

Influence of COVID-19 isolation on academic performance in engineering university students

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— *Abstract* —

The outbreak of the COVID-19 disease caused great damage globally, where education has used information and communication technologies (ICT) to transform face-to-face teaching into a virtual one. The implementation in Ecuador of mandatory preventive isolation (APO), higher education institutions applied strategies that, supported by ICT, provided an environment conducive to tele-education, however, students despite being at home suffer the ravages of isolation. Due to the aforementioned, this research aims to determine the influence in the academic performance of students of engineering degrees of the Universidad Laica Eloy Alfaro de Manabí extension El Carmen due to the application of the APO, for that, a quantitative analysis was applied based on the scores of the total students enrolled in the periods 2019 (2) and 2020 (1), the data were tabulated and interpreted using the computer tool MiniTab and SPSS. With the results achieved, it was determined that isolation has had a significant impact on students, particularly male students compared to female students.

Keywords:

Higher education; tele-education; academic achievement; COVID-19; isolation.

2020 was a momentous year after being marked by the global COVID-19 disease pandemic, caused by the severe acute respiratory syndrome virus coronavirus 2 (SARS-CoV-2). According to the World Health Organization (2019), the first case of this infectious disease was registered in Wuhan, China, at the end of 2019, however, despite efforts to prevent the infection and its transmission, it managed to spread to all continents, so in March 2020 the WHO declared the COVID-19 disease as a pandemic, due to its rapid spread and the number of victims it took worldwide.

One prevention measure that various countries have adopted is the suspension of events and closure of establishments where there may be agglomerations, this has caused schools not being able to accommodate students in their facilities, which according to UNESCO (2020), has affected about 1.2 billion students, who have had to dispense with in-person classes.

Ecuador, in response to the COVID-19 pandemic, established, through executive decree 1017, mandatory preventive isolation (APO). According to Bennet "Isolation is the process and procedure used to prevent an infected individual from transmitting a contagious disease to others" (2015: 168), this type of measure has a direct impact on the country's economic sectors, another of which is education. With the precept of APO, higher education institutions were obliged to transform in-person education into a virtual modality, such as tele-education.

Tele-education, according to Buitrón & Enrique (2020), offers a digital environment where the technological infrastructure makes it possible to attend classes through various devices, thus sharing syllabuses, tutorials, teaching material, and all those actions that favor effective training from home.

Concerning the aforementioned, higher education institutions have faced the transition to tele-education suddenly and have seen the need to implement tools that, supported by information and communication technologies (ICT), generate a learning environment where there is student-teacher interaction, this implies a greater commitment on the student's part since he is responsible for his own education and the teacher acts as a guide of the educational process (Lopez Sepulveda, 2001).

Although learning environments with the implementation of ICT have generated a space of interaction in real-time that transcends the space-time limits and originate stimulating circumstances for learning (García-Chato, 2014; Vasconcelos, 2015). It should be considered that a process of isolation alters the learning environment, therefore, it entails a greater effort on the part of the teacher and families that added to the limitation of the space of social interaction can affect the academic performance of the students, considering that these circumstances increase depression and reduce concentration (Ceballos Marón & Sevilla Vallejo, 2020; Gamboa Suárez, Hernández Suárez & Prada Núñez, 2021). (Ceballos Marón & Sevilla Vallejo, 2020).

On the other hand, Pérez-López *et al.* (2020) infer that communication between teacher-student reduces the risk of abandonment formed by the non-presence between students and teachers, a factor that originates from the isolation effect in distance learning models that has been exacerbated due to forced confinement due to the pandemic.

Academic performance has been conceived as the quantified result that the teacher uses as an indicator to establish the achievements reached by the student, this is linked to social skills because an individual from birth is a social being and depends on the training, he receives to show integrity before society (Jerez, 2017; Treviños, 2016). Some factors can influence the academic performance of the student, according to Espinoza (2017), the environment and motivation contribute to determining the condition of a student as disapproved, in addition, there is a significant association between the study habits and the academic performance of the students.

Based on the above, this study aims to determine the influence of compulsory preventive isolation, to which students have been subjected, on their academic performance and thus determine whether the institution should establish new strategies on the teaching-learning process in students of the engineering majors of El Carmen.

METHODOLOGY

The present study had a descriptive approach for which a quantitative analysis of academic performance was used on a determined group made up of students of the engineering majors of the Universidad Laica Eloy Alfaro de Manabí El Carmen – Ecuador extension between the periods 2019-2 and 2020-1. The institution in question establishes through the current legal regulations a final scale of 0 to 20 points, where it is established that a final calculation of fewer than 14 points fails the subject (ULEAM, 2020).

According to Rodríguez (2016), the population is made up of a determined or indeterminate group of units that have common characteristics, therefore, students enrolled in the engineering majors offered by the aforementioned institution were selected as a population, as shown in Table 1.

At the end of the academic period, the grades obtained by each student in each subject at all levels were collected, excluding those who were unenrolled from the subject. We classify students by gender for a hypothesis test by a difference of means between the two populations with a significance value of $\alpha = 0.05$ for which the following hypotheses were proposed.

H_0 = Academic achievement before APO is equal during APO

H_1 = Academic achievement before APO is not equal during APO

The formula used for the calculation and testing of the hypotheses was:

$$Z = \frac{(\bar{X}_1 - \bar{X}_2) - d_0}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Finally, an odds ratio (OR) was carried out with a 95% confidence interval to show if there is a relationship between academic performance and the number of failures where the APO and the approval of a subject as the condition were established as a risk factor, subsequently, the data obtained were tabulated and using the MiniTab and SPSS tools the interpretation and design results were carried out.

