

# COMPARATIVE ANALYSIS OF ASSESSMENT TOOLS FOR MODERN E-LEARNING EDUCATIONAL SYSTEMS

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**Abstract**— The paper aims to realize a comparative analysis of two evaluation systems applicable in modern e-learning systems. The evaluation aims to determine the main characteristic of each system and make an analysis of the advantages and disadvantages of the two systems and then evaluate the applicability of the automated evaluation system in modern e-learning educational systems.

**Keywords**— e-learning, on-line evaluation, off-line evaluation, automated evaluation systems.

## I. INTRODUCTION

THE rapid development of IT and communications technology in the last two decades has led to major changes in the computer assisted training, opening new possibilities for the educational system, giving rise to new ways of teaching, learning and assessment. Thus e-learning has become an alternative to classical education which by using information and communication technologies has led to an improvement of the educational process [1].

The term e-learning appeared in 1998 and is considered an interaction between teaching - learning and information technology covering a broad range of learning practices starting with the classical education up to the online learning [2], e-learning being a challenge in the educational systems around the world.

The methods used for e-learning leading to a total computerization of both the current teaching methods and processes by using different programs [3], facilitating the realization of interactive courses based on modern technologies and online testing of students by using different types of questionnaires, all achieved by means of the Internet.

## II. METHODS OF EVALUATION USING E-LEARNING

An alternative to the classical evaluation of students / pupils made paper through essays, case studies and subsequently corrected by the teacher - process that takes time is the online testing offered in general education

institutions using an electronic platform or through the use of software in which you can create and manage quizzes with automatic correction.

The online test/examination methods can be applied for all forms of evaluation in the classical education system: initiative, formative (ongoing) and summative (cumulative) [2]. The most common way to realize an online test / examination is through questionnaire with responses involving YES / NO answers, or select one or more possible correct answers of several possible. The questionnaire tests do not emphasize the creativity of students / pupils but allow an evaluation with high objectivity, can be applied to any subject regardless of its specificity.

The time spent resolving an online questionnaire can be limited to a certain period of time (open on ... time ... / closed on ... time ...) or time can assigned to each question individually.

Evaluation of these online questionnaires is done automatically after closing them, through different ways, namely [2]:

- 1) *Identifying the number of correct answers from all questions;*
- 2) *By finding the correct part of a response through scoring each answer that is partially correct;*
- 3) *By downgrading the wrong side of a response*
- 4) *By penalizing with a number of negative points for each mistake in the responses;*
- 5) *Combined assessment by pointing correct partial responses and downgrading the incorrect part;*
- 6) *Statistically - by scoring positive or negative for each question according to the proportion of right or wrong answers.*

Such an online test system may allow the simultaneously assessment of all students / pupils examined or individually by each one during the time the test is active. An important role is securing the test examination so that the student / pupil may have access to it only during the examination period provided for each subject and also the teacher can determine the

number of trials allocated to each student / pupil for each test, number which is generally equal to 1.

If the test is set up is such a way that each student can have more than one trail to solve the test at each accessing of the online test results in a change of both the order of occurrence for the questions in the questionnaire and responses for each question.

### III. MOODLE 3.0 EVALUATION SYSTEM

The Department for Distance Learning at the University of Oradea has implemented the Moodle (Modular Object-Oriented Dynamic Learning Environment) which is a Learning Management System [4], providing an platform for e-learning.

The Moodle platform allows teachers to create online test. An online test can have any number of questions, usually multiple choices, which can be added or deleted from the test through a "question bank" shown in Fig. 1.

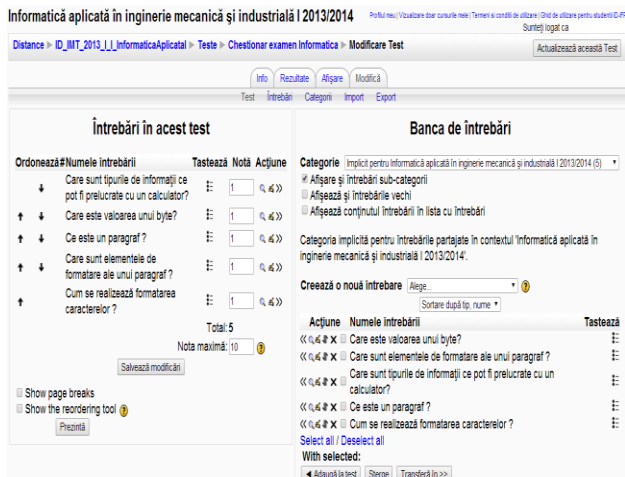


Fig. 1. "Question bank" in the Moodle platform [5]

After completing the online test it can be further modified by changing the questions or by changing the percentage for the correct answer by the teacher Fig.2.

