The hybrid university modality: An experience based on the study of technological conditions and the learning context

Yamirlis Gallar Pérez[1] Enrique Aurelio Barrios Queipo[2], Tomás Aznar Sánchez[3]

[1]*Universidad Internacional SEK Ecuador, Quito, Ecuador.*
[2]*Centro de Educación Superior de Negocios, Innovación y Tecnología IUNIT, Madrid, España.*
[3]*Centro de Educación Superior de Negocios, Innovación y Tecnología IUNIT, Madrid, España.*

Abstract

The didactic transformation of Higher Education associated with the impact of information and communication technologies (ICT) as an essential resource in the teaching-learning process has been scientifically argued since the last decades of the 20th century. The health situation created by Covid 19, dynamized this reality in an emergent way and promoted its generalization in the different formative modalities. The results achieved in the hybrid modality (face-to-face and virtual) demand the improvement of the didactic strategies applied. The present work contributes to this end, through the didactic characterization of the hybrid modality from the technological conditions and the learning environment of the students of the SEK International University in Ecuador. The results show an increase in the use of mobile devices in academic activities, with an emphasis on cell phones. Likewise, it is corroborated that the environmental conditions of learning and connectivity are very diverse, aspects that must be addressed by the learning process. A mixed research approach was applied, based on a survey of students' perception, its corresponding statistical treatment, analysis-synthesis, and documentary review.

Keywords: Didactics, Hybrid Modality, ICT, Learning.

1 Introduction

In the last 30 years, information and communications technology (ICT) has continuously and constantly energized Didactic Science, which has caused a paradigm shift in Higher Education that is currently in full development. A paradigm can be understood as "a system of rules and regulations that establish limits or boundaries to solve problems that are within these limits, and that in a certain way offer a model to solve these problems (Joel Barkers in "The New Business of Paradigms" at YOUTUBE Channel, 2020, 5m). Thus, a paradigm shift happens when these rules are changed.

In Higher Education, the rules that have characterized its Didactics are being changed to ensure that future graduates can face and solve known and unknown problems in the production and services sector and their personal lives, caused by the development spiral of the Digital Revolution.

ICT applied to university education is the realization of the Digital Revolution in education. In the opinion of the authors of this paper, it has two essential didactic functions: the first is its function as a learning resource. The second is its function as teaching-learning content. It is necessary to determine and specify this duality so that teachers and students can use it consciously and objectively.

According to Coll (2008), Fuentes (2009), Barriga (2016), and Álvarez de Zayas (2016), among others, theoretical, methodological, and practical transformations are taking place in the Didactics of Higher Education, in a dynamic that can be characterized through the study of its components (teachers and students who modify their roles and functions), and non-personal components

(objectives, contents, methods, resources, organizational forms, evaluation, results). These transformations recognize in the formative curriculum the existence of new spaces of high complexity (Barreras, 2015), temporality, environments, communicative processes, orientation, and management of learning.

The health situation of Covid 19 has caused since 2020, until today, the application of different formative modalities, being the most widespread in the university world the hybrid modality (also called discontinuous or intermittent). In this modality, face-to-face, both in-person and synchronous virtual, is applied and combined with asynchronous virtual.

It is important to recognize that the massive application of the hybrid formative modality worldwide since 2020 has scientifically shown insufficiencies in the learning results achieved by students as a result of the didactic changes that have occurred. This international reality constitutes a challenge for the community.

Multiple authors highlight the need to face these didactic transformations from science, to offer scientific answers to the problematic situation presented. A group of authors from the Universitat Oberta de Catalunya University (Rivera, 2020), a highlight in a decalogue for the improvement of online teaching, several aspects that allow having a guide directed towards the improvement of the didactic strategies applied in the curricular subjects.

On the one hand, they denote the need to rethink teaching-learning in this modality, overcoming the social distance (Aznar 2021); adopt the techno-pedagogical according to the circumstances of the educational context; model the evaluation system under a non-presential modality; to design activities and communication processes that are adapted to the conditions of virtuality and to assume and develop new tools that correspond to the knowledge that students must develop.

For his part, Barrios *et al*. (2018) highlight that improve processes in institutions has focused on the technological, to the detriment of the link of the technology as a didactic resource with the transformations caused in the rest of the didactic components.

