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Impact and success factors of online education methods at university level in times of COVID-19: a case study of Paraguay

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Impact and success factors of online education methods at university level in times of COVID-19: a case study of Paraguay

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Abstract: The drastic changes that COVID-19 has brought along include the necessity to introduce new forms of online university education. This article compares the impact of the change from face-to-face to online classes on student performance and satisfaction and identifies key success factors for effective online teaching. The study is based on the comparison of 34 face-to-face and online courses in 2019 and 2020 among 416 students of the 1e to 4e-year from the degree programs of the Faculty of Business Sciences of the German Paraguayan University in Paraguay. The study provides a methodology to identify and measure the success factors for an effective change to online education and provides practical lessons learned on the effective integration of digital tools in the teaching and learning process, relevant for other universities in developing and developed countries alike.

Keywords: online education; synchronous and asynchronous teaching; teaching and learning processes; pedagogical training; digital training; competence-based learning.

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1 Introduction

Health measures due to the COVID-19 pandemic have impacted on all areas in which people operate and higher education does not escape from that. These measures have resulted in the unforeseen and, at least temporary, suspension of face-to-face classes in most of the universities worldwide in March 2020. In March 2020, it is estimated that the university activities of 99% of teachers and students in Latin America have been affected. During the pandemic around 24% of the classes were cancelled in 43% of the cases the classes were temporarily suspended (see Table 1). In 77% of institutions, solutions based on synchronous, asynchronous or self-study online education have been rapidly introduced (Marinoni et al. 2020).

Table 1 Global impact of COVID-19 in higher educations in March 2020

	<i>Not affected</i>	<i>Teaching replaced by online teaching</i>	<i>Teaching suspended with online solutions in development</i>	<i>Teaching cancelled</i>
Africa	3%	29%	43%	24%
Northern and Southern America	1%	77%	22%	3%
Asia and Pacific	1%	60%	36%	3%
Europe	99%	85%	12%	3%

Source: Marinoni et al. (2020)

In response to the COVID-19 pandemic, universities have been forced to switch to online education without having time to adjust their teaching-learning methods, train teachers and students, implement digital tools and ensure sufficient levels of connectivity (Pedró, 2020). In general, a negative impact on university education is expected. There are no conditions regarding access to computing devices and broadband connectivity between teachers and students, and teachers lack digital skills (Pedró, 2020).

Part of the challenge comes from the fact that the method and the academic content offered was never designed for distance education courses, but rather tries to alleviate the absence of face-to-face classes with virtual classes without prior preparation (Giannini, 2020). It should also be noted that distance education requires greater discipline and commitment on the part of the student, which perhaps explains that it is more successful among older people who participate in post-graduate courses, compared to those in

undergraduate studies. In general a significant overall negative impact on academic achievement and student satisfaction is expected in the region.

For this, it is important to analyse and evaluate different experiences and to derive lessons learned that can assist to develop more effective on-line education. This case study analyses the impact of the transition from face-to-face classes to online classes at the Faculty of Business Sciences of the German Paraguayan University (UPA). The study compares the academic performance and satisfaction of 416 students from the different cohorts of degree programs in Business Administration (AE) and Business Informatics (IE) who participated in face-to-face classes in 2019 and online classes in 2020. Likewise, the study identifies key factors and a series of lessons learned to achieve an effective and satisfactory online education.

2 Literature review

2.1 Definition of the on-line learning model

Before comparing the face-to-face and online learning model it is important to define the distance education model applied in this case study. Synchronous online teaching involves online classes are offered at predetermined times with direct interaction with the teacher. An asynchronous distance education model allows the student to participate in a flexible schedule without direct interaction with the teacher (Somera rain et al., 2010). In this study, a face-to-face teaching and learning model in 2019 is compared with a synchronous learning model in which physical class presence is replaced since the start of the pandemic in march 2020 with classes using video-conferencing during the same daily class hours. In both periods the courses were provided by the same lecturers who applied the same competence-based and interactive learning methods and were using the same digital learning platforms to access study materials and upload study assignments and take exams.

2.2 Defining impact indicators

Several studies have compared the impact of face-to-face and online education models using academic performance and student satisfaction as principal impact indicators. Several authors, as in the case of López (2006), suggest using *academic performance* as a key indicator to compare the two learning formats. Academic performance can be measured by looking at different factors including retention and academic dropout rates, the difference between initial and final enrolment levels, the number of graduates, average grade by subject, grades between different subjects or during the full study period and internal academic efficiency.

