Impact of Students’ Behavior on Continuous Assessment in Higher Education

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Abstract

The aim of this study is to analyze students’ academic results following the introduction of a continuous assessment system in Higher Education. This study examines a large sample that consists of third-year students’ grades across nine subjects in the Bachelor of Business Administration program at the University of Castilla-La Mancha (Spain). Specifically, this paper studies the relations among three types of grades (i.e., final exam grades, continuous assessment activities grades (excluding the final exam) and global assessment grades, which are calculated as the weighted averages of the final exam grades and the continuous assessment activities grades) and the influence of the number of students who actively participate in a subject and the date of the final exam on students’ grades. Generally, this study reveals a positive effect of continuous assessment activities on students’ academic success. Furthermore, there is a statistically significant positive relation between the number of students who actively follow a subject and their global assessment grades. Finally, the earlier the students completed the final exam, the higher their grades were on this exam.

Keywords: Continuous assessment; Grades; Higher Education; Students’ academic results;
Introduction

The European Higher Education Area (EHEA) focuses on the continuous evaluation of students’ knowledge and competences (i.e., abilities, skills and attitudes) according to the administration of various evaluation tests (Ariza, Quevedo-Blasco, Ramiro, & Bermúdez, 2013; Bengoetxea & Buela-Casal, 2013). This system of evaluation differs from a traditional system, which is based exclusively on a final exam. Previous studies have analyzed the academic results of students who were engaged in the same subject but who experienced two different systems of evaluation (i.e., continuous vs. traditional evaluation) during one academic year (see Carrillo-de-la-Peña & Pérez, 2012; Gracia & Pinar, 2009). Former research has also examined the results of students who were engaged in a specific subject across two academic years, which reflects both before and after the establishment of a continuous evaluation system (see Jareño, 2007; López, Herrero, Pajuelo, & Durán, 2007; Mingorance, 2008).

The present study differs from the previous literature in two ways. First, the current research analyzes the results for third-year students in the Bachelor of Business Administration (BBA) program at the University of Castilla-La Mancha (UCLM) in Spain across nine subjects according to a continuous assessment system (see Vidal, 2003; Gijón-Puerta & Crisol-Moya, 2012, for detailed information regarding the transition process when establishing the EHEA at Spanish universities). Second, this

1 The Bologna Declaration of June 19, 1999 posited the foundation of the EHEA to be established before 2010 (see http://www.ehea.info/).
study examines three types of grades, which are final exam grades (FEG), continuous assessment grades (CAG) and global assessment grades (GAG). The global assessment grades are the result of the weighted averages of the final exam grades and the continuous assessment activities grades.

This research analyzes several aspects of the students’ academic results. First, it examines the correlation between the continuous assessment activities grades, as ranked by percentiles, and the final exam grades. Previous studies have documented the positive effect of continuous assessment on students’ academic success (Carrillo-de-la-Peña, Baillès, Caseras, Martínez, Ortet, & Pérez, 2009; Peterson & Siadat, 2009). However, these studies examined the development of the continuous assessment activities but not the grades that students obtained from these assessments. The current research analyzes the relation between the continuous assessment grades (CAG) and the final exam grades (FEG).

Second, it calculates the percentage of students who passed the subject according to the percentiles of the continuous assessment grades. Some previous studies document that the percentage of students passing a subject is higher under the continuous assessment system than under the traditional system (Mingorance, 2008; Gracia & Pinar, 2009; Carrillo-de-la-Peña & Pérez, 2012).

Third, it assesses the relations among the number of students who actively participated in the subject and the three types of grades considered in this research. The

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2 According to regulations regarding student assessments at the University of Castilla-La Mancha, the assessments evaluating the students’ academic progress include, among others, useful participation in class, external training, theoretical essays, self-assessment activities and progress and final exams (see [http://www.uclm.es/ez/EUP-ALMADEN/pdf/normativa/ReglamentoEvaluacionGradoMasterUCLM.pdf](http://www.uclm.es/ez/EUP-ALMADEN/pdf/normativa/ReglamentoEvaluacionGradoMasterUCLM.pdf)).
relation between the number of students who actively follow a subject and the grade obtained in that subject is unknown. On the one hand, a teacher’s dedication to each student may be lower when teaching subjects with a large number of students compared to a small number of students (Kokkelenberga, Dillona, & Christy, 2008). On the other hand, the difficulty level associated with passing a subject may be lower for the subjects with a large number of students compared to a small number of students. The call effect may lead to a greater number of students enrolling in a subject.

