CHEATING AND LEARNING THROUGH WEB BASED TESTS

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Abstract

The use of web-based tests delivered through learning management systems has grown at university level in the last years. One of their key advantages is the possibility of creating tests with some degree of randomness that are automatically assessed in real time. Although the access to the learning management system resources is controlled for each student by means of personal username and password, the cheating among students when doing the tests cannot be avoided. However, if the students finally learn, in spite of cheating, the process could still be considered to be successful. In this work, the date, the required time to solve the test and the grades of quizzes undertaken by students through a web based learning management system are analyzed and they are compared to the grades obtained by the same students in a written test solved in an examination classroom under the supervision of the teacher. The course in which this study has been developed (Signals and Systems for Electrical and Electronics Engineering undergraduate students) is organized in 5 subjects and the students make a quiz on the web for each subject. At the end of the course the students make a final written exam that includes a true/false test. Around 50 questions for each subject of the course have been created. The questions are organized in 5 to 8 categories for each subject. The learning management system generates quizzes by arbitrarily selecting 1 or 2 items from the 5 to 8 categories in a given subject to complete a 10-item quiz. Due to the reduced number of items for each category and the large number of students that attend the course, several questions are repeated in quizzes generated for different students. The authors have noticed that some students work in groups to solve the quizzes. Some of them answer all the questions in a quiz in few minutes (less than 20 % of the time used by the most of their mates) and obtain high scores. When the scores of the same students in the final exam are analyzed, it is found that they also obtain good results. Then, it could be concluded that although they have found a way of cheating to solve the web quizzes, this is still pedagogically valid because they have learnt about the subject (they also obtain good results in the written test).

Keywords: Learning management systems, quizzes, cheating.

1 INTRODUCTION

Learning management systems (LMS) have become a common and very useful tool for instructors at any educational level [1-3]. They usually offer a series of resources as creating links to websites or files, creating many kinds of activities for students as chats, fora, wikis, questionnaires, surveys etc. In the currently ongoing process of creating the European Higher Education Area, the educational outcomes of university courses are being defined in terms of competences that are to be acquired by the students in order to get their degrees [4, 5]. Accordingly the assessment of the students must be based on competence acquirements and on the student's workload so a continuous supervision of students work is often convenient. Continuous evaluation methods increase the instructors' workload when they deal with numerous groups of students as usually is the case for basic courses of many engineering studies [6]. In this scenario, the LMS could be a very helpful tool for instructors.

From the point of view of the instructor the online quizzes can help to follow the progress of his/her students and to automatically provide feedback to the students about this progress. Nowadays the LMS system offers several ways to create tests with some degree of randomness. The variations of the quizzes are usually obtained by picking questions from a large item bank, by changing the order in which the questions are presented, by changing the order in which the possible answers are presented (at least for multiple choice questions) and by changing numerical data when the solution is a single relation of these numerical data. Although the access to the LMS resources is controlled for each student by means of personal username and password, there is not an effective way to be sure of who is answering an online questionnaire. Additionally, when a large number of students attend a course, the probability that the same question is asked to several students is high.

ISBN: 978-84-614-2439-9

The authors have used a LMS for assessing the progress of the students in a basic matter of Electrical and Electronics Engineering in the Escuela Universitaria de Ingeniería Técnica de Telecomunicaión (EUITT) at the Universidad Politécnica de Madrid (UPM). They have notice that some students answering one or several online tests in a very short time obtain surprisingly high scores. The purpose of this work is to analyze the date, required time to solve the tests and grades of quizzes undertaken by students through a web based LMS and to compare them to the grades obtained by the same students in a written test solved in an examination classroom under the supervision of the teacher

2 METHOD

Signals and Systems is a main topic for Electrical and Electronics Engineering undergraduate students. The course usually last 15 weeks and the students attend 4 h of lessons per week. At the EUITT this course is organized in 5 subjects:

T.1. Introduction to signals and systems

T.2. Time domain analysis of linear and time invariant systems

T.3. Fourier analysis of continuous time signal and systems

T.4. Laplace analysis of continuous time signal and systems

T.5. Fourier and Z-transform analysis of discrete time signal and systems

The assessment methods used in this Signal and Systems course are as follows:

a) One online test after each subject (20% of the final mark).

b) Exercises every week that are marked in the classroom (30% of the final mark).

c) Final exam at the end of the semester with two parts: a test part (20%) and an open answer exercises part (30%).

The final exam is mandatory to take into account the marks obtained through the weekly work of students. This exam is the same for all students enrolled in the course. The final exam is made under the supervision of all the teachers involved in Signals and Systems it is assumed that the students cannot cheat at this stage (at least is quite difficult in comparison with situations of online test and classroom exercises). For students that did not follow the continuous assessment method, the final exam counts 100% of their mark.