However, most studies comparing face-to-face and online models measure impact by comparing student grades. These studies were carried out since a – much discussed – reference study by Russel (1999) that indicated that there were no differences in academic performance between the two modalities. Summers confirmed that, if the course content is similar, the academic performance of face-to-face and online classes is comparable (Summers et al., 2005). Somera rain et al. (2010) also concluded that it did not find differences between face-to-face courses and courses provided in a synchronous or asynchronous online format.

While these studies may be encouraging, it is possible that these insights change in the context of the forced shift from classroom to online teaching formats due to COVID-19 in 2020. In a recent UNESCO study the authors assume that this shift to online classes will have a strong negative impact on student performance in Latin America and the Caribbean due to the lack of access to equipment and broadband connectivity, a lack of digital skills among teachers and students and the lack of adjustments in content and methodology (Pedró, 2020).

Second, several studies evaluate *student satisfaction* to compare face-to-face and online learning models, understood as the extent to which students perceive that they are receiving quality teaching and training based on academic competencies for students, translated into skills such as reflection and self-learning, the acquisition of strategies to resolve conflicts and the establishment of the foundations to establish and promote learning throughout life (Muñoz et al., 2011).

Studies show different conclusions about the level of satisfaction between face-to-face and online classes. Somerarain et al. (2010) shown in his study that he found no statistically different satisfaction levels between a face-to-face class, synchronous and asynchronous online classes. Bennet and Green (2001) assumed that student satisfaction can be even higher than face-to-face education if a number of conditions are met. Summers et al. (2005) shown a lower level of satisfaction in asynchronous online classes due to a lack of discussions between students, limited possibilities for direct interaction to ask questions and get explanations about content and evaluations with their lecturer. It is important to mention that he did not find a difference in satisfaction regarding the content, level of learning and relevance of the course (Summers et al., 2005).

2.3 Success factors for online education

In Giannini (2020), the results suggest that, on a global scale, the main concerns that impacted on education during the pandemic are social isolation, financial issues, internet connectivity and, in general, anxiety-related situations, the pandemic. In the specific field of higher education, the transition to distance education has been accompanied by other impacts that are no less important, although probably less visible and still documented. The adoption of this continuity solution will have negative results, both in terms of the quality of and equity in education (Pedró, 2020).

Perceived problems as observed by Pevneva and Edmunds (2020) were the *poor organisation* and related high workload for lecturers of the transition to distance education. UNESCO indicates the difficulties to maintain a *regular schedule* of the classes as one of the main challenges (Pedró, 2020). This last factor can be associated with forms of teaching and learning that, even from school, do not promote self-regulation of learning. This can be combined with the negative impact of a decrease in the number of student-teacher *contact hours* that can be observed after the introduction of online classes in the region.

An important aspect of the quality of face-to-face and online education is in the *didactic method* of teaching and learning based on constructivism that promotes active student participation and interactivity. Among others, Fernández-Rico et al. (2007) concluded that two success factors in the general satisfaction of the classes taught include those related to the dynamics of teaching and learning methods. As in face-to-face education, it is very difficult to develop an effective online class using a method based on traditional instructional methods (Bennett and Green, 2001). A critical factor for online

education is that in many cases the institutions adjust the pedagogical and didactic approach to the available technology and not to the needs of the students (Summers et al., 2005). To be effective in online education, the constructivist approach Lancheros (2018) is suggested, which promotes a combination of co-construction between students and teachers and between students themselves (Bennett and Green, 2001) and whose fundamental principles are presented to maintain its development through contextualised and non-massed online education processes. Lower levels of interactivity result in many online courses in lower *active participation* of students, one of the explaining factors of limited success of many online courses (López and Sánchez, 2013).

Likewise, the *quality of teachers* represents a key success factor to offer high quality face-to-face and online education. In particular, *didactic competencies* are manifested as outstanding variables that enable teachers to contribute to teaching, the clarity of their explanations, the ability to make classes interesting and motivate students, the involvement of teachers towards academic difficulties (Muñoz et al., 2011). Among the success factors in online education, Videgaray (2007) highlighted the ability of teachers to maintain a motivating relationship with students to encourage the creation of virtual learning communities that encompass various communication channels, forums, chats, messages, etc.

