Organization of students' performance monitoring on the basis of statistical feedback in the Web portal space of the university department

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Abstract[1]

This paper describes a process of continuous monitoring of students' performance organization. It is suggested that this process should be realized with the help of web-portal based information system. As an example a testing system based on the Course Management System (CMS) Moodle is taken.

1. Introduction

Nowadays much attention is devoted to the question of the education quality. It is indicated, that the education quality should be improved also due to the developing of more perfect system of students' performance monitoring.

The described process can be automated on the basis of web-portal technologies.

In this paper the process of students' performance monitoring will be analysed. Much attention will be devoted to a testing process. CMS Moodle will be examined as an instrument for information system of students' performance monitoring development.

2. Review of the present students' monitoring system

Generally under the term of monitoring the process of systematic information gathering and processing is understood. This information can be used to improve the process of decision-making and indirectly as a feedback tool [3].

As a type of monitoring in the educational process a monitoring of the students performance can be considered. Several forms of this monitoring type are shown on the fig. 1.

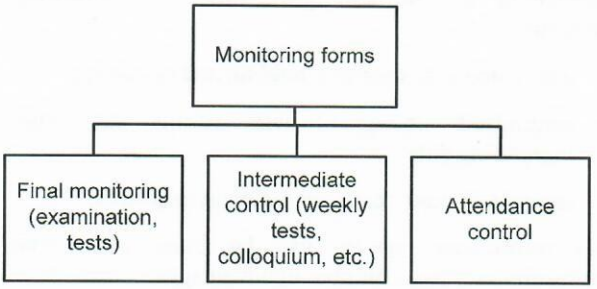

Fig. 1. Several forms of the students performance monitoring

Final monitoring includes examination (oral or written) and tests, intermediate control – weekly or boundary tests, colloquium, etc. Furthermore there are other types of monitoring in the educational process.

Present monitoring system in the most of universities along with its virtues can be characterized by a number of disadvantages:

1. Educational process is continuous; examination is taken discretely with 1 term step-interval. This type of monitoring organization is rather strict and it can cause difficulties in the regulation process, for example in the case, when a student becomes unsatisfactory grade. Besides, obtained results not always indicate the real state of affairs (owing to some psychological factors). This form of monitoring seems to be not effective because of the lack of feedback. Intermediate (boundary) control is not obligatory in the most of disciplines and is rather laborious.
2. Time resource allocation also seems not to be effective, because a teacher spends a lot of time for checking and analyzing examination results and also for completion of different documentation forms such as examination lists and reports. It is rather difficult to carry out examination results analysis, because the data are represented in the separate paper documentation form.
3. Teacher subjectivity must not be excluded.

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Therefore it is more appropriate to realize students' performance monitoring in the education process tempo. That means that every aspect of students' learning activities would be tracked and registered (studies attendance, intermediate control results, and examinations). It seems to be reasonable to carry out monitoring several times a year after finishing some parts of a discipline. Monitoring process can be realized in the test form because it is one of the most convenient ways of students' knowledge control. Tests results can serve as a feedback tool. It is important that monitoring data should be stored centrally in order to facilitate the analysis and decision making process.

At present time there is a tendency for computerization of the education system, so it is expedient to create an information system that will solve the following problems:

- automated tests creation, holding and check-up;
- centralized storing of tests results and other monitoring data;
- analysis of tests results in different measures.

This information system can be build as a web application as it has a number of advantages:

- facilitation of the remote access for the students of branch-universities;
- there is no need in additional software, students will need only web-browser for their work with the system;
- simplicity of integration with existing web-portal applications.

3. Organization of the students' performance monitoring process with the use of web-portal technology

The process of information system creation is impossible without formalization of the processes that will be automated.

The organizational model for the process of students' performance monitoring should include the next stages:

1. Monitoring planning stage: definition of terms, periodicity, monitoring form, and schedule. It can be realized in the network diagram form with the use of MS Project tools;
2. Monitoring process adaptation in the web portal space. This stage includes the development of process models, working out information system realization concepts, development tools selection, etc.;
3. Realization stage (information system development and implementation);
4. Integration of monitoring results to the web portal database.

In order to organise the monitoring process much attention should be paid to testing technology.

4. Testing process technology

The testing process in the university department web-portal environment should include the next steps:

- analysis of the learning material (based on the working program of the discipline, in order to define questions categories and contents);
- question bank creation (according to the curriculum questions categories are created and the questions are distributed among these categories);
- test generation and setting (this task includes test structure definition, grading method and criteria determination, general settings of the test specifying, etc.);
- organization of the students registration process;
- computer classes preparation (hard- and software adjustment);
- testing;
- grades analysis. Grades analysis can be carried out with the use of OLAP-technology and statistical methods. The results of analysis will serve as a feedback tool for teachers and students. According to them corrections in the question bank and course structure can be made.

