

Impact of students' performance in the continuous assessment methodology through Moodle on the final exam

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Abstract

This paper looks into the different evolution of students' online questionnaire performance and its impact on the final examination mark. This innovative technique has been used in a group of an introductory financial accounting course with 8 online questionnaires (one per unit) in the Moodle platform. Using cluster analysis, we identify different groups of performance evolution. The evidence obtained suggests that in one of this groups a favourable test performance evolution may lead to overconfidence with the subsequent negative effect on the final examination mark. Future research with more variables and bigger samples will help to identify this student profile with a view to prevent this undesired negative effect of this teaching technique.

Keywords: Moodle; accounting; online questionnaires.

1. Introduction

In the new European Higher Education Area, the educational model must be student-centered (European Ministers of Education, 1999). Therefore, Information and Communication Technologies (ICTs) are very useful in the teaching-learning process (UNESCO, 2008) and there have been numerous experiences of application in different subjects with very positive overall results (García-Benau & Zorio-Grima, 2012; Swan, 2004).

Specifically, in the area of business administration and management, a positive experience on the use of the Moodle platform has recently been analysed (Escobar-Rodriguez & Monge-Lozano, 2012). In this sense, some authors point out the interest of formative evaluation, which has also been evidenced in the accounting field (Einig, 2013).

Our work contributes to the literature in the sense that it identifies different types of students according to their performance evolution in the online tests and how some of these behaviors can be identified as generating over-confidence towards the final exam.

After this brief introduction that states the research objective, section 2 presents the teaching experience, the sample and the methodology used. Section 3 analyzes the results obtained. Finally, the main conclusions are presented.

2. Materials and Method

2.1. Teaching experience

The introduction of the Moodle platform as a teaching and evaluation tool has been implemented in a Financial Accounting course in the year 2015/2016. This subject is taken by first-year students of the Degree in Business Administration and Management of XXXX University. The evaluation of the subject is based on a final exam (80% of the final mark in the subject) and a continuous assessment methodology (remaining 20%) which includes a practical exercise test in the classroom (10% final grade) and eight online questionnaires (one per unit) through Moodle (10%).

In the academic year 2015/2016, the following final grades were obtained for the subject: 26.42% of the students made a no-show, 33.96% failed the subject (final grade <5), 26.42% had passed (5th final grade <7) and 13.21% obtained a grade of good ($7 \leq \text{final mark} < 9$). No student in this group got the highest grade, i.e. excellent ($9 \leq \text{final mark} \leq 10$). Note that the Spanish system has a grading system ranging from 0-10 points, requiring at least 5 points to pass the course.

The syllabus consists of 9 units. 8 units have been evaluated through online self-corrective questionnaires in the Moodle platform, combining multiple-choice and true/false questions.

2.2. Description of the sample

The group of students in this course includes 53 students, 32% of which are women and 68% are men. 81% of the students are between 18-24 years old, 9.43% between 25-29, and the rest are over 30 years old. The 73.6% is the first time they take the subject, 15.1% re-take it for the second time and 11.3% of the students are taking it at least for the 3rd time.

During the 2015/2016 academic year, 94.12% of women chose to follow the continuous assessment system (16/17) compared to 83.33% of men (30/36). Of the total of 46 students who followed the continuous assessment method, only 39 showed up in the final exam (84.7%).

2.3. Variables and Data Analysis

We use the Cluster Analysis in its hierarchical modality, whose main purpose is to group objects based on the characteristics they possess, trying to maximize the homogeneity of the objects within the clusters while at the same time maximizing the heterogeneity between the aggregates (Hair *et al.*, 1999).

Also, Multiple Correspondence Analysis is implemented, as it is a procedure to summarize the information contained in a contingency table through an objective procedure of assigning numerical values to qualitative variables (Peña, 2002).