This assessment method was adopted because the success rate during the last decade (when students were assessed only by means of a final exam) was decreasing and the drop out rate was increasing [7]. The authors have checked that the continuous assessment method yields to similar pass/fail rates than the final exam, but the drop out rate is lower [8].

At the EUITT there are around 450 students that attend this course every academic year. They are divided in 8 groups each of which is attended by an lecturer. Although the work of students is organized and supervised by their teacher, there are some common tasks for all students, for example the online tests and final exam.

During the academic year 2009/10, the five online tests were solved through Moodle on the following dates dates: (i) October 15th to 19th; (ii) November 5th to 9th; (iii) November 19th to 25th; (iv) December 11th to 16th and (v) January 14th to 20th. The date of the final exam was January 26th. The students had a limited time to solve each test once they had opened it (from 20 to 50 min depending on the subject). They could solve the test in any place where they had a personal computer with internet connection and at any time during the indicated periods for each test.

The online tests were prepared in Moodle [1]. An item bank with around 50 questions for each subject of the course had been created. The questions were organized in 5 to 8 categories for each subject. The LMS generated quizzes by arbitrarily selecting 1 or 2 items from the 5 to 8 categories in a given subject to complete a 10-item quiz. When a student finished an online test he/she could see his/her mark but could not see the right solution till the test was closed for all students.

All students that made the final exam were included in this study (244). This analysis involves the marks obtained by these students in the online tests and in both parts of the final exam. Correlations and analysis of variance were used to infer if several groups of marks were correlated or not and if the mean value of marks could be considered statistically different.

3 RESULTS

The motivation of this work is to analyze how the marks of a single online test are distributed depending on the time taken for the student to solve it and the moment chosen by him/her to begin the test (at the beginning of the period or during the last days they could solve the test). Fig. 1 shows the marks obtained by the students that solved one of the online tests (the 3rd one for this case). The mean time required to solve this test was 30 min (with a standard deviation of 12 min). It can be observed that some students solved the test in a few minutes (less than 15 min). However, only 2 students that solved the test in less than 15 min during the first days (Fig.1a) obtained a mark over 5. In contrast, a greater portion of students that solved the test in less than 10 min obtained a high score during the last days (Fig. 1b). This fact made the authors be suspicious about the way these students solved the test. The students that made the test during the last days could have some information about the questions that could appear form their mates that solved the test during the first days, so some of them could take advantage of this.

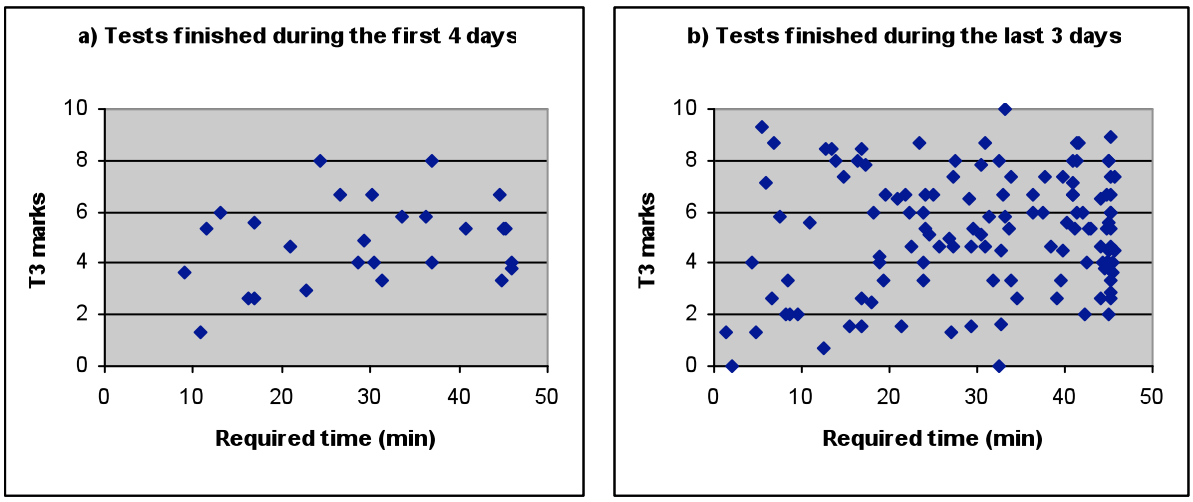

Figure 1: Marks obtained in third online test by students versus required time to do it. Part a) shows the results of students that made the test during the first 4 days since the test was opened, and part b) the results of students that made the test during the last 3 days in which the test was open

Fig. 2 shows the data corresponding to fourth online test. Similar observations to those of Fig. 1 can be made: part a) shows that students that made the test during the first days in which the test was opened required more than ten min to solve it and when they solved in less than 20 min they obtained a mark lower than 6. Part b) shows that some students finished the test in a surprisingly short time and obtained high scores (two of them solved it in 1 min and obtain near 5 or higher marks) during the last days.

