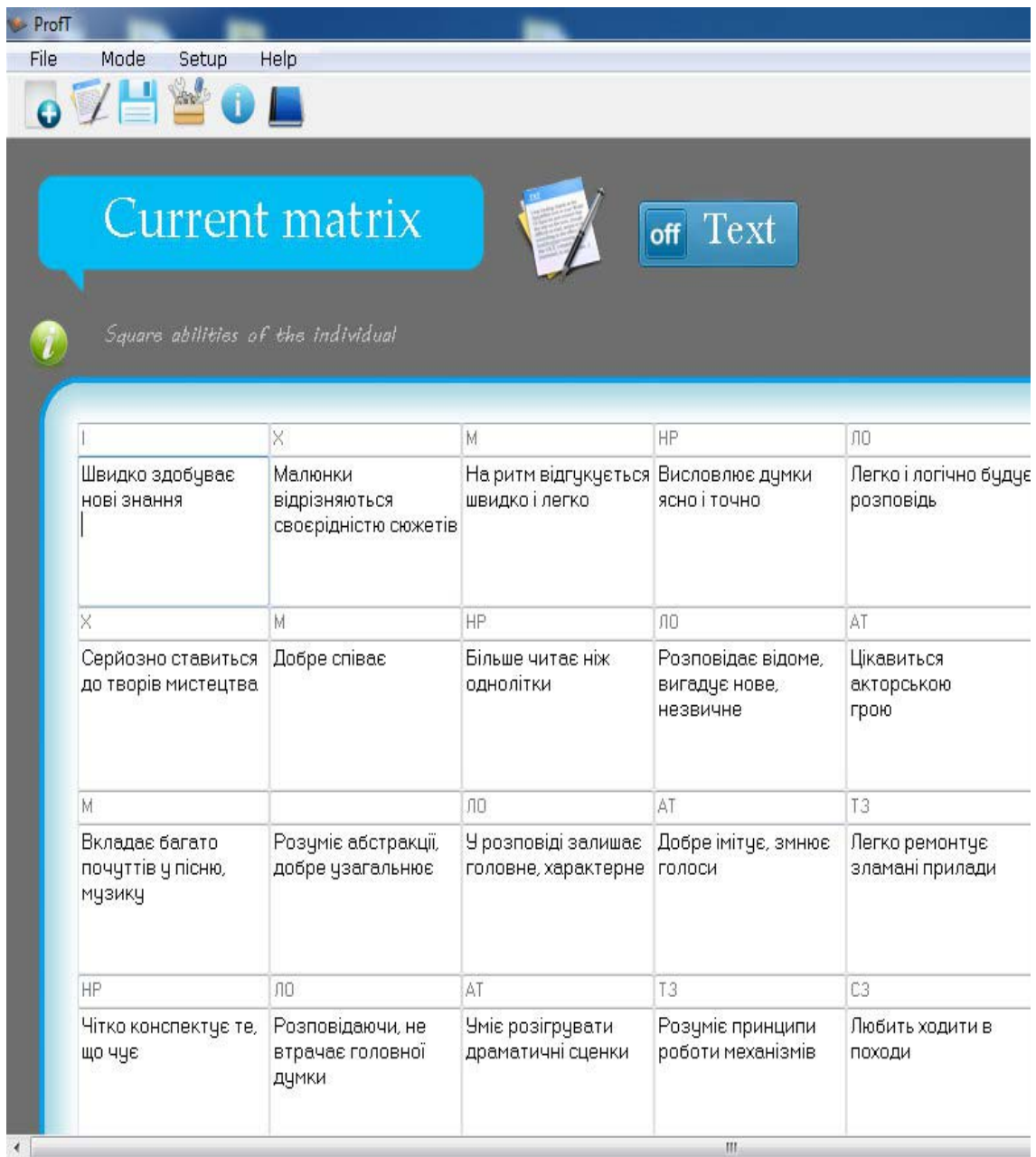
Fig. 1   Software membrane by the method of questioning "Square abilities of the individual".

