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## Monitoring and evaluation procedure with LMS Moodle

Natalia V. Belozertseva\*  
Olga I. Vaganova\*\*  
Irina V. Akimova\*\*\*  
Anna V. Lapshova\*\*\*\*  
Roman A. Stepanov\*\*\*\*\*

### ABSTRACT

The purpose of the article is to develop recommendations for results processing in Moodle electronic system. Methodology: the authors presented formulas for calculating the reliability of the tests used to verify students' training, the description of what is required for monitoring, the actions of the teacher to perform a quality assessment system. The process of calculating the final grade for the course is presented, which will provide the necessary conditions for conducting student knowledge control. Results: in the process of study, it was concluded that modern methods of processing the data used during the control measures in higher education institutions within the framework of the Moodle system contribute to improving the graduates training.

KEYWORDS: Moodle; gradebook; electronic system; student; assessment; control.

\*Moscow State University of Humanities and Economics, Moscow, Russia. ORCID: <https://orcid.org/0000-0003-2367-6014>. E-mail: bnv\_75@mail.ru

\*\*Minin Nizhny Novgorod State Pedagogical University, Nizhny Novgorod, Russia. ORCID: <https://orcid.org/0000-0001-8347-484X>. E-mail: vaganova\_o@rambler.ru

\*\*\*Penza State University, Penza, Russia. ORCID: <https://orcid.org/0000-0003-0900-4676>. E-mail: any19.10@mail.ru

\*\*\*\*Minin Nizhny Novgorod State Pedagogical University, Nizhny Novgorod, Russia. ORCID: <https://orcid.org/0000-0001-7017-3589>.

\*\*\*\*\*Minin Nizhny Novgorod State Pedagogical University, Nizhny Novgorod, Russia. ORCID: <https://orcid.org/0000-0002-5978-3447>. E-mail: Sined100895@yandex.ru

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## Procedimiento de seguimiento y evaluación dentro de LMS Moodle

### RESUMEN

El propósito del artículo es desarrollar recomendaciones para el procesamiento de resultados en el sistema electrónico Moodle. Metodología: los autores presentaron fórmulas para el cálculo de la confiabilidad de las pruebas utilizadas para verificar la preparación de los estudiantes, una descripción de las acciones del docente necesarias para la implementación del control para que el sistema realice un procedimiento de evaluación cualitativa. Se presenta el proceso de cálculo de la nota final de la asignatura, que proporcionará las condiciones necesarias para el control de los conocimientos del alumno. Resultados: en el proceso de trabajo llegamos a la conclusión de que los métodos modernos de procesamiento de datos utilizados durante las actividades de control en la educación superior en el marco del sistema Moodle contribuyen a la mejora de la formación de los egresados.

**PALABRAS CLAVE:** Moodle; diario de evaluación; sistema electrónico; estudiante; evaluación; control.

### Introduction

Monitoring and evaluating educational output is a system of planned activities that help to identify the level of knowledge and the formation of students' competencies. Control should be carried out both at the level of individual tasks and exercises, and after doing some module, according to the results of the semester, year. Control must meet the requirements of reliability and practicality. Reliability means obtaining logical results, their stability, reproducibility and independence from the subjective opinion of the reviewers.

The purpose of the article is to develop recommendations for results processing in Moodle electronic system.

Functionality is expressed in the maximum reduction of time for organizing and processing results. The basic requirements for control are: objectivity, regularity, clarity and accuracy of the tasks statement. Monitoring activity peculiarity consists not only in knowledge and skills development, but also in feedback implementation, which makes it possible for the teacher to receive information on the progress of the educational process, on the results of all students and each individual (Bulaeva, et al., 2018). To implement the data collection procedure, there are various platforms for organizing training and monitoring. The use of electronic resources occupies an important place in the educational process. Electronic

tools allow you to activate the student's cognitive activity, motivate him to fill in the knowledge gaps on time, as the assessment results appear automatically and the student can take appropriate measures to improve their own knowledge (Vaganova et al., 2019). Currently, electronic educational systems provide ample opportunities for training students. Moodle allows you to carry out an operational knowledge test, evaluate in a short time a large mass of students' work, carry out verification of theoretical materials, ensure objectivity of assessment.

One of the most popular electronic platforms in the modern educational system is Moodle, which provides tools for monitoring and evaluating the educational results of students that are adequate to innovative development.

With the growing popularity of electronic resources in the education system, distance learning, the requirements for Moodle are growing. The control of knowledge is becoming an increasingly complex procedure, therefore, a thorough in modern conditions analysis of the results processing process in the Moodle system is necessary.