Finally, this research analyzes the relation between the final exam date and the grades obtained. A large number of teachers believe that there is a negative relation between the date on which the final exam for a subject is scheduled within the examination period and the grades obtained on the exam (Herrera-Torres & Lorenzo-Quiles, 2009).

Method

Participants

The study sample consists of third-year students in the BBA program in the Faculty of Economic and Business Sciences at the UCLM in Albacete (Spain) during the 2011-2012 academic year. Both morning and evening teaching groups are included in this sample.

Instruments

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3 Other evaluation issues are analyzed in Jareño and López (2015).

4 The transition of the BBA to the EHEA occurred during the 2009-2010 academic year, so the students of the 2011-12 academic year are the first ones in reaching the third course.
The analyzed variables include the final exam grades (FEG), the continuous assessment grades (CAG) and the global assessment grades (GAG) for the nine academic subjects. The GAG variable is calculated as follows:

\[
GAG = \sum_{i=1}^{n} w_{CAGi}CAG_i + w_{FEG}FEG,
\]

where \(\sum_{i=1}^{n} w_{CAGi} + w_{FEG} = 1\); \(w_{CAGi}\) is the weight of the \(i\)-th continuous assessment grade, CAG, in GAG; \(w_{FEG}\) is the weight of the FEG in the GAG; and \(n\) is the number of continuous assessment activities in addition to the final exam. For every subject, only grades greater than zero for the final exam and for at least one of the continuous assessment activities during the ordinary session are included. The subject name, the weight of the various continuous assessment activities on the global assessment grades and the number of observations for each subject are presented in Table A1 of the Appendix.

**Procedure**

This research analyzes the relations among the variables using Pearson’s correlation coefficients and Student’s \(t\)-tests to determine statistical significance. In addition, this study divides the continuous assessment grade variable into the following three percentiles:

- **Lower percentile (CAG below the 20\(^{th}\) percentile):** consists of the 20\(^{th}\) percentile of students with lower grades on the continuous assessment.

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5 During the ordinary session, the continuous assessment activities and the final exam occur within a short time period; therefore, the correlation between these variables seems stronger.
Intermediate percentile (CAG above the 20th percentile and below the 80th percentile): consists of students with grades on the continuous assessment that are greater (lower) than the 20% of students with lower (greater) continuous assessment grades.

Higher percentile (CAG above the 80th percentile): consists of the 20% of students with higher grades on the continuous assessment.

This study uses three percentiles to investigate whether the relation between CAG and FEG holds not only for the whole sample, but also distinguishing between students with the highest CAG and students with the lowest CAG. Therefore, it provides evidence about the relation in the tail ends of the distribution.

**Results and Discussion**

**Correlation Between the Continuous Assessment Grades and Final Exam Grades**

This section analyzes the relation between the continuous assessment grades (CAG) and the final exam grades (FEG). On one hand, this study collects the correlation coefficients for the whole sample and by percentile. On the other hand, this research investigates whether FEG at the higher percentile differs from FEG at the lower percentile.

Table 1 presents the Pearson’s correlation coefficients for the nine subjects. For the whole sample, it shows that there is a positive statistically significant correlation between the CAG and FEG in seven out of nine subjects. This evidences the relevance of the continuous assessment process to succeed in the final exam. However, to analyze in more depth this issue, this study distinguishes between three students’ profiles: students with excellent, standard and low grades in CAG.
By percentile, the lower percentile shows no statistically significant correlations between the CAG and FEG for any subject. For the higher percentile, there is a statistically significant negative correlation of 54% between the two types of grades for one subject. Finally, for the intermediate percentile, there is a statistically significant positive correlation between the CAG and FEG for three of the nine subjects, which have correlation coefficients between 23% and 49%. Therefore, for the intermediate percentile, the results for one-third of the subjects support the proposal that students’ success is related to both the development of continuous assessment activities and students’ success when completing these activities. Previous studies have documented this positive effect of continuous assessment on students’ academic success (Carrillo-de-la-Peña, Baillès, Caseras, Martínez, Ortet, & Pérez, 2009; Peterson & Siadat, 2009). However, these studies examined the development of the continuous assessment activities, whereas this research takes into account the students’ grades obtained from these assessments.