Fig. 3 shows a comparison of the marks obtained by the students in the final exam test versus the mean marks obtained in the online test. Only the results of students that made at least 1 online test and the final exam are shown. There were around 50 students that did not follow the continuous assessment and only made the final exam. It can be seen that there is a low correlation between final exam test marks and mean marks in online tests (correlation coefficient equal to 0.28). One reason could be that there was a group of students that only made the first and/or the second online test and they gave up and made the final exam. Some of these students obtained high marks (points in the left and upper part of Fig. 2). There is a second group of students that solved reasonably well several online test and obtained high mean mark in the online tests, but they did not learn from this practice and obtained a bad result in the final exam test (right and lower part of the graph). The analysis of variance of these two variables shows that the mean value of the final exam mark is 3.2 and this is statistically lower than the mean mark of the tests averaged for all students (4.1) with a p value lower than 10^{-5}. The variances of both groups of marks are practically the same, 2.1, i.e. quite large, and this explains why the points cover a wide range of values in both horizontal and vertical directions.

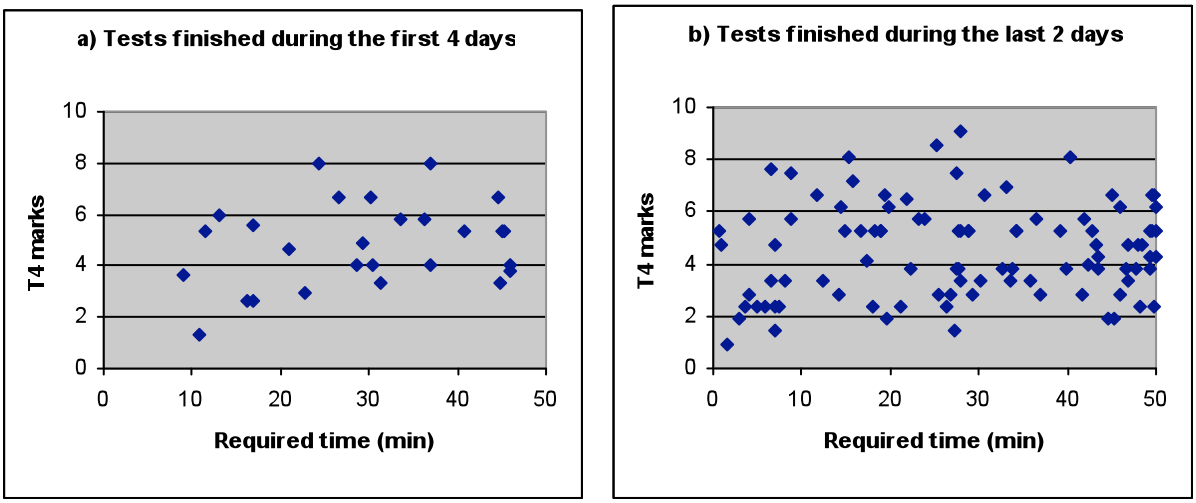

Figure 2: Marks obtained in fourth online test by students versus required time to do it. Part a) shows the results of students that made the test during the first 4 days in which the test was open, and part b) the results of students that made the test during the last 2 days in which the test was open

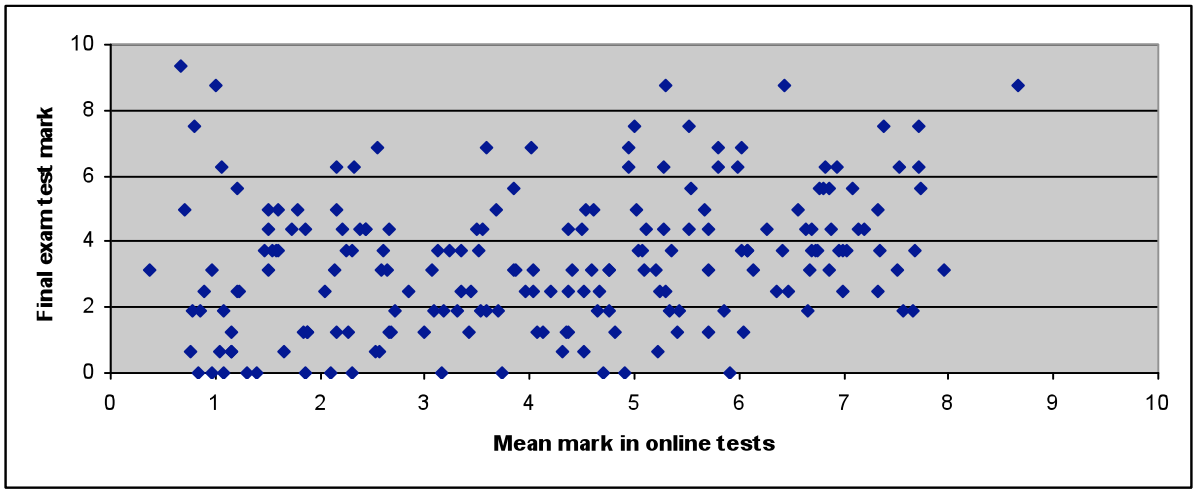

Figure 3: Marks obtained by students in the final exam test versus the mean mark obtained in the online tests