This reality leads the scientific community to innovation processes with two essential ideas. The first is to systematize all the experience accumulated by Didactics on the teaching process, learning, educational communication, the conception of the university classroom, educational management, and educational guidance, in terms of ICT and vice versa. The second is to specify the knowledge of these experiences in the conditions of virtuality, an issue that is currently in the process of identifying the relationship between ICT and learning, discovering the characteristics of the context where learning takes place, and of modeling the learning process under these conditions, because in the conditions of virtuality a new educational paradigm is being produced.

Consequently, with all the above, the present work aims to characterize the process of teaching-learning university hybrid formative modality, based on the perception of the students of the International University SEK Ecuador, as a contribution to the improvement of teaching strategies applied in the curricular subjects.

The transitions of educational paradigms, according to Espina *et al*. (2005), tend to overlap models, conceptions, methodologies, strategies, and modes of action already established, innovated, and enriched in practice concerning the novelty of the new paradigm. This is the basis for the logical and coherent modification of existing theory and practice over time, which requires the creation of new didactic rules to be assumed by both teachers and students.

The authors of this paper consider that the more than 30 years of educational efforts to massify the online and distance modalities, found an event such as Covid 19 that boosted their use and, at the same time, generated new practices such as the hybrid, originating mistakes, errors and opportunities to characterize their teaching-learning process and act didactically, according to these characteristics.

2 Methods

To characterize the teaching-learning process, hybrid formative modality, in the context of the

SEK International University, which offers 16 undergraduate courses in three Faculties and two Schools, a specific diagnosis was applied to a non-probabilistic sample composed of 148 undergraduate students, willing to be studied. The last three academic periods where the academic semester has a duration of 16 weeks (April - July 2020; October 2020 - February 2021 and April - July 2021).

In all cases, the teaching-learning process has been developed with the use of the Canvas platform, the Zoom tool, and other tools selected according to the nature of each subject. Interactivity between students and teachers has been characterized by a fluid two-way or multidirectional communication, asynchronous and synchronous, teleconferences, forums, chats, and collaborative work groups, among others.

The survey used a questionnaire constructed for this research, intending to explore the students' perception of the technological devices and the environment that characterized their learning during this time. The structure of the questionnaire had two groups of questions:

Group of questions I.- Technological conditions of learning. To determine the types of devices that students have used and their perception of their impact on their learning. It is taken into consideration that these conditions require circumstances of connectivity and virtual interactivity.

Group of questions II.- Learning environment. To determine under what conditions the students have developed their teaching activities and their perception of their impact on their learning. The relationship between the cognitive process and the affective-volitional-spatial process is taken into consideration.

These variables in their relationship with learning have been described by many researchers, among which the following stand out: Segovia *et al*. (1999), Toro (2007), Ramírez (2009), Hernández *et al*. (2016), Rivera *et al*. (2020), among others. From the students' perception, it is possible to infer aspects of interest for the construction of the new didactic paradigm of Higher Education.

The non-parametric statistical analysis made it possible to test the hypotheses designed in each group of questions, based on the data obtained. The methods of documentary review and analysis-synthesis were associated with this procedure, making it possible to establish the regularities of the corresponding characterization process.

3 Discussion of the results

3.1 GROUP I. TECHNOLOGICAL CONDITIONS FOR LEARNING.

Analysis 1.

H1 (null). - 50% of students in the hybrid mode prefer to combine the use of fixed and mobile devices in their teaching activities.

H2 (alternative): More than 50% of students in the hybrid mode prefer to combine the use of fixed and mobile devices in their teaching activities.

Hypothesis Testing

A hypothesis test is performed using Statgraphics Centurion software for a sample proportion of 0.67 in a sample size of 148. The null hypothesis responded that: "50% of students in the hybrid mode prefer to combine the use of fixed and mobile devices in their teaching activities" with a proportion equal to 0.5, and the alternative hypothesis refers to: "More than 50% of students in the hybrid mode prefer to combine the use of fixed and mobile devices in their teaching activities" with proportion greater than 0.5; the P value was 0.0000376528.