[INSERT TABLE 1 ABOUT HERE]

According to the Pearson’s correlation coefficients, there is no evidence about a positive statistically significant relation between the CAG and FEG in the tail ends of the distribution. Therefore, this study further investigates whether there are statistically significant differences in means between FEG at the higher percentile (i.e., FEG for students with the highest CAG) and FEG at the lower percentile (i.e., FEG for students with the lowest CAG). Table 2 shows that the mean of FEG at the higher percentile is significantly higher than the mean of FEG at the lower percentile for eight out of nine
subjects. This result evidences that students with the highest CAG obtain significantly higher grades in the final exam than students with the lowest CAG. This finding supports the hypothesis that a positive relation between CAG and FEG is present in the tail ends of the distribution.

[INSERT TABLE 2 ABOUT HERE]

**Additional analysis**

*Relation Between the Continuous Assessment Grades and the Percentage of Students Who Passed a Given Subject*

The present study analyzes the percentage of students who passed a given subject (GAG > 4.9) for the three CAG percentiles. According to the results presented in Table 3, as the percentile of CAG increases, the percentage of students who passed a given subject also increases. Thus, as success in the development of continuous assessment activities increases, success in passing the subject also increases. Moreover, the increase in the percentage of students who passed a given subject is greater during the transition from the lower to the intermediate percentile than during the transition from the intermediate to the higher percentile.

This finding extends previous evidence (Mingorance, 2008; Gracia & Pinar, 2009; Carrillo-de-la-Peña & Pérez, 2012), because it shows that passing a subject is positively related not only to following a continuous assessment system, but also to the success achieved in this system.[INSERT TABLE 3 ABOUT HERE]

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6 (GAG > 4.9) refers to a subject that was passed.
Correlation Between the Number of Students and Grades (CAG, FEG and GAG)

Table 4 presents the Pearson’s correlation coefficients for the number of students in each subject and the average grades that they obtained (CAG, FEG and GAG). There is evidence of a positive relation between the number of students and the three types of grades, although this relation is only statistically significant for the GAG variable. Thus, this finding only supports the call effect hypothesis for global assessment grades. This result is in line with Hattie (2005), who defends that reducing the number of students of a subject has an inconclusive effect on students’ grades. Normally, smaller classes would allow teachers to have more individualized and frequent feedback with their students. However, it does not guarantee higher students’ grades.[INSERT TABLE 4 ABOUT HERE]

Relation Between the Final Exam Dates and Final Exam Grades

This section presents the relation between the final exam dates for each subject and the average grades obtained on the exams in Figure 1, distinguishing between the first term (panel A) and second term (panel B) subjects. These results validate the negative relation between these two variables mainly for the second term, which supports the hypothesis that the earlier the students complete the final exam, the higher their grades are on this exam due to increases in their ability to concentrate and their

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7 Further support of this hypothesis would imply to have data from previous academic years for comparison purposes. Unfortunately, these data are not available.
dedication to the subject.\textsuperscript{8} Therefore, this finding indicates that students’ exam results may decline as the distance to the final exam date increases (and vice versa). This is in line with evidence in Herrera-Torres & Lorenzo-Quiles (2009), who find that third-year University students organize their study time based on the proximity of the final exam date.

[INSERT FIGURE 1 ABOUT HERE]

\textbf{Conclusions}

The present study examines three types of grades (i.e., final exam grades, continuous assessment activities grades and global assessment grades) and analyzes the relations among them, including the effects that specific aspects (e.g., the number of students who actively participate in a subject and the date of the final exam) have on the students’ grades. This study assesses students’ grades across nine subjects from their third-year in the Bachelor of Business Administration program at the University of Castilla-La Mancha (Spain) during the 2011-2012 academic year.

The results reveal the following: (a) a significant positive correlation between the continuous assessment activities grades and the final exam grades; (b) a positive relation, in general terms, between the continuous assessment activities grades and the percentage of students passing a given subject; (c) a significant positive relation

\textsuperscript{8} The final exam grade depends on several factors. This section of the paper only analyzes the relations between the final exam dates and the grades obtained on the final exam, considering the other variables as \textit{ceteris paribus}. 
between the number of students in a given subject and the global assessment grades; and (d) a negative relation between the final exam dates and the final exam grades, mainly for second term subjects.

These results have relevant implications for the assessment system in Higher Education. Thus, the continuous assessment process contributes to the success of students in the final exam, and hence this process should be supported in Higher Education. Furthermore, the number of students enrolled in a subject may not be a crucial factor in order to pass it. Finally, academic institutions should take into account the timetable of the final exams because this schedule might impact on the final exam grades of students.
References


Table 1.

