MOODLE AND MULTIPLE-CHOICE TESTS

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Abstract

Multiple-Choice items are used in many different kinds of tests in several areas of knowledge.
They can be considered an interesting tool to the self-assessing or as an alternative or complementary instrument to the traditional methods for assessing knowledge.
The objectivity and accuracy of the multiple-choice tests is an important reason to think about. They are especially useful when the number of students to evaluate is too large.
Moodle (Modular Object-Oriented Dynamic Learning Environment) is an Open Source course management system centered around learners' needs and designed to support collaborative approaches to teaching and learning. *Moodle* offers to the users a rich interface, context-specific help buttons, and a wide variety of tools such as discussion forums, wikis, chat, surveys, quizzes, glossaries, journals, grade books and more, that allow them to learn and collaborate in a truly interactive space.
Come together the interactivity of the *Moodle* platform and the objectivity of this kind of tests one can easily build manifold random tests.
The proposal of this paper is to relate our journey in the construction of these tests and share our experience in the use of the Moodle platform to create, take advantage and improve the multiple-choices tests in the Mathematic area.

Keywords - Mathematics, Multiple-Choice Tests, Technology in Education, Moodle.

1 INTRODUCTION

The teaching and learning of mathematics at the tertiary level is a matter of concern in almost all countries. Universities and Polytechnic Institutes face increasing difficulties at enrolling students in university studies in which mathematics is a substantial component and teachers face increasing difficulties at helping their students learn the mathematics they would like them to learn. It was thinking in overcoming these difficulties that we started to develop some multiple-choice tests performed on the *Moodle* platform. This work arose as a need to improve learning and increase the levels of success in the Mathematics subject areas in the Accounting and International Commerce courses of the Institute of Accounting and Administration of Oporto – ISCAP.

2 WHAT IS MOODLE?

Moodle (Modular Object-Oriented Dynamic Learning Environment) platform is an Open Source course management system centered on learners needs and designed to support collaborative approaches to teaching and learning, producing Internet-based courses and web sites. Philosophically based on social constructionist pedagogy, *Moodle* has been and continues to be developed on a grassroots level, with new versions regularly released to the user community.
Moodle offers to the users a rich interface, context-specific help buttons, and a wide variety of tools such as discussion forums, wikis, chat, surveys, quizzes, glossaries, journals, grade books and more, that allow to learn and collaborate in a truly interactive space.
In the educational institutions, since the primary school to higher level, the Moodle is an import tool for the teachers and students. Moodle allows to innovate the teaching and learning process, exploring technologies as a pedagogical resource and to induce bigger motivation to the students.
This platform offers significant potential for the improvement of education and training. It supports learning processes, through enhanced communication, discovery, simulation, exploration and problem solving. Combining several possibilities we can improve the success rates and make available to students a set of materials adapted to their needs.

Moodle also allows to create a secure storage of documents, provide support material, promote self-learning, increase the self-confidence of students, increase the communication between students and teachers and between students. We can use it in the classroom or outside, at any time and any place. The number of *Moodle´*s users has grown up year after year.

3 MULTIPLE-CHOICE TESTS

When we plan a course there are several components that we must take in attention: instruction, objectives, assessment and the evaluation. The assessment can be characterized in two different categories: formative and summative. To measure the level of achievement or performance in these categories, according to Ory [11] there are two general types of items: *objective items* and *subjective or essay items.*

Objectives items involve multiple-choice, true-false and matching questions. In subjective or essay item, also named constructed-response or open questions, include extended response or essay and restricted-response items, short-answer items or problem solving.
The opinions about the usage of the multiple-choice tests to assessment are very divergent.
Many authors [2][10][17] refer several advantages of multiple-choice tests: objectivity, accuracy, assessment in large classes and they can be used in many areas of knowledge.
The criticism most frequently indicated is that multiple–choice tests can not measure certain learning outcomes, such as the ability to communicate and articulate explanations, organize information, and the creativity - the ability to produce original ideas. For Burton [2] such learning outcomes can be better measured by short answer or essay questions, or by performance tests.
In our opinion multiple-choice tests are very useful to assessment in large classes. We can take advantage if we can perform it on the computer.
Informatics tools are very useful to help us in the construction of these tests. *Moodle* provides teachers with a lot of flexibility when creating this common question type, and it can be a good way to motivate and help students increasing their independent learning skills.