The number of errors that occur during describe action sequences (can be used tests Closed rankings of responses);

The number of calls to other textbooks or consultants in the study guide content (recorded by students);

Number of deviations (returns) from the route of the line for the manual (by analyzing the history of the movement, which is also automatically saved);

The accuracy of selection of the missing information needed to make a decision (to achieve the objectives of the module) (tests can be used semi type);

The length of the training route (in modules), which is a listener during single-use guide. This indicator indirectly characterizes the degree of fatigue during the transformation of educational material (analyzed history movement, and is saved automatically).

An effective means of assessing the quality of knowledge and diagnosis of electronic control

advocate training program.

Controlling program —a software intended for testing (assessment) as knowledge or testing.

Requirements for monitoring programs:

• Should represent the possibility of answers in form as close to accepted in the subject area;

• Should provide an adequate analysis of the answers that distinguishes typo of mistakes and face the correct answer in any equivalent form of its submission;

• Should not offer a response to the student to choose from a list containing intentionally incorrect approval;

• Must be provided with fixing test results, rip up their storage, printing and statistical analysis.

Control of knowledge in the curriculum can be divided into a creeping and final. Running control is implemented in every fragment on the page of control and is designed for self-learning of the fragment. Final control is based on all of the educational information provided in the curriculum.

In training programs the most common test control of knowledge.

Two types of control test questions that can be represented as follows.

Let controlling question will be considered as a certain set of questions, which is denoted by M, and user response — as set N.

Then tests can be viewed as two types of matching sets M and N, namely:

(1) Easy line (1; n), where n—number of elements of the set N. That is one element of M n corresponding to elements of the set N;

(2) Bijection (n; n), where n—the number of elements of M and N. Corresponding to each other elements of the set M and N are identified by one and the serial number.

The first match type is implemented on a computer so: on the display screen are published questions and answers. An example of the second type of compliance can be the following:

(1) Establish a correspondence between mathematical formulas and their names are randomly displayed on the display screen;

(2) It is a set of sentences in their native language, which represent a logically linked text and the corresponding set of disordered sentences in a foreign language; you want your sentence in a foreign language in the correct order.

Note that all information that provides control (questions, answers and correct answers), it is advisable to keep in one file, namely the file test. Therefore, the implementation of test control PC is important to choose the file structure of the test.

File test represents a sequence of questions to be answered by choosing the correct answer from multiple choices.

File test may consist of three sections:

• Section title;

• Section assessments;

• Section issues.

Begins test file, usually heading which provides general information about the test, such as its purpose. The sign of the end of title could be, for example, a point behind at the beginning of the next line.

By following section titled test ratings, it should be listed valuation levels and number of points required to achieve point level.

According to estimates following section for section test, each question begins the text of the question on which of an individual line may follow artwork file name that begins with the characters. The file name is a sign of the end point. If the question is no artwork, instead of a dot file name.

Followed by alternative answers. For each alternative text for the next line is placed score for its choice. If the answer is not an alternative to traveling last question, the number of points to put the comma if the latter, period.

4. Conclusions

Educational test programs allow test use the

advantage of knowledge test as:

- Audit and accounting knowledge in a short time;
- Inspection at a high level of objectivity;
- Simultaneously cover a large number of students;
- Creating conditions to focus only on the task;
- Rapid presentation of results;
- Promote the creation of systematic feedback;
- Allows quantitative indicators to assess student achievement;
- Gives a fairly accurate picture of students mastering educational material.

Training and monitoring programs are easy to use and does not require sophisticated computers.

In addition, they can mitigate those shortcomings that are inherent in the method of programmed control:

- tiered testing method allows correcting wrong according to the student during the test;
- multimedia program increases students' interest in the process of testing and validation of knowledge;
- program makes it easy to adjust the number of tests and number of answers to each task separately, so a test is resistant to random positive assessment.

Thus, the methods and assessment tools and quality diagnostic expertise in e-learning contribute to effective assimilation of knowledge by students and students in the learning process.

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