Table 1
Student population by academic period and major

Academic period	Modality	Students by degree					
		Agricultural Engineering			Systems and Information Technology (IT) Engineering		
		Men	Women	Total	Men	Women	Total
2019-2	In-Person	292	208	500	209	151	360
2020-1	Virtual	317	251	568	211	172	383

Source: Own elaboration

RESULTS

For the analysis of the results, we started processing the grades obtained by the students of both degrees. In the agricultural degree, we obtained $Z = -7.63$ as the value, which within a test of two extremes places it at the lower end below the critical value (Z_c) ± 1.96 , when obtaining a test value of 0 and being below the value $\alpha = 0.05$, the H_0 is rejected, unlike the female students of the IT degree, who obtained a value $Z = -1.84$ which places it at the lower end above the Z_c and with a test value of 0.07, which is accepted by the H_0 , in this first analysis it is deduced that the APO has influenced the students' academic performance, being the women of the agricultural degree the most affected.

When processing the grades obtained by the agricultural degree students, a value $Z = -4.14$ has been obtained, a value that is located at the lower end below the Z_c , with 0 as a test value which rejects the H_0 , on the other hand, from the students of the IT degree we got the value $Z = 0.17$ that places them at the right end below the Z_c and with a test value of 0.86 which accepts the H_0 . For the analysis carried out in men, it is deduced that during the APO the academic performance of agricultural students has been affected,

however, the men of the IT degree have not had a significant change in their academic performance.

As we consider all the students of each degree, it is shown that the trend in academic performance is maintained between men and women from the same degree, with agriculture being the most affected. It should be noted that within the IT degree there is a marked difference between the test values of men (0.86) and women (0.07), where the latter are closer to the significance value.

Through the odds ratio analysis of an interval with a range of 1,044 and 2,526, it is established that female students of the agricultural degree have a probability of 1,624 more to fail a subject while in isolation, this shows the APO as a risk factor that influences the condition of approval of the students (Table 2). On the other hand, the confidence interval for IT women ranged between 0.787 and 3.894 with a probability of 1.751, based on the aforementioned, it is deduced that there is an influence of the APO on the approval status of a subject, however, this is not significant for IT students (Table 3).

Table 2

*Odds ratio APO analysis * Agricultural degree's women's subject*

			Subject		Total
			Passed	Fail	
Mandatory Preventive Isolation (APO)	In Isolation	Count	181	70	251
		% within Subject	51.86%	63.64%	54.68%
	No Isolation	Count	168	40	208
		% within Subject	48.14%	36.36%	45.32%
Total	Count	349	110	459	
	% within Subject	100%	100%	100%	

Source: Own elaboration

Table 3

*Odds ratio APO analysis * IT degree's women's subject*

			Subject		Total
			Passed	Fail	
Mandatory Preventive Isolation (APO)	In Isolation	Count	153	19	172
		% within Subject	52.04%	65.52%	53.25%
	No Isolation	Count	141	10	151
		% within Subject	47.96%	34.48%	46.75%
Total	Count	294	29	323	
	% within Subject	100.00%	100.00%	100.00%	

Source: Own elaboration

When applying an odds ratio analysis to men in the agricultural degree, a probability value of 1,674 was obtained for an interval between 1,215 and 2,307, thus maintaining a relationship between the values obtained among women. In addition, students of the IT degree unexpectedly present a probability of 3,488 for a range of 2,213 and 5,497, thereby ratifying the APO as a risk factor that negatively influences the state of approval of the subject and can be seen in the following tables.

Table 4
*Odds ratio APO analysis * IT degree's men's subject*

			Subject		Total
			Passed	Fail	
Mandatory Preventive Isolation (APO)	In Isolation	Count	144	173	317
		% within Subject	45.86%	58.64%	52.05%
	No Isolation	Count	170	122	292
		% within Subject	54.14%	41.36%	47.95%
Total	Count	314	295	609	
	% within Subject	100.00%	100.00%	100.00%	

Source: Own elaboration

Table 5
*Odds ratio APO analysis * IT degree's men's subject*

			Subject		Total
			Passed	Fail	
Mandatory Preventive Isolation (APO)	In Isolation	Count	124	87	211
		% within Subject	41.61%	71.31%	50.24%
	No Isolation	Count	174	35	209
		% within Subject	58.39%	28.69%	49.76%
Total	Count	298	122	420	
	% within Subject	100.00%	100.00%	100.00%	

Source: Own elaboration

CONCLUSIONS

The use of ICT has created virtual spaces of education that facilitate student-teacher interaction, however, the application of the mandatory preventive isolation policy, created to reduce the spread of COVID-19, generated an abrupt change in teaching. Moving in-person education towards tele-education due to APO has negatively influenced students' moods, as corroborated by the research of Gamboa Suárez, Hernández Suárez, & Prada Núñez

(2021) who mention that in three out of four cases of people under these circumstances show depression, which evidences the direct influence on academic performance by causing a greater number of students to fail one or more subjects.

The change that a student experiences when entering a higher education institution, according to Medina Torres (2017), generates stress in the student due to academic activities and the security of a professional future. If you add to this that they must be in isolation and go to lectures through a computer, it makes evident an alteration in their student performance. In this sense, it was found that APO has mainly affected women's academic performance, which makes it necessary for higher education institutions to promote motivational and academic strategies to prevent health measures against the spread of COVID-19 from affecting students' academic performance.

It is important to mention that the results obtained contribute to the growing evidence of the effects that isolation has had on university students, however, future lines of research should expand the study when comparing it with other institutions of similar characteristics and consider social aspects that can be linked to APO.

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