3.1 Multiple-Choice Test Items

A multiple-choice test item consists of two components:

- A problem (***stem***) – that may be in the form of a question/problem or an incomplete statement, at the beginning of each item.
- A list of options (***alternatives***) – that contains one correct option (the answer) and a number of incorrect options (**distractors**).

The distractors should get some students to choose these options. According to Haladyna [1] *a good distractor should be selected by low achievers and ignored by high achievers*.
There are a diversity of Multiple–Choice Items, such as single correct answer, best answer, negative, multiple response and combined response. We will describe just the single correct answer.
An example of a Multiple Choice Item:

Item Stem: There are 21 students that going to Erasmus. Five of these students are selected to attend four different countries in Europe.
The first person selected will go to Spain, the second will go to Romania, the third to Ireland, the fourth to France and the fifth to Italy. How many of such selections are possible?

Response Alternatives:

(A) C_5^{21} **-** Distractor

(B) $5!$ **-** Distractor

*** (C)** P_5^{21} **-** Answer

(D) 5^5 **-** Distractor

In this case the correct answer is the option who is marked with (*)

Fig. 1 - Multiple-choice item

How to write a good multiple-choice item? We fallow some suggestions for the construction of good multiple choice items. Take some suggestions.

Writing Stems

After reading the Stem, the student must know well what is the problem and what is needed to solve. The question must be very explicit and written with clearness.

The student should not have to read alternatives to understand the question or intent of the incomplete statement [2].

Various authors [3], [1], [4], [5] suggest we should be attending the following:

- remove excessive wording and irrelevant information in the stem;
- identify the one point to be test by that Item;
- eliminate excessive verbiage or irrelevant information;
- restrict the use of negatives in the stem, when used, underline and/or capitalize the negative word.

Writing Options

Here we also have hard work. Create a good distractor it is very difficult. The most instructors make only four options.

Various authors [3], [1], [4], [5] suggest we should be attending the following:

- the options should be mutually exclusive
- they have to be more homogeneous as possible
- the language rules of each alternative as to be consistent with stem
- there is only one correct answer or had no doubt in the student choose the most complete response;
- to choose the distractors think in most errors that students make it
- keep away in the options like “all off the above”, “I don’t know” and “none of the above” (in general)
- avoid specific determinates, such as “never” and “always”
- keep the alternatives parallel in form
- keep the alternatives similar in length
- the options can be organize in alphabetical order, temporal, numerical quantity or by time to response
- use letters in front of options rather than numbers
- write each option in vertical position
- distractors that are not chosen by any students should be replaced
- try while the test construction, that the number of correct choices don’t be all in the first option. We must be careful that the correct answers are homogenous in place.
- each options do not have multiple interpretations
- avoid the use of humour when developing options

We suggest that the item must be review by a colleague.

While we are doing an item to test higher thinking skills, we have more careful in their construction. We have to use charts, diagram, pictorial materials, tables or figures to ask for application, analysis or evaluation.

When it is the first time that the students make a multiple-choice test, we should to prepare them for this.

Critics

The biggest criticism to the multiple-choice test, concerns to guess the answers. But ~~it~~ this problem can be reduced when we increase the items. For instance, the probability of all answers will be correct, in a test with four items, is 0.4 %. If we increase the number of items, the probability of guessing will be lower.

Another critique it that this type of questions only measure memory and low level thinking. However, with Multiple-Choice Items is possible to write application and analysis levels that require use of concepts and theories and analytical thinking to make selection from the available options. *For items at those levels test-takers need to compare options and make judgment about the correct or best response* [2].

They can be designed so that students have to use critical thinking skills to make the subtle distinctions that are necessary to reason out the correct answer [6]

3.2 Multiple-Choice Test on Moodle

The *Moodle* platform allows a wide range of activities tools that enables flexibility to the teachers when they are creating tests. In Moodle “tests” are known by “quizzes”.
The image below shows the activities available in the Moodle.
We are going to focus on the quiz activity.