Moodle Platform; includes: wiki; forums, blogs that allow you to make the assessment process faster, more objective, adequate to the tasks.

All grades that are set by the teacher in the framework of Moodle or are determined by the system itself are included in the gradebook, called Gradebook. It is available to students, but at the same time they cannot change it, do not have the ability to correct grades inside it, because they do not have access to this function.

In the journal, students' grades are calculated both for individual answers and for a semester. This system simplifies the assessment procedure, makes it more operational. Student activity on an electronic course is checked using the following accounting capabilities - activity completion, which means completion of an action and logs - journals that give the teacher the opportunity to obtain timely information about the student's work.

## 1. Theoretical framework

In the quality management system of e-learning, one of the most important indicators are indicators of the education content quality, educational technologies and its results. E-learning quality assurance is achieved through international management standards, which require regular self-assessment and external audit (Yarygin et al., 2019). These processes are

inextricably linked with the implementation of control in a separate electronic course. In pedagogical practice, great importance is given to the electronic environment, which creates optimal conditions for assessing knowledge (Kiseleva et al., 2019).

The assessment process aims not only to test the student's knowledge, skills, competencies, develop self-control skills, critical thinking of students, but also test the effectiveness of teaching (Pichugina & Bondarchuk, 2019). Consequently, assessment tools should check not only the level of students' mastering the teaching material, but also the level of teaching (Kidina, 2020). Therefore, nowadays scientists have identified two types of assessment: cumulative and formative (Bogdanova & Fedorova, 2020). The essence of the first is the accumulation of points by the student to obtain the final grade and accumulate achievements (Shcherbakova & Shcherbakova, 2019). The second is a mechanism that allows the teacher to gather information to improve teaching.

To make students accumulate points the teacher must develop a specific set of tasks (Demidov et al., 2016b). Points are cumulative (Demidov et al., 2016a). To complete the assignment, students must reach a predetermined level and receive an appropriate grade (Kharytonov et al., 2019). The following types of accumulative systems are distinguished: simple (all points are summed up, while the sum of points that must be achieved in order to obtain one or another assessment is known in advance) (Demidov et al., 2016b); accumulative system with weighted values (here different tasks have different weights and are accordingly evaluated differently (Ivanova & Korostelev, 2019); accumulative system (Vaganova et al., 2020), with weight factors and rating (the student's total of points is not comparable with different study periods (Nagovitsyn et al., 2020); allows (at the end of the reporting period) to compare the final estimates with each other for different periods (Tsarapkina et al., 2021).

Using Moodle provides a variety of ways to measure student learning, competency building. Evaluation is the result of the evaluation (Misakov et al, 2019). In Moodle, a teacher can not only evaluate students themselves, but also offer them self-assessment. The term "Rating" means rank, position in a row (Ponachugin & Lapygin, 2019). Ratings as the number of places in the scale is a reference set of options for the qualitative assessment of a given task (Rakhmangulova & Petrova, 2021). The Mark score is a numerical expression of the degree to which student achievement matches the benchmark. The scale is a reference gradation of

the measured characteristics. Calculation of the assessment is carried out related to various elements of the assessment (Pavlovych & Bilous, 2019).

One of the most common control methods is testing, which LMS Moodle allows to implement at a high level. Verification is carried out with the help of many tools that are improving every year. Testing in the electronic system allows you to see the results not only for teachers, but also for the students themselves.

## 2. Methodology

The article reveals the process of monitoring and evaluating students in LMS Moodle, and its capabilities are determined. The test is defined as one of the most frequently used tool in the students' educational activities control. Formulas for calculating the reliability of tests used to test student preparation are given. To carry out the assessment procedure, several formulas are used. Among them, we identified, firstly, the formula for calculating the average score of the subjects, and secondly, the formula for calculating the standard error. To obtain indicators for each course located on Moodle, special reports are developed. Work with the report is based on Microsoft Excel. The category of electronic courses in LMS Moodle is selected, the data is exported to Microsoft Excel. The problem is that all the comments that were noticed during the work and drawn up in the report, the teacher is not able to convey. And each time there should be a re-examination of electronic courses again. To correct this remark, as a type of module (plug-in) it is necessary to select a "block", which is a widget that is built into the page of the Moodle learning management system. In this case, re-checking of the courses is no longer relevant.