Another success factor in online education is the level of *digital skills* of lecturers. According to a study by OECD (2020) the competencies of lecturers can strongly vary between countries, with the proportion of teachers with few competencies in problem solving in highly technological environments ranges from less than 5% in Australia to around 54% in Ecuador. Gorospe (2004) indicated that it is essential to offer support and training to the teaching staff on a continuous basis during the development of the online courses. Borges (2005) supported these issues stating that academic success is influenced by the training and qualification of teachers, their presence, interaction and collaboration, helping with these measures to avoid frustration and desertion in students.

Similarly, in a recent UNESCO study almost half of teachers indicated that they needed help to manage distance learning effectively (Pedró, 2020). The lack of methodological knowledge, technical knowledge and computational skills affects a smooth transition. UNESCO classifies three levels of digital competences of teachers in higher education including: Exploration where the teacher has a first approach to knowing the opportunities of technology; Integration where teachers develop skills autonomously and Innovation where it seeks to build novel strategies that allow them to reconfigure their educational practice (Hernández et al., 2014).

Student motivation is another key success factor for online education. To successfully complete a class with a virtual program students need a high level of commitment to learning and in terms of greater self-realisation, greater self-esteem and improvement in relationships interpersonal relationships with their study groups or their teacher / tutor (Lancheros, 2018). King (2002) stated the importance of interaction between students who share their ideas, relating their personal and professional experiences with other students, as an essential part of the success of online education. Student commitment also stands out in a study by Pascarella et al. (2010), which is considered as an added value that leads to learning and contributes to quality assurance systems with relevant information about students and their training experience (Pascarella et al., 2010). Although it is difficult to measure student engagement, the level of student satisfaction can be used as a relevant indicator of student motivation.

As far as the student is concerned, it is known that they are also conditioned to their *financial resources* that affect the possibilities of study in general and access to digital devices and the Internet in particular. This factor represents an important factor during the pandemic where many families have experienced a reduction or total loss of their sources of income, particularly in the case of Latin America and the Caribbean. Especially in cases where universities offer online solutions of low quality and limited contact hours, many families decide to abandon or postpone the participation in higher education.

Finally, a UNESCO study indicates that access to a *computer and broadband internet* represents a strong limitation to be able to offer a high quality of online classes (Giannini, 2020). Roblyer and Davis (2008) also emphasised that it is pertinent that for active participation in synchronous virtual classes and in the development of virtual assignments and exams it is necessary to have access to a computer and not just a smartphone. Results of the study of Torres-Díaz et al. (2016), students with access and effective use of broadband internet show greater academic success in those who carry out interactive activities with peers and teachers than those who only seek information.

3 Metodología de la investigación

The key research questions of this study are:

- 1 What is the comparative impact of face-to-face and online education on academic performance and student satisfaction levels?
- 2 What are key success factors of an effective shift from face-to-face to online education?

The first part of the research is based on a quantitative and comparative analysis of academic performance and satisfaction levels with face-to-face courses in 2019 with online courses in 2020 followed by 416 students. The data is collected among all 1e, 2e and 3e year bachelor students and covers 16 subjects in business administration and 18 subjects in business informatics. Academic performance is measured by the officially registered average student's grades and satisfaction is measured through a standardised questionnaire that is obligatorily filled out by all students at the end of each subject since 2014. The statistical analysis included Arithmetic Mean, Standard Deviation, the *F*-test for variances, the hypothesis test *t* for small samples and a confidence interval of 95%.

Table 2 Key factors and indicators to measure the quality of face-to-face and online learning

<i>Impact</i>	<i>Indicator</i>
Academic student performance	Average level of grades per subject and per year
Satisfaction levels of students	Satisfaction with the teaching and learning method

Source: Developed by the authors.

Table 3 presents the main success factors and indicators for online education that were distilled from the literature review in chapter 2. These indicators are partially measured through student surveys among 350 students participating in 16 modules of business administration, discarding the course in business informatics due to the low number of students that skew the results. *F*-tests were performed to determine the type of variances in order to apply the Student's *t*-test for small samples, corresponding to equal or

different variances according to the case. Other indicators are measured using the results of focus group meetings with lecturers that have been held on a weekly basis since the start of the pandemic.