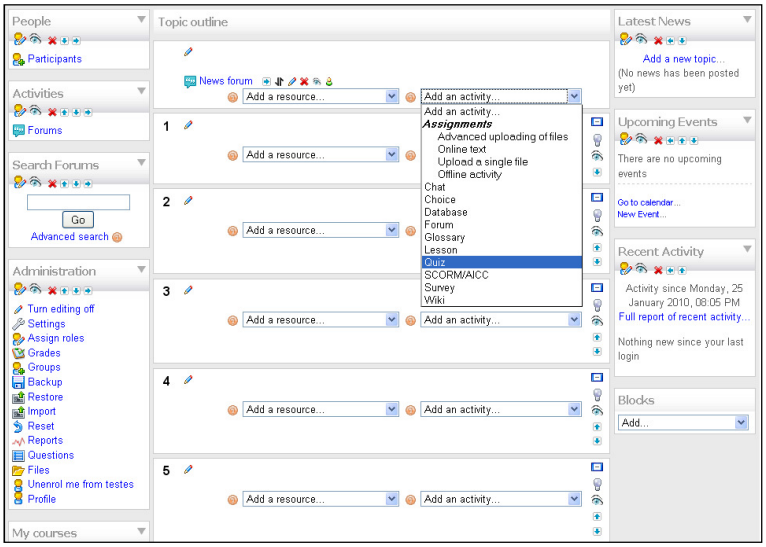

Fig. 2 – Activities in the Moodle main page

After selecting the “Quiz” activity we must define some options like timing to open/close the quiz, shuffle questions, shuffle within questions, review options, overall feedback …
Moodle has a mechanism of management issues that can manage a database of questions, sorted into categories and subcategories. This is very helpful to organise all the questions by subjects, difficulty levels or others.

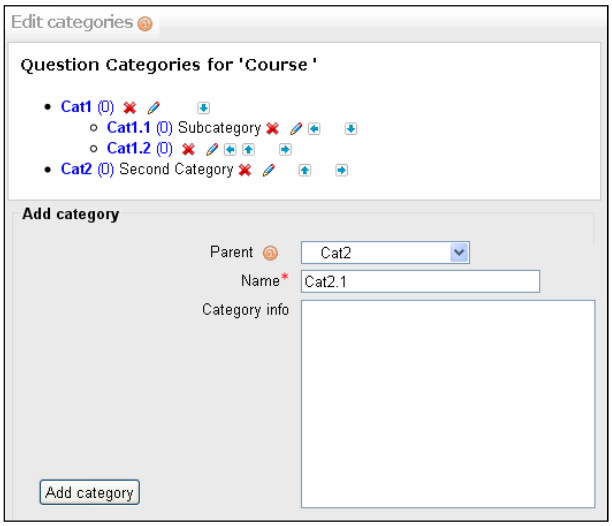

Fig. 3 – Editing categories and subcategories

When we are creating a new question, we must put it in the subcategory of the category we want it forms part and build the question.
We have the ability to create quizzes with several types of questions, and we also are able to import them from different sources.
In the next figure we can see the types of questions that can be chosen on Moodle.

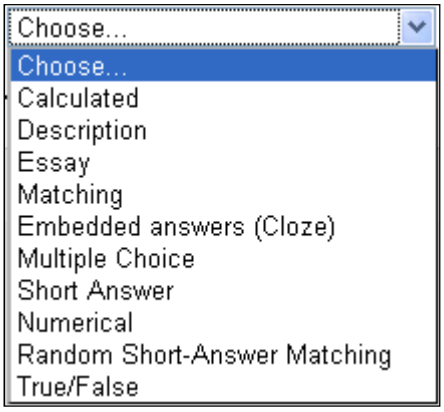

Fig. 4 – Types of questions

Then we choose a category and start to write the question, add more questions or editing. In figure 5, we can see an example of one question in the category *Definite Integration*.