For the analysis of multiple correspondences, the average grade of the online tests and the grade of the final exam have been categorized into a variable with 4 categories (failed, pass, good, excellent). The equivalences are Failed $X < 5$ (variable = 1), Pass $5 \leq x < 7$ (variable = 2), Good $7 \leq x < 9$ (variable = 3), Excellent $x \geq 9$ (variable = 4).

3. Results

3.1. Pearson's correlation analysis

A Pearson correlation analysis is performed considering as variables the final exam grade and the grade of each of the questionnaires. There was no significant correlation between the grade obtained in the final exam and the grade obtained in any of the 8 questionnaires.

For the case of the tests, there is significant and positive correlation between the test of the units 3 and 4 ($r=0.315$, $\text{sig}=0.033$), and for the units 6 and 7 ($r=0.339$, $\text{sig}=0.047$). Note that these tests refer to consecutive but not specifically related thematic units: "accounting cycle" (unit 3) and "Inventories" (unit 4), "Non-financial fixed assets" (unit 6) and "Other financial assets and liabilities" (unit 7). This may suggest that the variables that condition the results obtained in the test are not only related to contents but also to other variables such as the chronology of the course, the specific academic calendar of that course, the evolution of student motivation along the course, etc.

3.2. Student profiles in continuous assessment

A hierarchical cluster analysis is performed on the students performance, considering as classification variables the different grades obtained in each one of the questionnaires.

The Ward method is chosen to minimize the differences within the cluster and avoid problems with the allocation chaining. Among the different alternatives, in terms of the measure of similarity between objects, the square Euclidean distance has been chosen, since the variables are measured on a common scale (0 to 10). As mentioned above, there are no problems of multicollinearity in our sample.

After studying multiple solutions, a solution with three clusters has been chosen.

Table 1. Number of cases in the solution.

Cluster	Cases	%
1	12	48%
2	4	16%
3	9	36%
Valid	25	
Lost	21	

Table 2. Cluster composition.

Variable	Cluster 1	Cluster 2	Cluster 3
T1	7,22	8,19	7,04
T2	7,61	7,24	8,22
T3	6,73	6,81	6,58
T4	7,21	N.P.	8,06
T5	7,52	7,25	7,87
T6	6,75	7,00	7,41
T7	7,17	6,50	8,11
T8	5,25	6,33	9,48



Figure 1. Evolution of the average mark per cluster.

Figure 1 shows that students in Cluster 1 and 2 have followed a decreasing trend in their results of the continuous assessment questionnaires, compared to students in cluster 3 that are characterized by an increasing trend in their results of the questionnaires. The main difference between clusters 1 and 2 is that cluster 2 maintains a nearly constant decreasing trend and cluster 1 has a greater variability in the average test results.

Likewise, for a more visual interpretation of the different clusters, the evaluation of the similarities between the different profiles of students (according to their results in the tests) and the categorization of the average grade obtained in the questionnaires has been performed with a multiple correspondence analysis. The results are presented on a perceptual map (Figure 2). The blue circle shows the 3 categories of average marks in the tests (1, failed, 2, pass, 3 good) and the green circle represents the profile student cluster (1, 2 and 3, illustrated in Tables 1 and 2 as well as in Figure 1).

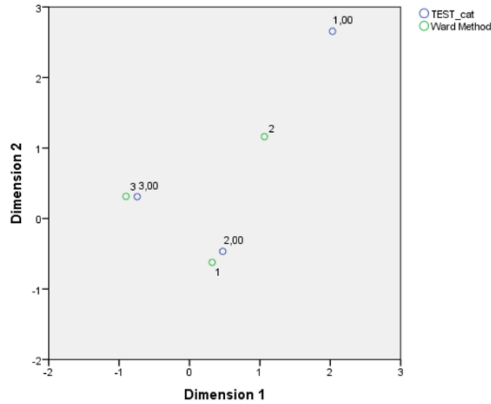


Figure 2. Perceptual map of the multiple correspondence analysis for the categorical variable Test and the result of the cluster analysis.