Table 3 Key success factors of online education

<i>Factor</i>	<i>Indicator</i>
<i>Organisational factors</i>	
Class structure and hours	Weekly class structure and contact hours
Contact time between students and lecturers	Satisfaction levels of students with number of contact hours
<i>Pedagogical factors</i>	
Interactive teaching and learning methods	Satisfaction levels of students with the level of interactivity of learning
Student participation	Timely completion of class assignments
<i>Teacher's competencies</i>	
Education level of lecturers	% of lecturers with a Bachelor, Master and Doctorate
Didactic competencies of lecturers	Competency levels: Low, Intermediate or High level
Digital competencies of lecturers	Competency levels: Exploration, Integration or Innovation
<i>Student motivation and resources</i>	
Motivation level of students	General satisfaction levels of students with learning methods, study content and lecturers
Financial resources of students	Financial resources to access computers and internet
<i>Digital access</i>	
Access to digital devices by lecturers	% of lecturers with access to a computer
Access to internet by lecturers	% of lecturers with access to a broadband internet
Access to digital devices by students	% of students with access to a computer
Access to internet by students	% of students with access to broadband internet

Source: Developed by the authors

4 Results

4.1 Answer to research question 1: What is the impact of face-to-face and online education on academic performance and student satisfaction levels?

The comparison of average grades of the students taught in classroom mode in 2019 and online classes in 2020 indicates that the variances do not present statistically significant differences for the two careers as the analysis resulted in p -values of 0.15 for business administration and a value of 0.45 for business informatics in the F -test for variances of two samples. Therefore a t -test is applied for samples with equal variances which shows that the statistical value t in absolute value exceeds the critical value (see Table 4). This implies that there are no significant differences in academic performance in face-to-face and online classes.

Table 4 *T*-test comparing academic performance in terms of average grades of students in face-to-face classes in 2019 and online classes in 2020

<i>t</i> -test for two samples with equal variances				
<i>Study program</i>	<i>Business administration</i>		<i>Business informatics</i>	
<i>Year</i>	<i>2019</i>	<i>2020</i>	<i>2019</i>	<i>2020</i>
Median	78.18	83.6125	77.32	82.44
Variance	20.27	35.0825	29.67	27.96
No. subjects observed	16	16	18	18
Grouped variance	27.68		28.81	
Hypothetical difference of median	0		0	
Grades of freedom	30		34	
<i>t</i> -value	-2.92		-2.86	
<i>P</i> (<i>T</i> ≤ <i>t</i>) one tailed	0.003		0.004	
Critical <i>t</i> -value (one tailed)	1.70		1.69	
<i>P</i> (<i>T</i> ≤ <i>t</i>) two tailed	0.0065		0.0071	
Critical <i>t</i> -value (two tailed)	2.04		2.03	

Source: Developed by the authors

Regarding the level of overall student satisfaction we measured the satisfaction with learning methods, learning content and lecturers. Table 5 shows that when applying the *F*-test, unequal variances are indicated in the case of business administration and equal variances in the case of business informatics. In both cases, no significant differences can be found between the general satisfaction levels of students in face-to-face classes in 2019 and online classes in 2020.

Table 5 *T*-test comparing academic performance in terms of overall satisfaction levels of students in face-to-face classes in 2019 and online classes in 2020

<i>t</i> -test for two samples with equal variances				
<i>Study program</i>	<i>Business administration</i>		<i>Business informatics</i>	
<i>Year</i>	<i>2019</i>	<i>2020</i>	<i>2019</i>	<i>2020</i>
Median	9.34	9.28	9.41	9.41
Variance	0.35	0.56	0.38	0.32
No. subjects observed	16	16	15	15
Grouped variance	0.46		0.35	
Hypothetical difference of median	0		0	
Grades of freedom	30		28	
<i>t</i> -value	0.29		-8.26749 E-15	
<i>P</i> (<i>T</i> ≤ <i>t</i>) one tailed	0.39		0.5	
Critical <i>t</i> -value (one tailed)	1.70		1.70	
<i>P</i> (<i>T</i> ≤ <i>t</i>) two tailed	0.78		1	
Critical <i>t</i> -value (two tailed)	2.04		2.05	

Source: Developed by the authors

4.2 Answer to research question 2: What are key success factors of an effective shift from face-to-face to online education?

In this chapter we analyse the relevance of each of the success factors of effective online teaching and learning.