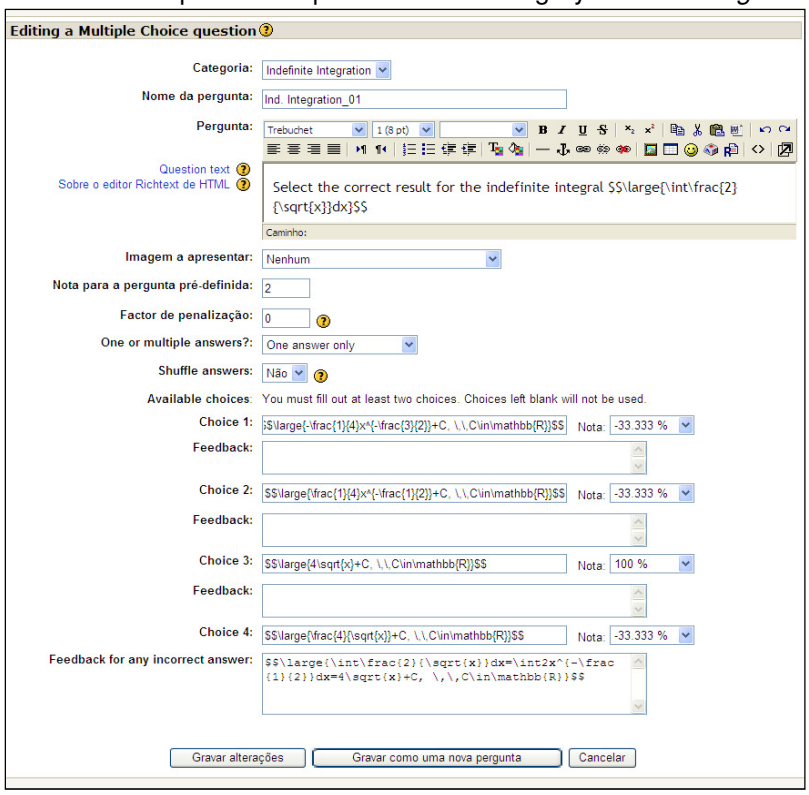

Fig. 5 – Edit a question

In this multiple-choice question, we have chosen four options for the answer but there is only one correct answer. The correct answer worth 100% of the score and a wrong one discounts 1/3. We can also see in this figure, that we use the field “feedback for any incorrect answer”. As a result, students can have, for each wrong answer, the correction of that and discover where they failed.
In figure 6 we can visualize the question outlook of the above question. We can also observe that the option chosen is incorrect and their feedback.

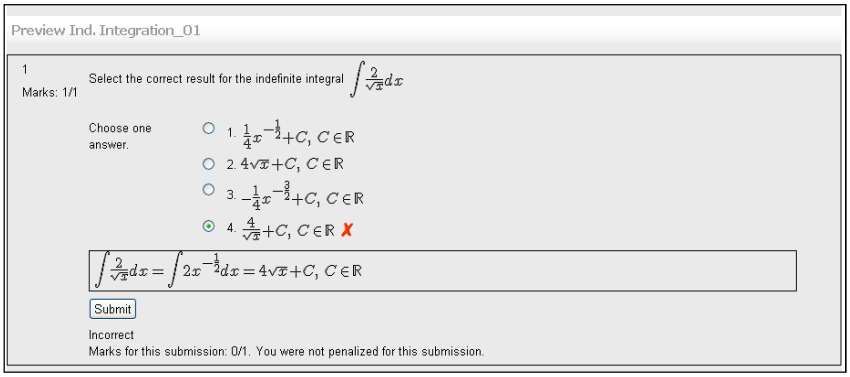

Fig. 6 – Visualization of one question

Images or graphics created with suitable software and saved in the “.jpg” or “.gif” format can also be included in a question just selecting the appropriated button.

