ACADEMIC INTEGRITY IN THE LIGHT OF ONLINE EXAMS – STUDY CASE

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Abstract

Education has been affected, undoubtedly, by the COVID-19 pandemic. In this difficult context, for all the agents involved, both challenges and opportunities can be identified that will definitively change the way the teaching-learning-assessment activities are carried out. A less addressed research issue is that of the last stage of the educational process, the evaluation of students. The COVID-19 pandemic created an environment conducive to a higher rate of exam fraud, and teachers devoted more time to preparing subjects to reduce the possibility of cheating. Thus, academic integrity has been questioned. This study is designed to obtain an estimate of the extant of cheating in online exams from the perspective of business students. The results, based on a sample of 129 grades received by undergraduate students from a statistic course, indicate that 16% of students have been able to resolve only the problem that was identical to all students and not the random problem, even if the algorithm was similar. Using Student t-test, there is a significant difference between the "cheating" students' grades and "honest" students' grades. These results may represent a new direction for professors to reconsider online exams.

Key words: *education, academic integrity, online exams, COVID-19*

JEL Classification: I20, I23, I29

1. Introduction - literature review

The educational process is a systematic, planned, and an intense activity of access to knowledge, carried out through a series of scientifically validated teaching methods and techniques. Undoubtedly, the COVID-19 pandemic has brought major changes in the education system, making students more flexible and aware of the presence of difficulties (Schmidt, 2020). In this difficult context, for all the agents involved, both challenges and opportunities can be identified that will definitively change the way the teaching-learning-assessment activities are carried out.

There were two types of learning: synchronous and asynchronous. The first way is very similar to traditional communication through communication (Zoom, Teams, Webex, etc.), but makes it difficult for the teacher to work by teaching and tracking the participants' rooms at the same time. On the other hand, the asynchronous mode offers greater flexibility in setting the program (Mladenova, Kalmukov, & Valova, 2020). Thus, it is important to understand the teaching activity of that period to be able to project the future of education affected by COVID-19 (Daniel, 2020). From the beginning of the pandemic, the educational units were closed, had their courses suspended or carried out their activity in a hybrid system depending on the epidemiological conditions. At the same time, the quality of education has been affected all over the world, but to a greater or lesser extent, depending on certain factors, such as: school infrastructure, internet connection, teachers' skills, etc. (Wahab, 2020). At least in the case of Romania, there was a period of 4 weeks (April 2020) in which the courses took place depending on the choice of teachers conditioned by access to computer resources, often very limited. Thus, following this period, there is an important problem that is not only related to the fidelity of the grades obtained, but also to the degree of qualification of the graduates. Regarding this, the present study case examines the coefficient of similarity in an online exam with business students.

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2. Literature review

As for the literature, it is not yet very extensive due to the novelty of the subject, but there are some significant articles that follow, mainly, the situation in Asian countries, the first affected by COVID-19, but also in European countries. Bremmer and Clark (2020) show that in economic universities in Asia, Australia and the United Kingdom, students were most affected. Whether they are first-year students, worried about their university experience, or those in their final year entering the labor market, they have all undergone changes in terms of educational experience, but they have also felt benefits. Other authors, Liguori and Winkle (2020) point out that although there was a possibility to take a university course online before, this option was chosen by very few students, which has led to poor teaching techniques in this regard. The authors emphasize the need for documentation and preparation for online education but emphasize that not all areas can achieve very good results online.

Regarding the pandemic context in Europe, Konig (2020) showed, through a survey of teachers in the state of North Rhine, Germany, that, despite the closure of schools, teachers have managed to maintain a constant connection with their students. Also, following a regression analysis, it emerged that maintaining this contact is significantly influenced by the degree of digital skills of teachers.

Regarding the Romanian education during the pandemic, a study conducted by Florian and Țoc (2020) highlights the fact that, in the current context, the inequity in the educational system has been accentuated, the children from rural areas being the most disadvantaged. The authors recommend that, in the long run, the assessment methodology for national exams be rethought, teachers be supported to acquire basic technical skills, but also the construction and implementation of a framework regulation to make it mandatory to use an online educational platform.