4.2.1 Organisational aspects

Regarding the *organisational aspects* of teaching, the original face-to-face classes before the pandemic were distributed from Monday to Friday between 8:00 a.m. and 3:00 p.m. with theoretical classes from 8:00 to 10:00 a.m., practical classes with exercises from 10:00 to 12:00 p.m. and interactive workshops from 1:00 to 3:00 p.m. With the implementation of online classes, the same classes setup was maintained in terms of days and hours in the mornings, but in the afternoons the classes of 1:00 p.m. and 3:00 p.m. have been adjusted with spaces for self-study and for consultations and feedback from teachers. This implies that the students were offered the same *regularity in class structure and hours* in their online classes to what they were used to when visiting the university in 2019.

Also the *number of contact hours* has remained the same in the online class setup. Although the class hours in groups have decreased in 2020, the hours of individual contact with the lecturers during the afternoons have increased and the lecturers provided more written feedback. This is partially achieved by easier and extended use of digital communication outside formal class hours between lecturers and students through the mixed application of video conferencing, classroom and institutional electronic mail. When consulting the students about the satisfaction with the lecturer's time to attend the student they indicate no significant differences between face-to-face and online classes (see Table 6).

Table 6 *T*-test comparing academic performance in terms of student satisfaction with contact hours in face-to-face classes in 2019 and online classes in 2020

<i>t</i> -test for two samples with equal variances		
<i>Study program</i>	<i>Business administration</i>	
<i>Year</i>	<i>2019</i>	<i>2020</i>
Median	91.31	89.99
Variance	16.33	287.70
No. subjects observed	14	14
Grouped variance	22.52	
Hypothetical difference of median	0	
Grades of freedom	26	
<i>t</i> -value	0.23	
$P(T \leq t)$ one tailed	0.41	
Critical <i>t</i> -value (one tailed)	1.71	
$P(T \leq t)$ two tailed	0.82	
Critical <i>t</i> -value (two tailed)	2.06	

Source: Developed by the authors

4.2.2 Pedagogical factors

Among the key pedagogical factors, interactive methods are an important factor to secure effective face-to-face and online learning methods. Since its inception in 2014, the university has adopted a competency-based approach to training combining theory and practice in all subjects. Similar to face-to-face classes, interactivity was achieved through group work, role play and other activities where students interact with the teacher and with each other. From the students' perception, the level of satisfaction in general (see Table 5) and specifically in terms of interactivity (see Table 7) has remained highly satisfactory, without showing significant differences in relation to the classes developed in the face-to-face format.

Table 7 *T*-test comparing academic performance in terms of student satisfaction with the level of interactivity of teaching and learning methods in face-to-face classes in 2019 and online classes in 2020

<i>t</i> -test for two samples with equal variances		
<i>Study program</i>	<i>Business administration</i>	
<i>Year</i>	<i>2019</i>	<i>2020</i>
Median	81.41	84.33
Variance	203.73	332.63
No. subjects observed	14	14
Grouped variance	268.18	
Hypothetical difference of median	0	
Grades of freedom	26	
<i>t</i> -value	-0.47	
$P(T \leq t)$ one tailed	0.32	
Critical <i>t</i> -value (one tailed)	1.71	
$P(T \leq t)$ two tailed	0.64	
Critical <i>t</i> -value (two tailed)	2.06	

Source: Developed by the authors

A lower level of participation of students affects the quality of online programs in many universities. In both face-to-face and online modalities students are to submit daily or weekly assignments on a digital platform which allows a comparison of the student responses times and completion rates of class assignments given during the course of each subject. Table 8 shows that it has not suffered a significant difference regarding the response levels of students made in the online mode. This can be used as an indication of continued high participation levels during the online classes in 2020.

Table 8 *T*-test comparing academic performance in terms of timely completion of class assignments in face-to-face classes in 2019 and online classes in 2020

<i>t</i> -test for two samples with equal variances		
<i>Study program</i>	<i>Business administration</i>	
<i>Year</i>	<i>2019</i>	<i>2020</i>
Median	91.31	89.99
Variance	165.34	287.70
No. subjects observed	14	14
Grouped variance	226.52	
Hypothetical difference of median	0	
Grades of freedom	26	
<i>t</i> -value	0.23	
$P(T \leq t)$ one tailed	0.41	
Critical <i>t</i> -value (one tailed)	1.71	
$P(T \leq t)$ two tailed	0.82	
Critical <i>t</i> -value (two tailed)	2.06	