According to figure 2, and as expected, those students who obtain an average mark of good in the tests are mainly those in cluster 3, whereas those who do not take test 4 (cluster 2) are the closest to obtaining an average grade of test of failed, and those in cluster 1 are those that obtain an average grade of pass.

3.3. Impact of students' performance in the continuous assessment through Moodle on the final exam mark

In this section, we look into the similarities between the different profiles of students (according to their result in the questionnaires) and their mark in the final exam through a multiple correspondence analysis. The perceptual map (figure 3) will help us identify the profile of students who achieve better results in the final exam.

The number of dimensions is selected based on the desired level of total explanation of the variation and the increase of explanation when adding an extra dimension. It is recommended to include in the analysis those dimensions with inertia greater than 0.2, always taking into account that a three-dimensional representation, or smaller, are valuable for an easier interpretation.

Thus, a two-dimensional solution is the most suitable for further analysis in terms of explanation and interpretation.

Table 3. Dimensions and inertias.

Dimension	Eigenvalue	Proportion of inertia	
		Inertia	Cumulated
1	0.249	0.062	0.789
2	0.129	0.017	1.000
Total		0.078	1.000

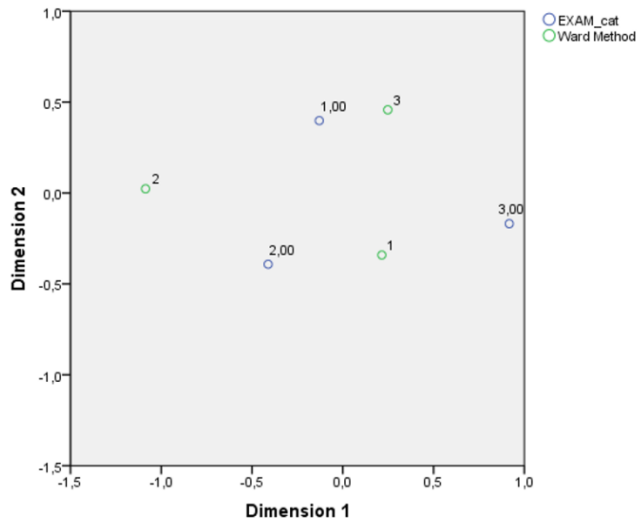


Figure 3. Perceptual map of the multiple correspondence analysis for the categorical variable Final exam and the result of the cluster analysis (student profile).

Contrary to what might be considered as an initial hypothesis, the perceptual map shows that there is a relationship between those students who belong to cluster 3 and category 1 of the final exam mark (failed). Smolin & Butakov (2014) look into this paradox, i.e. the inconsistency between in-class performance and the performance in the final exam. On the other hand, there is also a certain similarity between the students in cluster 1 and category 2 of the final exam result (pass).

Category 3 of the exam mark (good) is not specifically related to any student profile.

This result could indicate that there is an inverse relationship between the trend in the results obtained in the continuous assessment by a student and the probability of passing the final exam.

The findings of our study suggest some very interesting questions for future research, as follows. Could the relationship identified with failure in the final exam be attributed to certain emotional factors such as overconfidence? Does the tendency for a worsening of the continuous assessment mark encourage the student to make a greater study effort for the final exam?

4. Conclusions

In the context of incorporating the ICTs to the formative evaluation of the students, it seems extremely relevant to evaluate if an improvement on students' performance is really and efficiently achieved. The literature describes the different learning styles of the students (Escobar-Rodriguez & Monge-Lozano, 2012) and how different methodologies can be useful to respond to that variety. However, in accounting, there is no extant research on the existence of different patterns of knowledge level evolution, nor on the impact of these patterns on a final exam. Some studies, however, point out the possibility that in certain contexts overconfidence can arise depending on certain variables - such as the previous domain of technology or gender (Gunn and McSporran, 2003). Therefore, our findings suggest new avenues for research on the results of these new teaching methodologies using larger samples and more variables that may allow to identify the characteristics of the students with this profile, in order to try to avoid these undesired consequences of the instrument.

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