Also, through a questionnaire, this time applied to students at a middle school in Bucharest, it turned out that 60% of them prefer classical classes due to social contact with teachers and colleagues, reducing time spent in front of the computer, but also increasing motivation to learn inside a classroom.

A less addressed research issue is that of the last stage of the educational process, the evaluation of students. The COVID-19 pandemic created an environment conducive to a higher rate of exam fraud, and teachers devoted more time to preparing subjects to reduce the possibility of copying (Jelescu & Jelescu, 2020). There are few studies regarding evaluation for online courses. For example, there are studies that examine students cheating behavior, but do not offer a comparison between online teaching and face-to-face teaching. However, there is one empirical study (Kennedy, Nowak, & Raghuraman, 2000) that concluded cheating behavior is more likely to appear in an online class than in a traditional teaching class. The results are also confirmed by another empirical study conducted by professors from University of Connecticut (Harmon & Lambrinos, 2010).

3. Methodology

In this study, the data used was obtained from one course of statistics, an online class in undergraduate level taught in 2020-2021 at Bucharest University of Economic Studies. The full course was taught entirely online using Zoom platform and the exam was set on the university personal online platform. Moreover, the students were invited to attend a zoom meeting on exam in order to be seen and to prevent, as much as possible, the fraud. The exam had 7 problems, given sequentially, with one correct answer and with different difficulty levels. The problems were both random and fixed for each student. A fixed problem is identical for all students. A random problem contains a unique value in the question for each student. However, our interest is focused on two problems (number five and number six) with the same algorithm and the approximate level of difficulty. Both problems were marked with

2 points for the correct answer. One of them was fixed (problem number 6) and one of them was random (problem number 5). The problems are approaching the algorithm for calculating the coefficient of variation. But it should be mentioned that the fixed problem, number 6, was, however, more difficult that the random problem. It was created so to be more rigorous in fraud prevention. The problems can be observed in Table 1.

Table 1. Exam problems

<table>
<tr><th>Fixed problem (number 6)</th><th>Random problem (number 5)</th></tr>
<tr><td>A pharmaceutical company owns 100 stores in Bucharest. About the location of these stores and about the average value of daily sales (RON) data is known:
<table>
<tr><th>Neighbourhood</th><th>Stores</th><th>Average value of daily sales (RON)</th><th>Sales coefficient of variation (%)</th></tr>
<tr><td>Balta Alba</td><td>25</td><td>20</td><td>6</td></tr>
<tr><td>Drumul Taberei</td><td>30</td><td>...</td><td>20</td></tr>
<tr><td>Pantelimon</td><td>15</td><td>10</td><td>13</td></tr>
<tr><td>Berceni</td><td>10</td><td>12</td><td>12,5</td></tr>
<tr><td>Baneasa</td><td>20</td><td>14</td><td>12.3</td></tr>
</table>
Knowing that the modal value of sales for the Drumul Taberei neighborhood was RON 5.25 and the Pearson asymmetry coefficient had a value of -0.25 it is required:

To what extent does the neighborhood influence the variation of the sales value? Write the answer in ab.cd form.</td><td>The following data is known regarding the average number of defects registered for Logan cars sold in 4 different locations:
<table>
<tr><th>Location</th><th>Numer of cars</th><th>Average number of defects</th><th>Coefficient of variation</th></tr>
<tr><td>Bucuresti</td><td>150</td><td>6.25</td><td>20</td></tr>
<tr><td>Cluj</td><td>60</td><td>7.5</td><td>20</td></tr>
<tr><td>Bacau</td><td>100</td><td>8.75</td><td>14</td></tr>
<tr><td>Constanta</td><td>90</td><td>7</td><td>18</td></tr>
</table>
Check if the average number of defects is a representative value. Enter the value of the coefficient of variation of the ab.cd form.</td></tr>
</table>

The data for this study consisted of scores on the exam from university records. To evaluate if there was cheating behavior among students, the two-sample t test assuming unequal variances (an F test was performed in order to determine this) was used in order to compare the means between the grades received by students who only solved the fixed problem and the grades received by the other students.

$$t = \frac{(\overline{x_1} - \overline{x_2}) - (\mu_1 - \mu_2)}{\sqrt{\sigma_1^2/n_1 + \sigma_2^2/n_2}} \quad (1)$$

The hypotheses are:

H0: there is no difference between the population means.