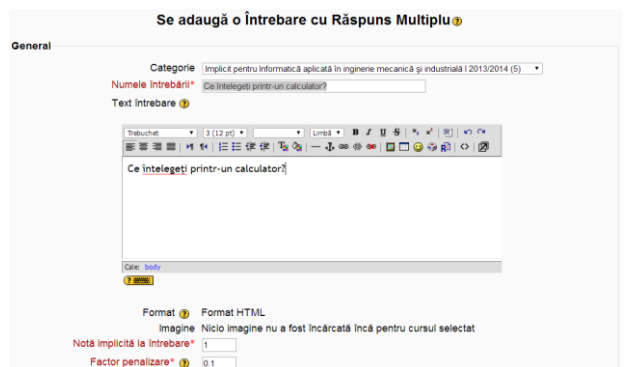


Fig. 2. Changing the online test[5]

The example presented in this paper is a test for a subject in the first year curricula for the Economic Engineering in Mechanical Field, distance learning. The test has five questions, each question has 3 response

alternatives from which only one is correct.

In fig. 3 is presented the test realized using the Moodle platform.



Fig.3. On-line test realized using the Moodle platform.

After solving the test through the selecting a response alternative for each question, the test must be saved by the student and then the system will display a test sheet with the correct response for each question. Simultaneously the grade for the student will be displayed based on the choices made during the evaluation and on the time the test was solved (Fig. 4).

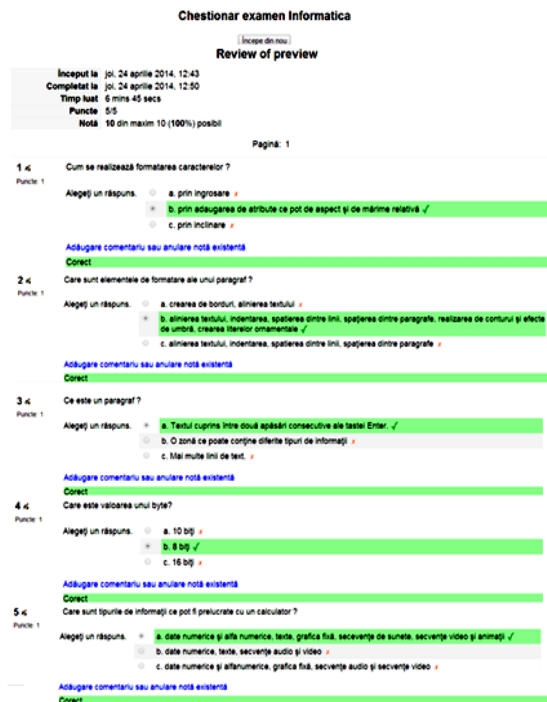


Fig. 4. Displayed test sheet with the correct answers and the grade of the student[6].

Another method of assessing the students / pupils is through the use of a software which you can create and

manage test with automatic correction.

#### IV. AUTO MULTIPLE CHOICE SOFTWARE

Auto Multiple Choice (AMC) is an software designed for realizing multiple choice test, managing the test and automatically correct and grade the tests.

The AMC software is realized and maintained by Alexis Bienvenüe and is available under the GNU General Public License, version 2 [7]. The software runs under Linux and MacOS operating systems.

Realizing test using AMC software can done either using an TXT syntax called AMC-TXT syntax or by using LaTeX syntax [8]. The example presented in this paper was realized using LaTeX syntax which allows for a more complex formatting of the tests.

As in the previous example the test realized in AMC has five questions with several alternatives.

In fig. 5 is presented the formatting in LaTeX of the test, in Fig. 6 is presented the result of running the LaTeX script (the generated test).