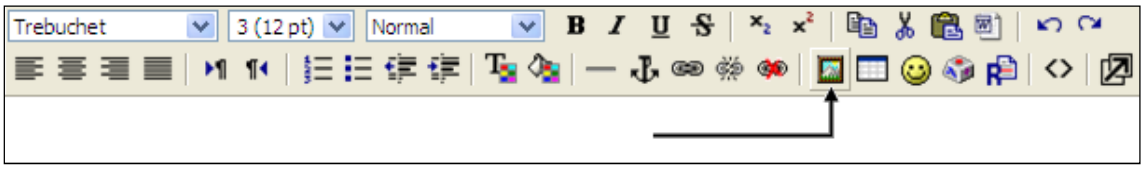

Fig. 7 – Button to insert pictures in a question

Having a database of questions organised into categories and subcategories we are able to add the questions to the multiple-choice test that we were building.
In figure 8 we choose three random questions to the quiz.

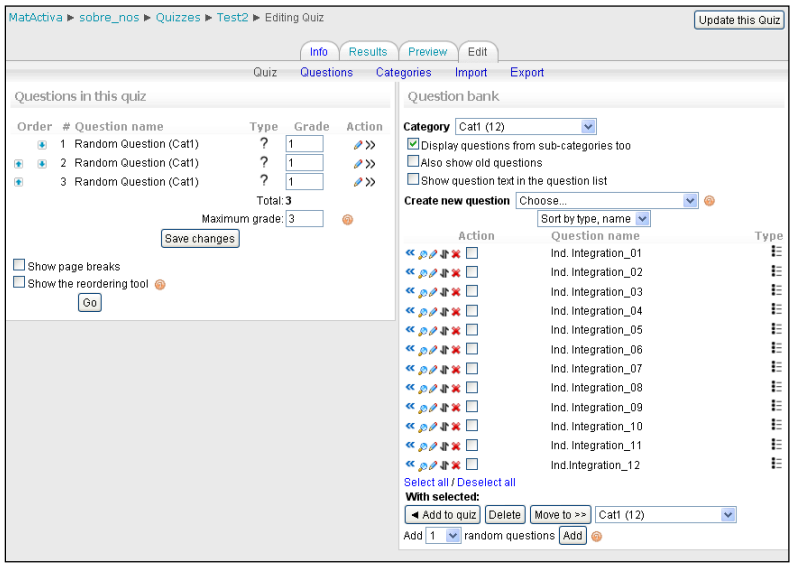

Fig. 8 – Selecting questions to the quiz

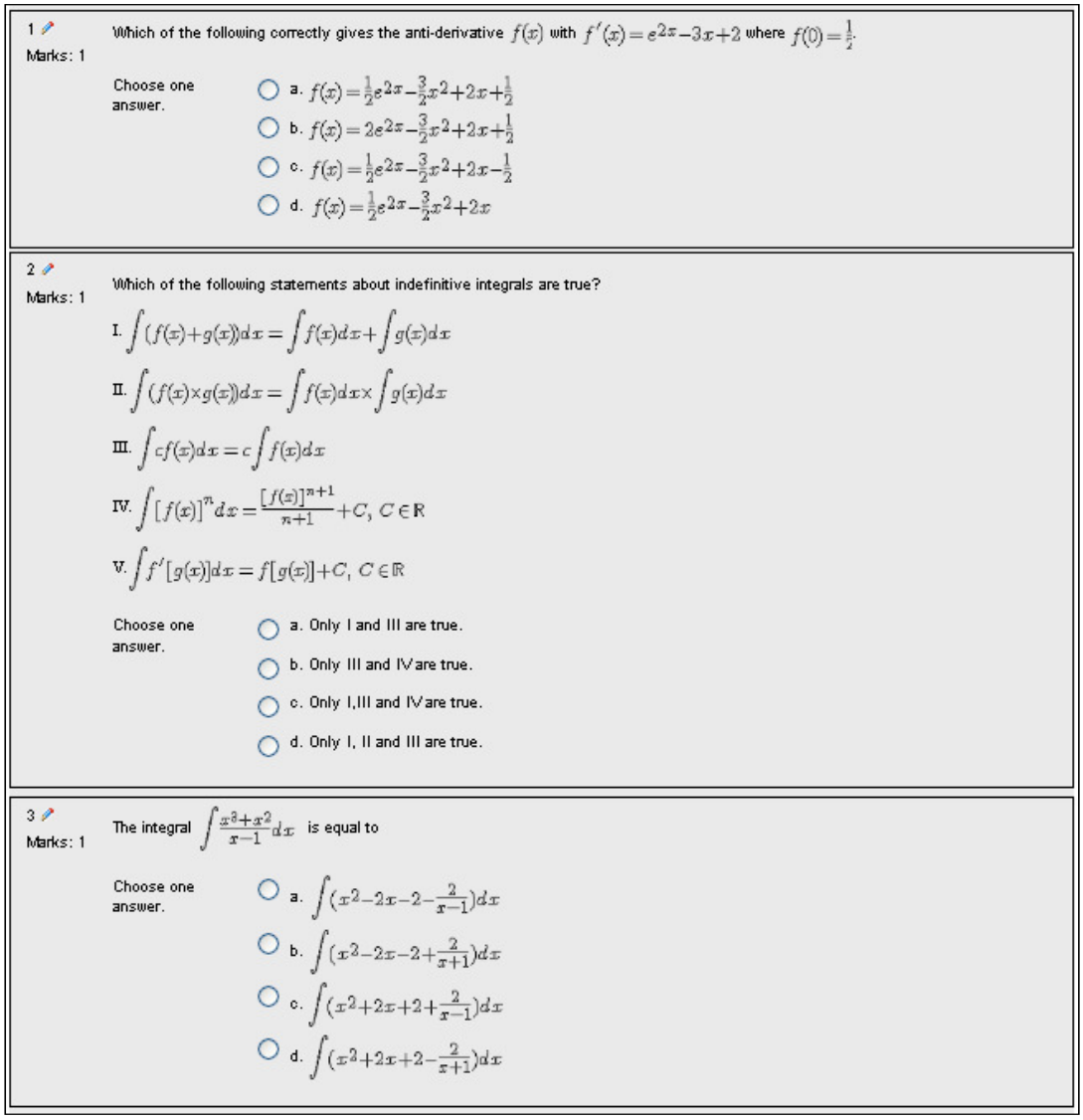

Fig. 9 – Visualizing the questions on the test

Depending on the choices that were made in the preparation of the test, after completed and sent, the student may have access to a set of information – the questions correctly or wrongly answered and its suggested resolution, all the correct options, the score achieved, comment evaluation...

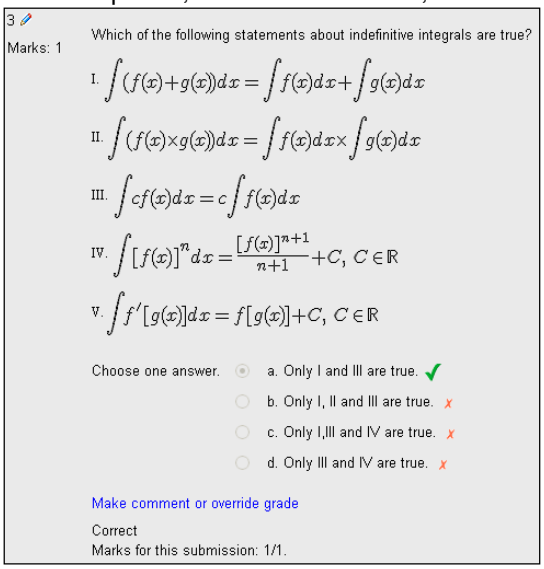

Fig 10 – Question answered

The teacher can have access to individual responses of each student; export data in Excel format or text; see the details of the scores…

4 CONCLUSION

We are using *Moodle* and developing the multiple-choice items in our school for two years.
The acceptation of the students has been excellent, exceeded our expectations. The possibility to use a good databases with multiple-choices Items, training quizzes online, accessing them out of school at any time and outside of the classroom, it's a good contribution to improve student's knowledge.
A large number of students are workers, so the access to these quizzes is very useful for training. And the possibilities to access a several different levels of thinking help them to consolidate the basis and requirements to higher levels of thinking.
The area (there are also some match quizzes, true or false questions, …) most used by the students is multiple-choice tests, perhaps because it is one way to prepare them to the exams.
The number of students who access these quizzes grows every semester and it encourages us to do more and better questions.

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