Figure 1

Results of the technological conditions for learning survey.
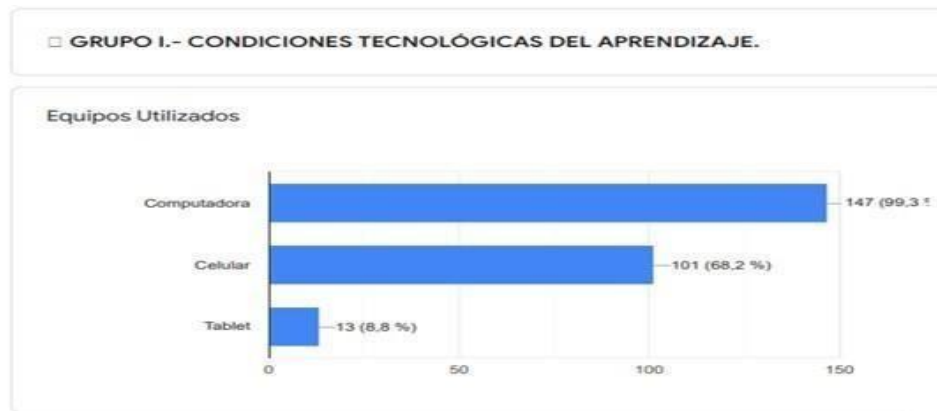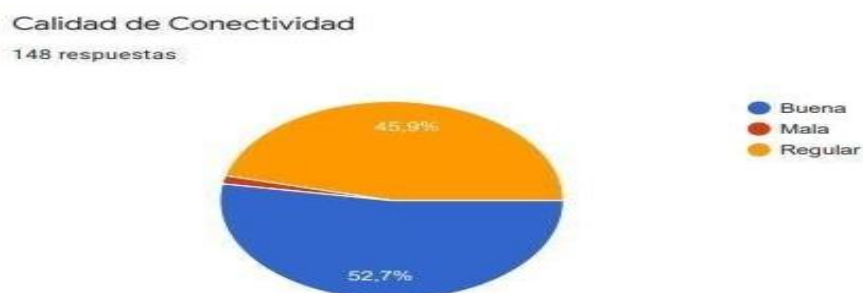

Source: Own elaboration.

In the sample of 148 observations, the sampling ratio is equal to 0.67. Since the P-value for the test is less than 0.05, the null hypothesis can be rejected with a 95.0 % confidence level. Therefore, it turns out that more than 50 % of the students combine the use of devices in teaching activities.

The described reality implies that, in the conditions of the hybrid modality, the teaching-learning methodologies must recognize the real possibilities of the students, in terms of their equipment to access the training programs. Limiting the use of one or another device does not favor the processes of inclusion, personalization, innovation, and creativity in education. On the other hand, the creation of digital content and tools for interactivity during learning has to assume the possibilities for this reality.

Figure 2

Results of the technological conditions for learning survey.

Source: Own elaboration.

Analysis 2.

H1.- The use of mobile devices in teaching activities is related to the quality of connectivity.

H2 (alternative): The use of mobile devices in teaching activities is not related to the quality of connectivity.

For the analysis of the correlation between the variables "Mobile devices vs Quality of connectivity", the following considerations were established:

a) The dependent variable is (Y): Quality of connectivity.
b)   The independent variable is (X): Devices used.
c) The responses for the case of the independent variable were recoded as follows: Computer and 2. Computer, Cell Phone, Tablet.
d)   Responses for the case of the dependent variable were recoded as follows: 1. poor, 2. fair, and 3. good.

A simple linear regression model is given by the equation: Y = a + b*X was adopted. From the results obtained by the Statgraphics Centurion software, it is obtained that the R-squared that gives the degree of correlation between the variables under study is 5.3 %, a result that shows that there is no correlation between the variables tested since according to the literature it should be higher than 70 %. Table 1 shows the comparison of the alternative models; however, none of them exceeds 5.38 %, which shows the independence of the variables.

Figure 3 shows graphically the curve and the model obtained. In addition, Table 2 shows the analysis of variance where the P-value is greater than or equal to 0.05, reaffirming that there is no statistically significant relationship between the Quality of Connectivity and Equipment Used with a confidence level of 95.0 % or more.

These results constitute a sample of the immediate future of Higher Education since students in the hybrid modality will be able to access their teaching activities with different technological devices with high individual mobility. On the other hand, society will be ensuring more and better connectivity for all, regardless of the equipment used.

Table 1

Comparison of Alternative Models.