The software offers alternatives regarding the type of questions allowing a question with only one correct answer or questions with several correct answers. Also the software will generate the required number of tests (equal to the number of students) and will randomly shuffle the answered for each question. Keeping track of the tests is done by the AMC software by placing an unique marker for each test (Fig. 7)

```

1 \documentclass[a4paper]{article}
2
3 \usepackage[utf8]{inputenc}
4 \usepackage[T1]{fontenc}
5
6 \usepackage{box, completemulti}{automultiplechoice}
7 \begin{document}
8
9 \onecopy{16}{
10
11 %% beginning of the test sheet header:
12
13 \noindent{\bf QCM \hfill TEST}
14
15 \vspace{.5cm}
16 \begin{minipage}{.4\linewidth}
17 \centering\large\bf Test\ Data examinariei Mai., 30, 2014\end{minipage}
18 \namefield{\fbox{
19 \begin{minipage}{.5\linewidth}
20 Numele si prenumele:
21
22 \vspace{.5cm}\dotfill
23 \vspace{.1cm}
24 \end{minipage}
25 }}
26
27 \begin{center}\em
28 Durata : 60 minute.
29
30 Nu sunt permise documente aditionale. Utilizarea calculatoarelor este interzisa.
31
32 Intrebarile cu simbolul \multisimbole{} pot avea
33 zero, una sau mai multe raspunsuri corecte. Alte intrebari au un singur raspuns corect.
34
35 \emph{Punctaje negative pot fi acordate la raspunsurile vadit gresite}.
36 \end{center}
37 \vspace{1cm}
38
39 %% end of the header
40
41 \begin{question}{grade}
42 {Cele șase grade de libertate care le poate avea un robot sunt?}
43 \begin{choices}
44 \correctchoice{ 3 translații de-a lungul axelor de coordonate și trei rotații în jurul
45 acestora.}
46 \wrongchoice{2 translații de-a lungul axelor 4 rotații în jurul acestora.}
47 \wrongchoice{4 translații de-a lungul axelor 2 rotații în jurul acestora.}
48 \wrongchoice{3 translații de-a lungul axelor de coordonate și trei rotații în jurul acestora.}
49 \end{choices}
50 \end{question}
51
52 \end{document}
    
```

Fig. 5. Formatting the test in using LaTeX.

**Question 1** Cele șase grade de libertate care le poate avea un robot sunt?

6 rotații.  
 2 translații de-a lungul axelor 4 rotații în jurul acestora.  
 4 translații de-a lungul axelor 2 rotații în jurul acestora.  
 3 translații de-a lungul axelor de coordonate și trei rotații în jurul acestora.

**Question 2** Actionarea robotilor industriali se realizeaza cu?

Exclusiv cu motoare electice si pneumatice  
 Exclusiv cu motoare hidraulice si pneumatice  
 Exclusiv cu motoare electrice  
 Cu motoare electrice, pneumatice, hidraulice.

**Question 3** Sistemul mecanic al robotului este alcatuit dintr-o multitudine de corpuri rigide legate intre ele prin articulatii

de rotatie, translatie sau sferice  
 de rotatie sau translatie  
 de translatie, rotatie sau sferice  
 None of these answers are correct.

**Question 4** Cati parametri se utilizeaza pentru a descrie legaturile dintre doua elemente ale unui robot?

2  
 6  
 4  
 3

Fig. 6. Test sheet obtained by running the script.



Fig. 7. Unique identifier placed on each generated test sheet..

Depending on the formatting of the LaTeX source file the software will also place on the test sheet a box which allows the student to write his/her name or will place a box where the student can mark his/her enrolment number (Fig. 8 and 9)

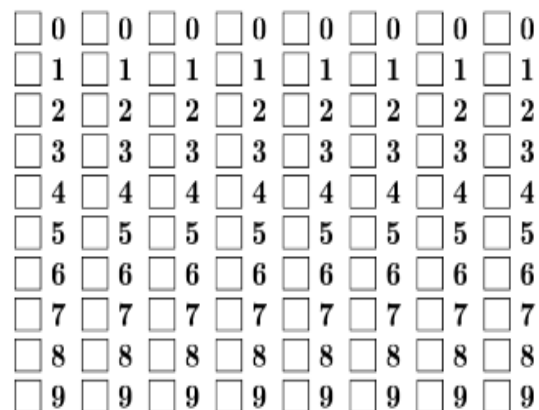


Fig. 8. Check box for marking the enrolment number[9]

In the example presented in this paper on the test sheets the student had to write his/her name on the test sheet. The area marked with red in Fig. 9 is used by the student to write his name and also the same area is identified by AMC and used is the student-paper association process (Fig. 14).