Testing is a team-work of a teacher and web-portal administrator. From the direction of the teacher theoretical base development, course analysis, question bank development, recommendations for test structure and contents and also grades analysis is essential. A task of administrator is to generate a test according to the algorithm constructed by the teacher, to adjust authentication system, to support the users and to maintain the system. It is significant that some administrator functions can be executed by the teacher (for instance test generation, etc.). That depends on the computer skills of the teacher and other factors.

The process of the testing organization on the web-portal of the university department was formalized as a functional model in IDEF0-notation and was realized with the use of AllFusion Process Modeler (BPWin 4.1) software. A fragment of the model is shown at figure 2.

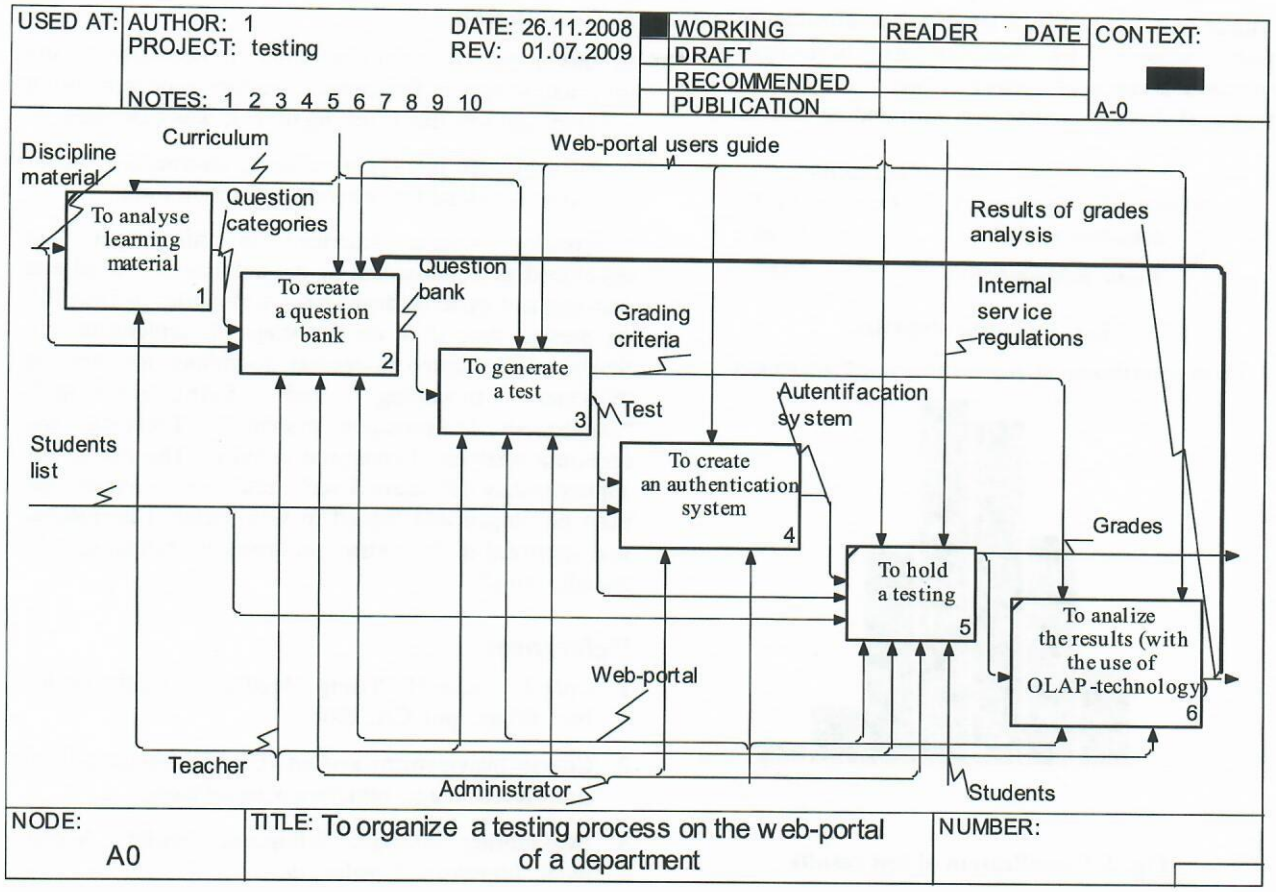

Fig. 2. Fragment of the functional model for the testing process organization

It is important to mention, that creation of the computer testing system requires significant time expenses both for the teacher and for the administrator. However further using of the system proves its efficiency because of check-up and grades analysis time reducing and enhancement of test results analysis due to automated reports generation and statistical analysis tools. Moreover the testing system can be created on the basis of the existing course management systems – CMS (for example, CMS Moodle [2], that contain standard components, which can be used for testing system development and maintenance. The use of standard components can reduce the time for information system of students' monitoring performance development.