## 3. Results and discussion

The Moodle system has a modular architecture. The core of the system is surrounded by a large number of different plugins (blocks, reports, course modules). The electronic course in the system is presented as several sections containing text and a specific set of course elements (files, forums, tasks, tests, hyperlinks). The course of the educational process is fixed due to two pre-installed modules: task and test. The role of tasks is to organize review work, course projects, essays, where the answer is formed in the form of a file, followed by the assessment and review of the teacher. The testing module allows you to control

knowledge in the form of tests with various kinds of questions. To obtain indicators for each course, special reports are developed. Work with the report is presented as follows. The category of electronic courses in LMS Moodle is selected, the data is exported to Microsoft Excel. Next, Excel automatically detects comments. All additions to automatically detected comments are saved in Microsoft Excel. This system has an obvious flaw. All available additions are stored only in Excel, so the teacher does not have the ability to transfer this report and every time electronic courses must be re-checked again. To correct this remark, as a type of module (plug-in) it is necessary to select a “block”, which is a widget that is built into the page of the Moodle learning management system (Aniskin et al., 2020). You can evaluate using the “rate” hyperlink. Icons are highlighted on the page with which you can understand whether the teacher made an assessment. This will allow you to save comments and more quickly correct them (Dobudko et al., 2019).

One of the most common forms of control in an electronic environment is a test. Moodle provides several types of questions: multiple choice; true/false; matching; short answers; numerical answers; calculated answers; embedded answers essay.

In order to carry out test control, the teacher fills in the fields in specially created forms for this, depending on the type of question used in the task. In order to enter a question, it is necessary to fill in the fields: the name of the question, its contents (to do this the use of an internal editor is provided, which allows you to format the text, insert lists, tables, necessary figures, provided that they are uploaded to the server), a picture for display (you can use any picture stored on the server), default score for the question, penalty (deduction of a certain number of points for incorrect answers), general comment (the teacher can provide an explanation for any question to make the students pass the test).

Note that Moodle makes it possible to create non-numeric rating scales. A student can get a grade not in the range from 1 to 100, but in the form of a word or phrase.

The most important advantage of the Moodle system is that Moodle provides built-in tools for processing test data. These tools are constantly evolving, undergoing changes, and the possibilities of monitoring and evaluation are increasing.

The first group includes the entire test, and the second contains separate questions or a group of questions. The average grade of the subjects is the arithmetic average of the grades

of all students who completed the test.  $T_s$  is the grade for the test of the  $S$ -th student, the median is the median value of the marks of the subjects  $T_s$ .

$$\bar{T} = \frac{1}{S} \sum_{s \in S} T_s$$

A median is a grade in the middle of a list of grades sorted in ascending or descending order that are set for the test. The possibilities of the median is that it allows you to compare students and highlight the “strong” and “weak”.

A generally accepted measure of variation in student grades per test (for a particular group of students) is the standard deviation of grades for the test. Its purpose is to characterize the differentiating ability of the test (this deviation shows the ability of the test to divide the subjects in terms of training).

The standard deviation indicates “strong” and “weak” students, if the test is high, then the deviation is not more than 30%.

Kurtosis asymmetry coefficients are measures that show the difference in the distribution form of test scores received by students from the normal distribution.

The reliability coefficient of the test in Moodle can be identified by determining the scatter of the results of each student who performed the test when answering questions. The smaller the given scatter of the results of each individual student with respect to the scatter of the total grades for the test, the questions are considered more consistent (Eremina & Pimukova, 2014). The calculation of the standard error is made according to the formula:

$$SE = \frac{ER}{100} SD$$

Calculation of standard error allows you to evaluate the factor of luck and set the margin of error for the student's grades for the test (Eremina & Pimukova, 2014).

If the standard error was 10% and the student received 60% of the maximum mark, in this case, his true mark will range between 50% and 70%.

The randomness indicator shows whether the student performed the test, being aware of his own activity, determines his preparedness, whether the student has real knowledge, or the fact of a good choice prevails in his work.

Moodle supports automatic processing of test results. To enter its statistics, you should go to the “Navigation” block, open the course section tab where the test is located, open the test tab, the results and select the “Statistics” item.

Grade calculations in Moodle are done according to the formula / function templates of popular spreadsheet programs. The creation of formulae should begin by assigning special identifiers to the valuation elements. Let A1 be the identifier of the evaluation element. `[[A1]]` is the value of the assessment element in the calculations in the final grade for the course (Sergienko, 2015). A1 is the maximum score for the evaluation element A1. The formula is written in the “calculation” field of the window and starts with an equal sign (=) and uses general mathematical operations and functions to form a single numerical result. This result can be edited. Only identifiers, standard arithmetic operations (+, -, \*, /, ()), as well as standard functions built into the Moodle system should be used in formulae. Among the most frequently used functions, we single out: sum (`[[t1]]`; `[[t2]]`; ...) – the sum of the values of the arguments; average (`[[t1]]`; `[[t2]]`; ...) – the average value of the arguments; max (`[[t1]]`; `[[t2]]`; ...) – the maximum value of the arguments; min (`[[t1]]`; `[[t2]]`; ...) – the minimum value of the arguments; round (number, count) – this function allows you to round a number to the specified accuracy.