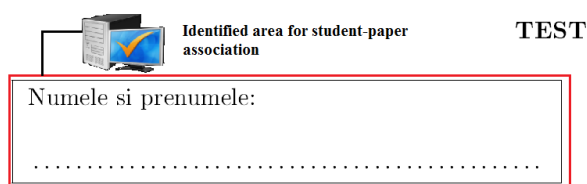


Fig. 9. Marked box for the name of the student

The method on which the student is identified is important when the test will be corrected by the software. In the case presented in Fig. 6 the correlation between test-student can be done automatically using a table containing the enrolment number and the student name.

In the alternative presented in Fig. 8 the correlation is done manually.

After generating the test these are printed and can be completed by the student (Fig. 10). All the test sheets are then scanned including those that are blank (absent students).

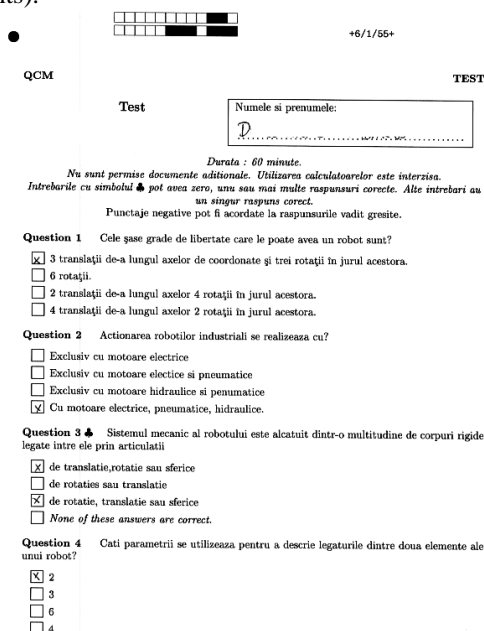


Fig. 10. Completed and canned test.

After scanning all the test the files are loaded in the AMC software and are checked automatically (Fig. 11)

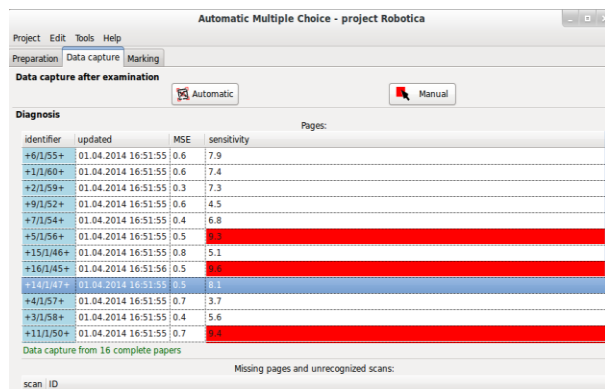


Fig. 11. Automatic check of all tests.

As seen in fig. 11 each test sheet is identified based on

the code placed by the software (Fig. 7). In this step the intervention of the teacher is required. Due to several factors such as the quality of the scan, the quality of the markings made by the students some checked boxes may have not been correctly identified. The process is assisted by the software by generating for each test a new window in which the checked and unchecked boxes are separated in two areas. If the user sees a mistake it can easily correct it (Fig. 12)