H1: there is a difference between the population means.

P-value was set to 5%.

4. Results and discussions

First, the grades obtained by the students are between 0 and 10, as it follows (figure 1). Most of the students obtained a grade between 2 points and 4 points, meaning that they only solved the easiest problems. Grades between 8 and 10 points are the least common ones, only 14 students achieved a good grade. Even though the problems covered only the content discussed at course and seminars, the higher grades were not predominant.

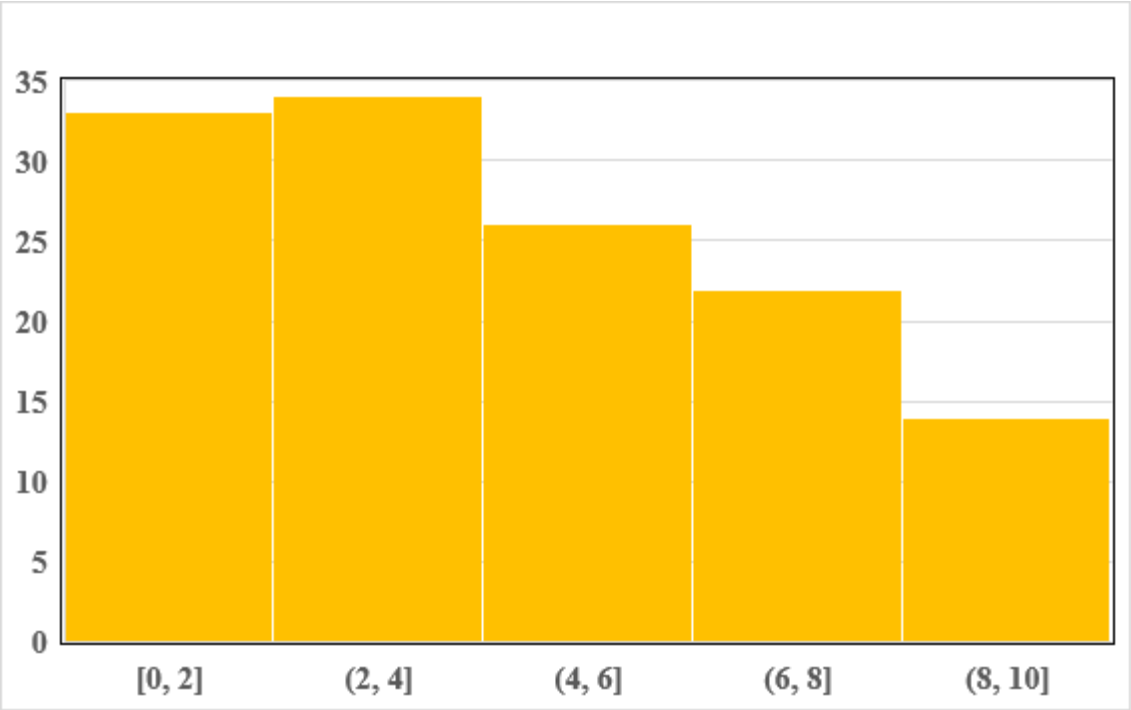

Figure 1. Histrogram of final grades
Source: created by author based on collected data

Regarding the problem number 6, which was fixed, 36.5% of the students solved it, while 39.5% of students solved the random problem, number 5 (Figure 2). Considering these results, it may be mentioned, as a first thought, that there is no fraud. However, there are two important things that should be highlighted. First, the proportions are approximately equal, and it also contains results of those students who may did the fixed problem good and the random problem wrong or vice versa. Second, as mentioned before, the fixed problem was more difficult than the random problem. Thus, there are students who, irrespective of academic integrity, may have only done the problems that were closer to what they had prepared for the exam.