The standard calculation formulae have limited use and do not reflect the logical relationships of the valuation elements. Imagine that an electronic course contains three active elements (the maximum and minimum passing points are known). The final grade for the course in Moodle is calculated as the sum of the points, but with the condition that all the grade points are completed for a specific grade. In more complex conditions, evaluation in Moodle is done by creating subcategories (combining several active rating elements into one category). In this case, a generalized calculated value is used.

In the Grade Journal in editing mode, users with the appropriate authority have the ability to edit grades. The journal records the results of current student performance. Its elements can be created both manually and automatically. Manually, they are created on the "Grade Log Settings" page. As soon as the estimated interactive action is added to the journal, a space is created automatically for the marks that will be put down after the students complete the tasks, manually or by the system. Figure 1 shows a fragment of the log settings.

Fig. 1. Setting up the Moodle Course Grade Log

Creation of the desired gradebook structure on the course is performed using the item “gradebook setup” located in the “settings”, “course control” block.

The journal reflects the three constructed blocks of the assessment journal “assessment element”, “category”, “assessment”. An assessment element is an interactive action (section of a course) in which its participants receive assessments.

Rating categories are called tables, united by meaningful meaning.

Grade Journal allows you to distribute the list of students by last name, view grades of individual students (their names are links), export grades to an Excel spreadsheet file or text file, and distribute the list in ascending or descending order. To make the system evaluate the student's work correctly, it is important to set parameters.

To view the detailed table with grades for each element of the course, you must follow the link “without category”, which leads to a summary table. On the “Settings” tab, you can work on the formation of the rating log, set the appropriate parameters. The function "Hide advanced settings" makes it possible to reset the set parameters (for example, weight or category). Weight is the importance used in calculating the score. Just a weighted value is the weight of an individual assessment, which is taken as equal to the maximum score for a

certain type of work. Using the “Advanced Settings” tab, additional settings are turned on or off, which reflect scores and the final rating without categories. The Show External Amounts tab allows you to determine whether external estimates will be shown.

If the course contains a large number of evaluated elements, you need to group them for each individual topic on the "set categories" page.

Moodle provides an opportunity to evaluate not only the teachers, but also the students themselves. However, this action is performed using the “Seminar” module, which allows students to evaluate and organize the quality of correspondence of forums entered in the glossary and recording database.

To set the final grade, you need to configure the formula for its calculation. It is important to set the identifier in the "ID value" section in the "Category total" field of the "Usp" performance category (the name of the variable may be different, but using valid characters (Latin letters, numbers, hyphens and underscores). After clicking "Add ID" identifier will appear on the page.

We would like to note that LMS Moodle provides built-in elements that allow you to monitor the results of the educational process. However, it is worth saying that obtaining reliable and up-to-date data on the effectiveness of e-learning use at the level of one teacher or student using standard Moodle functions is difficult. To do this, you need a set of tools that extends the standard functionality of Moodle, which includes additional services for obtaining operational information.

The monitoring complex should consist of several services, access to which is determined by the functions of the user in the system. Services allow you to monitor the "activity" of users. The number of active users is based on the minimum number of actions existing in the report settings. The share of active users is the ratio of the registered users' number in the system to the number of active users.

To generate a report, the service downloads data from the activity log: the name of the electronic educational complex; surname, name, patronymic of the participant; number of participants in the course; number of active students; the number of student activities for viewing content; the number of students' content creation activities; the number of students' completing assignments activities.

## Conclusions

LMS Moodle greatly simplifies the process of evaluating student performance. Testing in Moodle today allows you to evaluate the students' knowledge in an unbiased manner. The formulae presented in the article explain the credibility of the results processing procedure. The tools provided by Moodle allow you to evaluate the results at a high level, which ensures that students fill the gaps in their own knowledge on time. The above calculations for evaluating the students' work with Moodle show the assessment procedure, its main aspects. The data highlighted by us can be used by teachers to understand the essence of the Moodle system work in the assessment procedure and to build their own training courses to work with students more effectively.

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