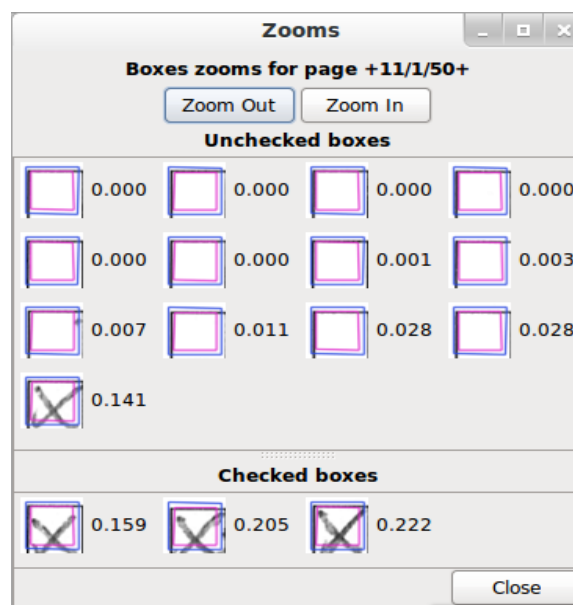


Fig. 12. Manual verification of the checked boxes (for the test 11/1/50 it was a mistake at the box 0.141)

After verifying all the test sheets the marking process can be realized. The software will allocate to each test a number of point according to the marking strategy established through the LaTeX syntax (Fig. 13)

Sheet	Mark	actionare	grade	mecc
1	20	1	1	3
10	10	1	1	1
11	3	0	0	0
12	6.5	0	1	0
13	0	0	0	0
14	13	1	1	1
15	3	0	0	1
16	20	1	1	3

Fig. 13. Marking the tests.

The next process is the realization of the test-student correspondence. For this process a table must be loaded in the software with the name of the students. The software will display a window containing the boxes with the student name and a button for each student from the table. In this case the allocation is done manually



(Fig. 14).

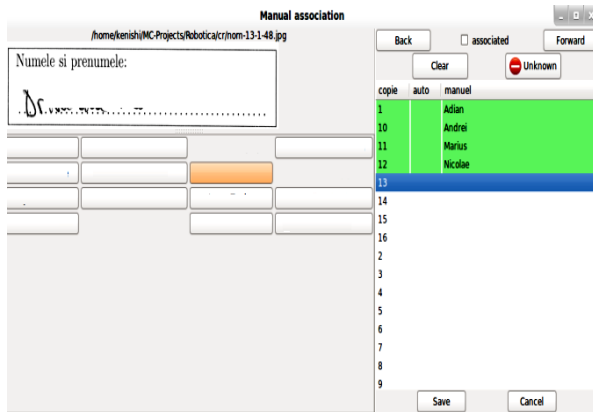


Fig. 14. Test-student correspondence.

The software can then export the results in several formats (Fig. 15)

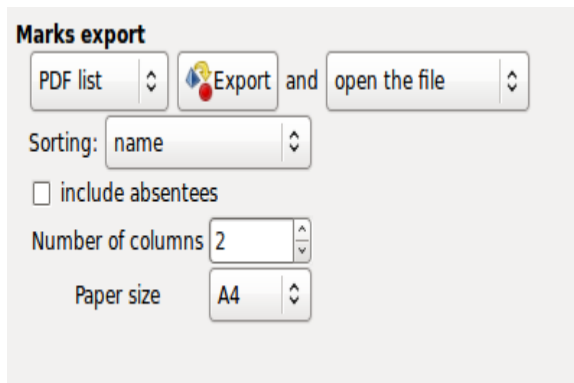


Fig. 15. Result export.

The export function can generate pdf file for on-line publishing or xml type file containing an predefined structure making possible the import of data into existing databases. This function should be implemented in the e-learning system.

As an option the software allows the annotation of the papers (Fig.16).This process is fully automated and will generate for each student a pdf file containing the scanned version of his test, the name, grade and correct answers (Fig. 17).

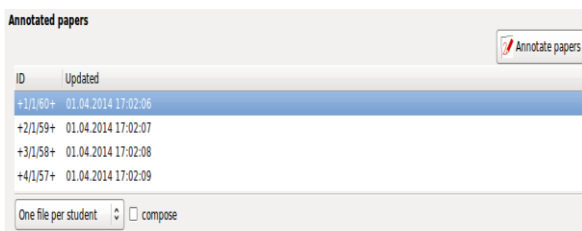


Fig. 16. Test annotation.