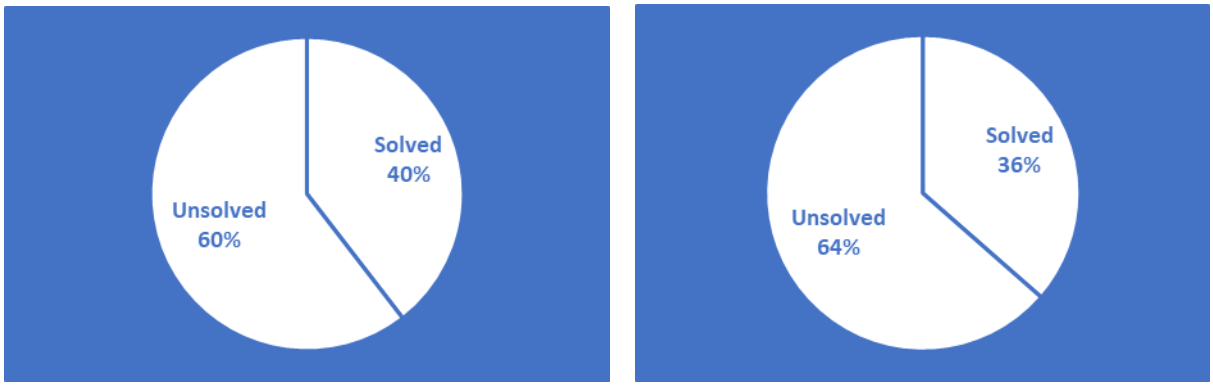

Figure 2. Random and fixed problem – students' proportions
Source: created by author based on collected data

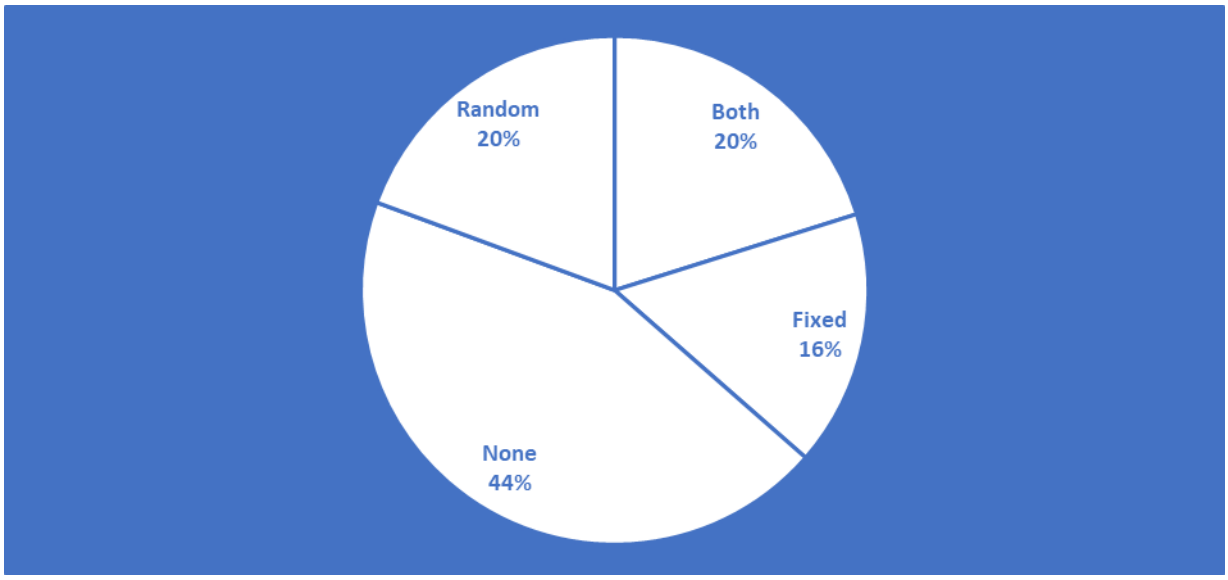

Figure 3. Students' proportions
Source: created by author based on collected data