Moodle is an open source Course Management System (CMS) that universities, colleges, schools, businesses, and even individual instructors use to add web technology to their courses. More than 30,000 educational organizations around the world currently use Moodle to deliver online courses and to supplement traditional face-to-face courses. Moodle is available for free on the Web [2], so anyone can download and install it [1].

5. CMS Moodle resources for the students performance monitoring

Moodle represents good opportunities for the students performance monitoring. Most of the course elements (lessons, quizzes, glossaries, wikis, etc.) can be graded. All marks are gathered in one journal that contains convenient tools for analysis, reports generation, grades import and export. Every teacher has an opportunity to create his/ her own grading scale that is very useful for criterion assessment of the students' performance.

An advantage of Moodle is an opportunity to import the results of the test (quiz in Moodle terminology) to MS Office Excel. So it is possible to make a detailed statistical analysis in various dimensions and organise OLAP-cubes.

One of the most important features of Moodle is a capability to trace every activity of users. Teacher can see course total statistics and also detailed information in the context of every course element. This statistics is available in different ways for every course participant. For example, the student will see only his own grades; the teacher will be able to make monitoring for every student, group of the students, course, etc [5]. For example fig. 3 illustrates the course total grade for the students. This statistics can be detailed for every course

element (e.g. quiz). Fig. 4 shows a visualization of quiz results achieved by the students: horizontal axis represents a range of correct answers, vertical axis – a number of students achieving corresponding results.

First name / Surname	Системное ... Course total
Arkadiev Andrei	60.00
Timur Sakhabutdinov	50.00

Fig. 3. Course statistics

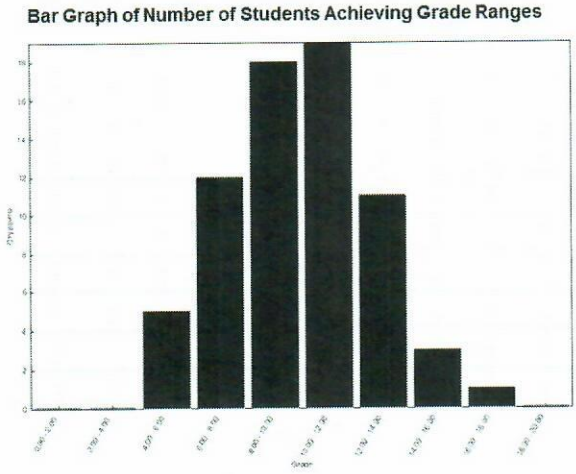

Fig. 4. Visualization of test results

Besides Moodle offers a tool for questions analysis in order to define if the question can be a measuring instrument of the students performance. Some statistical characteristics that will help to define a complexity of the question and indirectly a knowledge level of the students are being calculated. More detailed view of this question is given in [4, 3].

Monitoring system should be available both to the teacher and to the student, thus feedback mechanism will be activated. The user will be provided with statistical information that can be used for the educational process improving both by the teacher and the student.

6. Conclusion

In this paper a conclusion about a necessity of the information system for students' performance monitoring development was made, testing process was described.

It was suggested that the monitoring information system should be developed in the web application form.

Information system described in this paper was developed as a subsystem of the automated control and management systems department web-portal in USATU. At present time it is on the stage of implementation. Students were tested in several disciplines for example "Systems modelling and CASE-technology", "Databases", "Information systems", "Technical and economic analysis of enterprise activity". The system has approximately 400 users. User's guide for the system has been developed and loaded to web-portal. This manual was approved in the course "Information technologies in the education".

References

1. Cole J., Foster H. "Using Moodle". O'Reilly Media, Inc., Sebastopol, CA, 2008.
2. Course management system (CMS) Moodle official site. Access mode: http://www.moodle.org
3. "Monitoring concept: Wikipedia article". Access mode: http://ru.wikipedia.org/
4. Tolstobrov A.P., Korzhik I.A. "Means of analysis and quality maintenance of the test tasks with the use of LMS Moodle". In: *Bulletin of Voronezh State University. Systems analysis and information technology series*, 2008; 2: 100–106. Electronic copy: www.e-library.ru
5. Shilina M.A., Startsev G.V. "Automated learning process management on the basis of university department web portal". In: *Proc. of the 4th winter school for post-graduate students and young scientists "Actual scientific and technical problems"*. Vol. 1. Informatics, management and computer sciences. Dialog, Ufa, 2009, pp. 569–573.