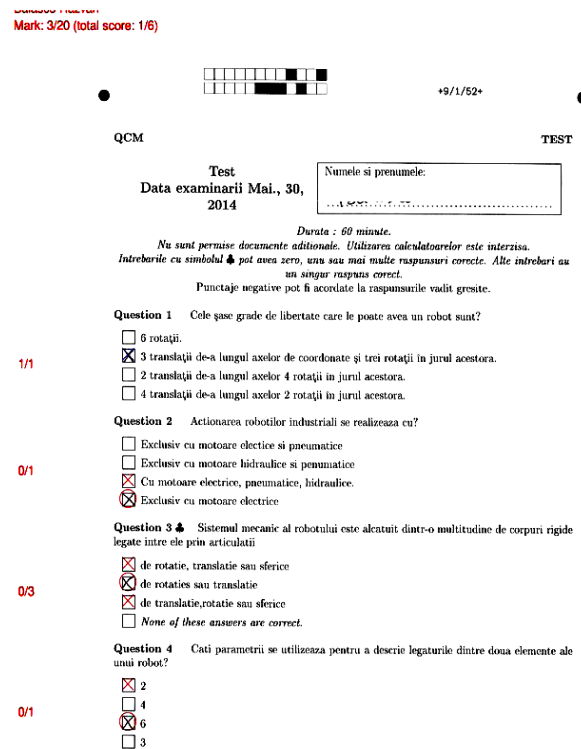


Fig. 17. Annotated paper

## V. CONCLUSION

Both evaluation methods presented are based on information technology making them suitable for the modern e-learning educational systems.

The Moodle platform allows a fully on-line evaluation process for the students being the preferred method of evaluation for those educational processes that fully rely on the on-line environment.

In this case the main disadvantage is the lack of control during the evaluation process. The system has implemented several features such as time limitation for each question or for the entire test but such systems may be insufficient in some cases. Also especially in certain periods of time the system may prove to be insufficient for a hardware resource point of view. Student will have the tendency to postpone the evaluation up the last time interval which can cause a overload.

This issue can be overcome either by allocating a time frame not for the entire student body but for groups or subgroups or by ensuring the availability of the hardware connection (using a high bandwidth internet connection, a high processing power server etc) but it could prove not to be cost effective.

Although a major advantage of the Moodle platform is the instant result feedback, the lack of any student teacher interaction in discussing the test results may prove disadvantageous for the educational process. As is the case of the University of Oradea for the students that use the Moodle platform after each examination a

meeting is established for with the goal of discussing the test results, exactly to overcome this problem.

From the teacher's perspective the Moodle evaluation platform presents several advantages:

- 1) *The process of generating the test is easy*
- 2) *The students do not need supervision*
- 3) *The grading is done fully automatically and is always accurate.*
- 4) *The grading is instant.*
- 5) *The questions existing in the database of the system are reusable.*

The AMC software relies also on IT technology but the evaluation process of the student is off-line. The management of the questions and test are done by the software.

The exams realized using AMC are closer to the classical examination, the student being required to take the test at a well established location and time under the direct supervision of the teacher. This eliminates problem related to the possibility of postponing the tests which appear in the fully on-line alternative.

From the point of view of teacher's AMC software has some drawbacks compared to Moodle.. The process of generating test requires LaTeX knowledge and can be a time consuming activity. Once the questions have been written this can be used reused (creating a database of questions).

As an advantage over the Moodle platform the possibilities related to the formatting of the test are much more significant in AMC, allowing the creation of test starting with the simple questions to test containing questions with multiple choices, test with separate answer sheet etc.

Due to the fact that AMC is based on scanning the off-line test some problems may appear during the process of correcting the test sheets. The methods of overcoming this problem can vary from instructing the student to use a dark pen to the use of high quality scanning equipments. Also the software allows the rapid identification of the errors.

The process of test-student correspondence in its manual form is a fairly simple and quick process and there is also the possibility of making it fully automatic, so this step could not be considered an disadvantage.

AMC offers a fully customizable grading strategy allowing the deduction of points for wrong answers.

A major advantage of AMC over the Moodle is the possibility of generating an annotated paper of each student. These papers are useful either when the test results are discussed with the students or for the teachers to monitor and evaluate the evolution of the students.

In regards to the licensing costs both the Moodle platform and AMC are distributed under the General Public License.

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