Figure no. 3 represents a brief presentation of results for all students: well prepared students – those who solved both problems, poorly prepared students – those who did not solve any of the problems, honest students – those who solved good the random problem and wrong the fixed problem, suspect students - those who only solved the fixed problem. Regarding these two interest problems, 20% of the students were able to resolve both problems. However, 16% of students were able to resolve only the fixed problem without knowing the answer for the random problem. This means that 16% of them may be considered cheaters. Resolving a difficult problem that was identical and not being able to solve an easier problem with one unique value raise a question of integrity. Thus, 21 students are suspected of a cheating behavior.

In order to estimate if there is a significant difference between cheating students' grades and the rest of the students' grades, a t-test was performed (table 2). The first sample includes 108 students (those who did both problems, none of them or only the random problem) and the second sample includes 21 students (those who only did the fixed problem). Considering a t critical of 1.67, the calculated statistic t is located in the critical region. Thus, null hypothesis is rejected, and alternative hypothesis is accepted. Based on this result, it can be concluded that the grade obtained by those who only did the fixed problem in the online exam is statistically different from the grade obtained by the other students. It can also be seen that those who "cheated" got a mean grade 5.43 and the others, 4.48. In other words, a cheating behavior led to an additional point in the final grade. Regarding this study-case, even if the exam was created in a specific manner to prevent as much as possible the fraud, an identical problem for all the students favors a cheating behavior more than a problem with random variables.

Table 2. Statistical analysis

	Variable 1	**Variable 2**
Mean	4.481481481	5.428571429
Variance	8.812737972	2.157142857
Observations	108	21
Hypothesized Mean Difference		0
df		58

	Variable 1	Variable 2
t Stat		-2.205994322
P(T<=t) one-tail		0.015679848
t Critical one-tail		1.671552762
P(T<=t) two-tail		0.031359696
t Critical two-tail		2.001717484

Source: author's calculations of data

In the light of these results, online exams may represent a way that favors the appearance of a cheating behavior since the solution may be transmitted among students. A problem with unique values may reduce the tentation even more if the problems are limited on time.

5. Conclusions

In this study, the addressed question was if an online exam favors a cheating behavior if the questions are identical. Data collected from a statistic course taught to business students was used to create a more representative image of academic integrity in an online exam. The problems were created to prevent the fraud as much as possible, but also to compare results from an identical problem and a unique one for each student. The expectation was to find a significant difference between grades for cheating students and honest students. Using a t-test to compare the means of the two samples, it was concluded that the difference is statistically significant. Thus, those students who only did the fixed problem, even if it was more difficult than the random problem, showed a lack of integrity and obtained one more point in the grade than those who showed academic integrity. The potential for a cheating behavior in online exams has been already discussed in the past, but the current situation requires more attention to the evaluation aspect in online courses. Due to COVID-19 pandemic, courses have been and still are taught online, more than in the past, and students are always evaluated using online platforms. Moreover, most of professors tend to use identical problems and questions due to the lack of technological skills, technological resources, or lack of time for exam preparation. As seen in this study case, identical problems tend to stimulate academic dishonesty.

This study has, also, limitations that should be discussed. First, data is limited to these students and to the format of the exam. Future research may look at students of the same course, but from different faculties. Also, a future study may consider the students' progress during the course weeks and intermediate exam if there is one.

This subject may be of interest for students, teachers, academic world, and researchers since online courses and evaluation will have an important impact on future generations and on their diplomas. Obtaining grades that do not reflect the real knowledge of students, well prepared students may feel demotivated, and the less-prepared students may believe they are better than they really are. Moreover, the value of the diploma in the work field and academic world will decrease. Keeping these in mind, a clear image of online evaluation is indispensable in these moments.

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