Source: Developed by the authors

4.2.3 Teachers' competencies

The study has found that the educational level of teachers supports the introduction of structural changes such as the transition to a new form of online teaching. Teachers with a higher level of preparation tend to have more competencies in change management and have higher technical skills. With 40% of teachers with a Master's degree and 30% with a Doctorate and a majority of teachers with postgraduate degrees in Pedagogical Training, the Faculty of Business Sciences has a high percentage of teachers with higher education. Although prior training contributes to the pedagogical quality of the teaching staff, it has been necessary to regularly organise pedagogical training workshops where experiences are shared and effective teaching strategies are developed among teachers. In this way, more effective teaching methods can be jointly identified and innovative teaching and learning methods can be experimented with.

It is also important to develop digital skills that allow the integration of digital solutions in the teaching and learning process. Therefore, the profile of new teachers includes minimum requirements for digital skills including the use of basic digital programs (text, calculation, presentation), educational digital platforms (Google, Moodle), videoconferencing and use of social networks. This indicates that teachers are minimally at the level of integration to join the teaching staff of the Faculty (Hernández et al., 2014). To optimise online classes and keep students motivated online, new tools should be regularly integrated, such as the integration of whiteboards, interactive tablets, quizzes, etc. To this end, the Faculty organises regular workshops where the teachers themselves evaluate and propose new digital solutions. In this sense, it is important that the teacher can move to the level of innovation in the application of digital technologies (Hernández et al., 2014).

4.2.4 Student motivation and resources

In general, there has been a sharp decline in student motivation and satisfaction and a high dropout rate from higher education in Latin America and the Caribbean during the pandemic in 2020 (Giannini, 2020). However, in the case of the Faculty, our analysis of online classes does not show significant differences in terms of student satisfaction in relation to face-to-face classes in 2019 (see Table 6).

It is important to indicate that there have been moments of significant criticism and questioning of various aspects during the first months of the introduction of online classes, such as class schedules, the use of cameras, online test formats, etc. To this end, regular virtual meetings have been organised with students to meet and discuss personal and academic issues and agree on mutual agreements regarding online education. There is student satisfaction with the work done in class and in groups, without showing significant differences in relation to face-to-face classes 2019 and online classes 2020 (see Table 9).

Table 9 *T*-test comparing academic performance in terms of satisfaction levels of students with individual and group works in class in face-to-face classes in 2019 and online classes in 2020

<i>t</i> -test for two samples with equal variances		
<i>Study program</i>	<i>Business administration</i>	
<i>Year</i>	<i>2019</i>	<i>2020</i>
Media	91.54	91.55
Variance	48.96	48.96
No. subjects observed	14	14
Grouped variance	38.29	38.29
Hypothetical difference of median	0	0
Grades of freedom	26	26
<i>t</i> -value	-1.41	-1.41
<i>P</i> (<i>T</i> ≤ <i>t</i>) one tailed	0.09	0.09
Critical <i>t</i> -value (one tailed)	1.71	1.71
<i>P</i> (<i>T</i> ≤ <i>t</i>) two tailed	0.17	0.17
Critical <i>t</i> -value (two tailed)	2.06	2.06

Source: Prepared by the authors

4.2.5 Access to digital devices and internet

The university has a policy of mandatory laptop use for all teachers and students before the pandemic. The university supports students with less financial capacity with scholarships and computers. This is combined with the offer of a Google Classroom digital platform where the student can access all their study materials and notes, upload works and participate in exams. This condition implies universal access and ensures that students are familiar with the educational use of digital devices in the classroom and outside the classroom.

For teachers, the university has funded laptops and teachers work with Google Suits tools for organisation and educational planning. To facilitate online teaching, the faculty has been supplemented with additional digital tools such as graphics tablets, cameras, microphones, headphones and adapters to optimise interactive online classes.

Seeing the access to the internet, most of the teachers and students have access to broadband Internet services in the coverage area of the residences, although there is instability at some times. Although the quality and stability of the Internet represents a limitation, it has been possible to give overall continuity to the online classes without major problems.

5 Discussion

This study reveals several discussion points. Firstly, several recent studies have indicated that the transition from classroom to online classes has negative consequences on the academic performance of higher education (Giannini, 2020; Pedró, 2020). However, this study has shown that, if a set of basic conditions is met, the switch to online classes in 2020 during the pandemic does not have to affect academic satisfaction and performance. This conclusion coincides with other previous studies that found no differences between face-to-face and online education under a series of conditioning factors (Russell, 1999; Summers et al., 2005; Somerarain et al., 2010).