Correlations between the Continuous Assessment Grades and Final Exam Grades for the Whole Sample and by Percentile for each Subject (AA, CA, BCM, FM, OM, SE, BT SIIE and MR)

<table>
<thead>
<tr>
<th>Subjects</th>
<th>AA</th>
<th>CA</th>
<th>BCM</th>
<th>FM</th>
<th>OM</th>
<th>SE</th>
<th>BT</th>
<th>SIIE</th>
<th>MR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Whole sample</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>r</strong></td>
<td>0.34</td>
<td>0.39</td>
<td>0.06</td>
<td>0.38</td>
<td>0.17</td>
<td>0.45</td>
<td>0.26</td>
<td>0.22</td>
<td>0.23</td>
</tr>
<tr>
<td><strong>t-test (H₀: r = 0)</strong></td>
<td>2.96&lt;sup&gt;c&lt;/sup&gt;</td>
<td>3.77&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.66</td>
<td>3.60&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1.65</td>
<td>4.31&lt;sup&gt;c&lt;/sup&gt;</td>
<td>2.13&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.71&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.28&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Lower percentile: CAG below the 20&lt;sup&gt;th&lt;/sup&gt; percentile</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>r</strong></td>
<td>0.04</td>
<td>0.13</td>
<td>0.00</td>
<td>0.17</td>
<td>-0.26</td>
<td>-0.19</td>
<td>0.39</td>
<td>-0.26</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>t-test (H₀: r = 0)</strong></td>
<td>0.15</td>
<td>0.55</td>
<td>-0.03</td>
<td>0.65</td>
<td>-1.14</td>
<td>-0.72</td>
<td>1.43</td>
<td>-0.80</td>
<td>0.35</td>
</tr>
<tr>
<td><strong>Intermediate percentile: CAG above the 20&lt;sup&gt;th&lt;/sup&gt; percentile and below the 80&lt;sup&gt;th&lt;/sup&gt; percentile</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>r</strong></td>
<td>0.24</td>
<td>0.49</td>
<td>-0.04</td>
<td>-0.04</td>
<td>0.23</td>
<td>-0.04</td>
<td>0.31</td>
<td>0.10</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>t-test (H₀: r = 0)</strong></td>
<td>1.60</td>
<td>3.74&lt;sup&gt;c&lt;/sup&gt;</td>
<td>-0.34</td>
<td>-0.30</td>
<td>1.72&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-0.28</td>
<td>1.98&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.62</td>
<td>1.11</td>
</tr>
<tr>
<td><strong>Higher percentile: CAG above the 80&lt;sup&gt;th&lt;/sup&gt; percentile</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>r</strong></td>
<td>0.18</td>
<td>-0.54</td>
<td>0.23</td>
<td>0.32</td>
<td>-0.09</td>
<td>0.32</td>
<td>-0.07</td>
<td>NA&lt;sup&gt;*&lt;/sup&gt;</td>
<td>-0.13</td>
</tr>
<tr>
<td><strong>t-test (H₀: r = 0)</strong></td>
<td>0.65</td>
<td>-2.46&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.01</td>
<td>1.21</td>
<td>-0.38</td>
<td>1.24</td>
<td>-0.25</td>
<td>NA</td>
<td>-0.56</td>
</tr>
</tbody>
</table>

Note: r shows the Pearson’s correlation coefficient. The null hypothesis for the t-test is that the correlation coefficient is equal to zero. p-values are as follows: <sup>a</sup>p < 0.10, <sup>b</sup>p < 0.05, <sup>c</sup>p < 0.01. *The correlation coefficient cannot be calculated because the CAG higher than the 80<sup>th</sup> percentile has the same value for all of the students.
Table 2.

*Mean of FEG at the Higher and Lower Percentiles and t-test for the Equality of Means for Each Subject (AA, CA, BCM, FM, OM, SE, BT SIE and MR)*

<table>
<thead>
<tr>
<th>Subjects</th>
<th>AA</th>
<th>CA</th>
<th>BCM</th>
<th>FM</th>
<th>OM</th>
<th>SE</th>
<th>BT</th>
<th>SIE</th>
<th>MR</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Mean FEG higher percentile</td>
<td>6.54</td>
<td>6.13</td>
<td>7.35</td>
<td>6.51</td>
<td>7.1</td>
<td>5.43</td>
<td>6.46</td>
<td>6.00</td>
<td>4.65</td>
</tr>
<tr>
<td>(2) Mean FEG lower percentile</td>
<td>5.15</td>
<td>4.25</td>
<td>7.04</td>
<td>5.43</td>
<td>4.51</td>
<td>2.16</td>
<td>5.53</td>
<td>3.67</td>
<td>3.72</td>
</tr>
<tr>
<td>t-test (H₀: 1 = 2)</td>
<td>2.70^c</td>
<td>3.41^c</td>
<td>0.49</td>
<td>2.05^b</td>
<td>3.34^c</td>
<td>5.13^c</td>
<td>1.74^a</td>
<td>1.89^b</td>
<td>1.74^b</td>
</tr>
</tbody>
</table>