The second step of this study is to track all students that solved at least 1 online test in a time that was less than half the mean time required by all students to solve that test and obtain a high mark. Fig. 4 shows the results obtained by this group of students. It can be observed that the correlation between vertical and horizontal variables is quite higher than that of Fig. 3 (the correlation coefficient is 0.50 for the data of Fig. 4). This means that this group of students, those that obtained a high mean mark in the online tests (whatever the way they obtained it), also obtained high mark in the final exam test, so they learnt to solve this kind of tests.

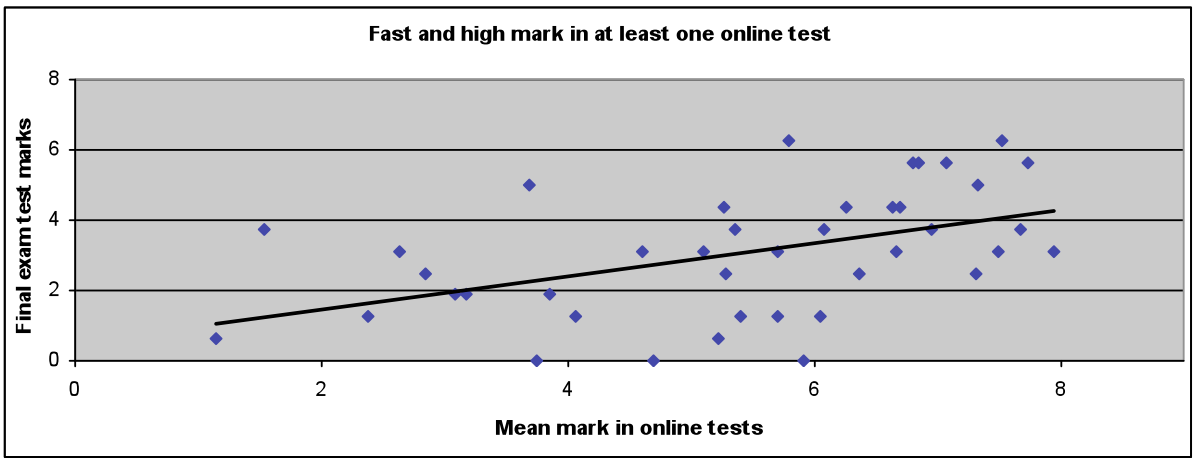

Figure 4: Marks obtained by students in the final exam test versus required the mean mark obtained in the online tests. Only the results for students that finished at least one online test in a few minutes and obtained a high mark in that test are showed

4 DISCUSION AND CONCLUSIONS

After analyzing the results shown in the previous section we can see that there is a small group of students (those included in Fig.4) that solved at least one online test in a surprisingly short time (at most half the mean time required by their mates to solve the same test) and obtained a high score in that test.

Figs. 1 and 2 show that 20-25 students finished the online test in a short time. It could be thought that they open the test just to see the kind of questions for each subject and answer them randomly. The probability of obtaining a mark over 5 in a ten single choice among four options questions quiz when it is solved in a random way is 2%. Then, it is hard to believe that around 10 of these students could obtain high marks.

A reason to explain that observation could be that these students knew many questions that could appear in that test (and probably knew the right answer to most of them); it must be noticed that a large amount of students were enrolled in Signals and Systems course for a second or third time because they had failed in previous attempts. These students could know some of the questions because they were solving the online tests for a second or third time.

A second reason might be that they solves the online tests in groups and had learned from classmates that had solved the test before; in this case, the last students that solved the test had some advantage. Some of the students represented in Fig. 4 could correspond to this profile. This practice could be censurable if many of these students finally obtained low marks (or lower marks than those of their mates that did not behave in the same way).

Fig. 4 shows that students that, for any reason, had some knowledge about the questions for each subject and took advantage of this obtaining a high mark in online test also obtained higher scores in the final exam test (comparing Fig. 4 to Fig. 3). So they had learned to solve the test, somehow.

Then it could be concluded that although they found a way of cheating to solve the web quizzes, this is still pedagogically valid because they also learnt about the subject (they also obtain good results in the written test).

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