Secondly, other studies indicate that online education requires different teaching methods than face-to-face education (Marinoni et al., 2020). It has also been concluded that many of the higher education institutions are not prepared in terms of the organisation and management of online education and that the level of preparation or preparation of teachers to face this challenge is very diverse (Giannini, 2020). To be able to respond to these challenges, institutions and teachers must apply approaches of 'learning by doing' or in an attempt to imitate what would have been the way of proceeding face to face with an online education offer. To be successful, this case study indicates that interactive methods must be applied but not necessarily require specific didactic methods adopted to online classes.

Rivero et al. (2008) concluded that academic performance increases in hybrid environments compared to classes taught in a traditional way. However, this study shows that the introduction of hybrid systems requires preparation time in terms of organisation and teacher training, conditions that have been met in the case of the UPA (2015) but may not be feasible for most educational institutions. Based on the case study universities are to initiate a process of planning schedules, implementation of interactive didactic methods, digital platforms, pedagogical and digital training of teachers and access to computers for teachers and students to be able to offer effective online education on the longer term.

In our study, coinciding with Sun (2012), student participation, interest and emotional engagement in an online learning environment have increased. However, this has not resulted in a significant increase in cognitive or behavioural engagement. The average grades in the online environment in 2020 did not increase significantly, maintaining the averages compared to face-to-face classes in previous years.

The additional workload of online education (Pevneva and Edmunds, 2020) due to the preparation of online classes and the time allocated for their own training and/or updating has been diminished over the course of the year of online teaching. This can be

explained by the familiarity with digital platforms, tools and digital content that was already integrated in the face-to-face learning system. Furthermore, the selection of and training in complementary and interactive online teaching and learning tools has been realised on initiative of teams of lecturers contributing to a distributed workload and higher levels of adoption.

6 Conclusions and recommendations for future research

This study has analysed the impact and success factors of the transition from face-to-face classes in 2019 to synchronous online classes in 2020 and covers data from 415 students and 30 teachers from the two careers of the Faculty of Business Sciences. The analysis first shows, in accordance with some studies and unlike other studies, that the transition has not affected academic performance and student satisfaction.

Second, the study has identified important conditioning factors for online education to be effective. In the first place, the study confirms that it is preferred to integrate synchronous digital classes supported by videoconferencing and not resort to asynchronous video classes. It also requires that classes be planned with a regular schedule and with a high number of hours of teacher-student contact and between students to offer an educational environment with structure and regularity.

Likewise, interactive teaching methods are essential tools in both face-to-face and online education to maintain the attention and active participation of students. It is observed that its application in online classes is more effective when the institution has already had experience with interactive methods. In this sense, it is essential that the pandemic be used to accelerate the introduction of new, more interactive didactic approaches in higher education in general. The transformation of the teaching-learning method and the transition to online education requires a strong investment in the continuous didactic and digital training of the teacher and with the active participation of the teacher in the integration of new methods and digital solutions. For an effective and practical appropriation, it is important to make use of the internal capacities of the teachers themselves in digital training.

Different from the experience at the regional level, the study shows a high level of motivation among students in online classes, which can be explained by the regular class schedule and high number of contact hours of online classes, high level of interactivity of the lectures and good didactic and digital preparation of the teachers. The Faculty's early and concrete responses to student criticism during the first months of the transition to online classes also assisted in maintaining high levels of student motivation. Finally, the study demonstrates the importance of access to computers and broadband internet so that online education can be offered successfully. This also suggests that an online education system based on the use of smartphones is not enough to ensure high-quality online education.

The experience of the pandemic leads us to reflect on the possibility of an extension of the period where we have to resort to online classes and future possibilities of similar occasions. Likewise, the analysis of success factors that can contribute to the search for new hybrid forms of face-to-face and online education that respond to the need for more flexible education systems that support higher levels of local and international mobility of students. For this purpose it is important to cover two new lines of research. First, it is recommended to undertake comparative studies of the impact of key factors of online

education in other higher education institutions to seek a higher level of generalisation of the results of this study. It is also essential to develop research on hybrid forms of academic offer that offer greater flexibility and a possible optimisation of academic satisfaction and performance in different subjects and groups of students.

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