The null hypothesis of the t-test is that the mean of FEG at the higher percentile equals the mean of FEG at the lower percentile. *p*-values are as follows: ^a p < 0.10, ^b p < 0.05, ^c p < 0.01 (one-tailed tests).
Table 3.

Percentage of Students Passing a Subject by Percentile of Continuous Assessment

Grades for Each Subject (AA, CA, BCM, FM, OM, SE, BT SIIE and MR)

<table>
<thead>
<tr>
<th>Subjects</th>
<th>AA</th>
<th>CA</th>
<th>BCM</th>
<th>FM</th>
<th>OM</th>
<th>SE</th>
<th>BT</th>
<th>SIIE</th>
<th>MR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lower percentile:</strong> CAG below the 20th percentile</td>
<td>92%</td>
<td>75%</td>
<td>100%</td>
<td>26%</td>
<td>63%</td>
<td>0%</td>
<td>46%</td>
<td>36%</td>
<td>58%</td>
</tr>
<tr>
<td><strong>Intermediate percentile:</strong> CAG above the 20th percentile and below the 80th percentile</td>
<td>90%</td>
<td>93%</td>
<td>100%</td>
<td>77%</td>
<td>85%</td>
<td>37%</td>
<td>97%</td>
<td>37%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Higher percentile:</strong> CAG above the 80th percentile</td>
<td>100%</td>
<td>100%</td>
<td>95%</td>
<td>100%</td>
<td>94%</td>
<td>73%</td>
<td>100%</td>
<td>72%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table 4.

Correlations Between the Number of Students and Average Grades (CAG, FEG and GAG)

<table>
<thead>
<tr>
<th></th>
<th>CAG</th>
<th>FEG</th>
<th>GAG</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>r</em></td>
<td>0.27</td>
<td>0.51</td>
<td>0.65</td>
</tr>
<tr>
<td><em>t</em>-test (H₀: <em>r</em> = 0)</td>
<td>0.75</td>
<td>1.59</td>
<td>2.23&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Note: *r* shows the Pearson’s correlation coefficient. The null hypothesis for the *t*-test is that the correlation coefficient is equal to zero. *p*-values are as follows: <sup>a</sup> *p* < 0.10, <sup>b</sup> *p* < 0.05, <sup>c</sup> *p* < 0.01.
Figure 1.

Relations between the final exam dates and the final exam grades for each subject (AA, CA, BCM, FM, OM, SE, BT SIIE and MR)

Panel A: First term
Panel B: Second term

Note: the number of students whose grades are included in this study for each subject is as follows: 69 (AA), 78 (CA), 102 (BCM), 75 (FM), 93 (OM), 75 (SE), 63 (BT), 57 (SIIE) and 88 (MR).
Appendix

Table A1.

Subject Names, Weights of the Continuous Assessment Activities on the Global Assessment Grades and the Number of Observations

<table>
<thead>
<tr>
<th>Subject Name</th>
<th>Weight of continuous assessment activities on GAG</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Individual activities(^a)</td>
<td>Activities in group(^b)</td>
</tr>
<tr>
<td>Accounting Analysis (AA)</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>Cost Accounting (CA)</td>
<td>10%</td>
<td>15%</td>
</tr>
<tr>
<td>Business Commercial Management (BCM)</td>
<td>15%</td>
<td>25%</td>
</tr>
<tr>
<td>Financial Management (FM)</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>Operations Management (OM)</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>Spanish Economics (SE)</td>
<td>25%</td>
<td>15%</td>
</tr>
<tr>
<td>Business Taxation (BT)</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>Statistical Inference and Introductory Econometrics (SIIE)</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>Market Research (MR)</td>
<td>20%</td>
<td>30%</td>
</tr>
</tbody>
</table>

Note: \(^a\) Individual activities include the resolution of problems or cases, elaboration on training essays and self-evaluation and peer-evaluation activities. \(^b\) Activities in groups consist of writing essays in a group.