Model	Correlation		R-Squared
Log-Y -X Square	-0,2320		5,38%
Y- Logarithmic	Root	-0,2320	5,38%
X-Square			
Multiplicative	-0,2320		5,38%
Exponential	-0,2320		5,38%
S- Curve	0,2320		5,38%
	X-Square Root	-0,2318	5,37%
X-Square			
Double Square Root	-0,2318		5,37%

Square Root of Y	-0,2318	5,37%
Y-Square Root Log-X	-0,2318	5,37%
Inverse Y-Square Root of X	0,2318	5,37%
Square of X	-0,2302	5,30%
Linear	-0,2302	5,30%
Inverse of X	0,2302	5,30%
Square Root of X	-0,2302	5,30%
Logarithm of X	-0,2302	5,30%
Y Square	-0,2257	5,09%
Y-Square Inverse of X	0,2257	5,09%
Double Square	-0,2257	5,09%
Y-Square Log-X	-0,2257	5,09%
Y-Square Root	-0,2257	5,09%
X-Square Inverse-Y Square Root-X	0,2243	5,03%
Inverse-Y Square-X	0,2243	5,03%
Inverse of Y	0,2243	5,03%
Double Inverse	-0,2243	5,03%
Inverse-Y Log-X	0,2243	5,03%
Logistics	<sin adjustment >	
Log probit	<sin adjustment >	

Figure 3.

Adjusted Model Graph.
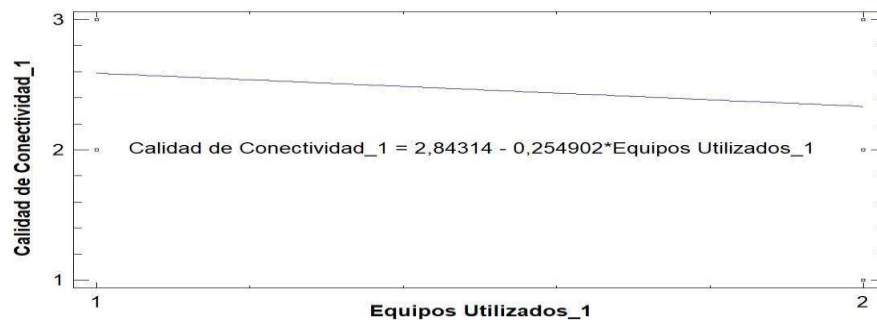
Source: Own elaboration.

Table 2

Analysis of Variance.

Source	Sum of Squares	Gl	Medium Square	Ratio -F	Value - P
Model	0,677807	1	0,677807	2,35	0,1328
Residual	12,1176	42	0,288515		
Total (Corr.)	12,7955	43			

3.2 GROUP II. LEARNING ENVIRONMENT.

Analysis 1.

H1 (null). - 100% of the students perform their academic activities in the hybrid modality at home.

H2 (alternative): Not all students perform their academic activities in the hybrid modality at home.

Hypothesis Testing

A hypothesis test is performed using Statgraphics Centurion software for a sample proportion of 0.84 for 148 participants. The null hypothesis responded that: "100% of the students perform their academic activities in the hybrid modality at home" with a proportion equal to 1, and the alternative hypothesis refers to: "Not all students perform their academic activities in the hybrid modality at home" with a proportion less than 1.

In this sample of 148 observations, the sample proportion is equal to 0.84. Since the P-value for the test is less than 0.05, the null hypothesis can be rejected with a 95.0 % confidence level, i.e., not all are taught at home.

Table 3 shows the frequency of occurrence of each location taken into consideration.

Table 3

Frequency Table for the place where the student receives the classes.

Class	Value	Frequency	Cumulative Relative Frequency acum.	Frequency Frequency	Rel.
1	Family/friend/other family/friend/other, Other	1	0,0068	1	0,0068
2	Home	123	0,8425	124	0,8493
3	Home, Family/friend/other relative/friend/other	10	0,0685	134	0,9178
4	Home, Family/friend/other family/friend/other, Other	2	0,0137	136	0,9315
5	Home, Others	8	0,0548	144	0,9863
6	Others	2	0,0137	146	1,0000

The analysis reveals whether there is a correlation between the place where they receive their academic activities and their learning, in addition to possible family support. For this purpose, a Cross Tabulation test with Chi-Square tests of independence was performed in Statgraphics Centurion.

Analysis 2.

Unit "place where you receive your academic activities vs. your learning". Table 4 represents a cross table where in the row is the place of learning and in the columns how that learning is favored. It summarizes the frequency of occurrence and its percentage, for example, there was 1 time in which place, where you receive classes, equals Home of a relative/friend/other, Other and Does it favor your learning? equals Almost Always. This represents 0.68% of the total 148 observations.

Table 4

Frequency table for where the student receives the classes and if it favors their learning.

	Almost always	Never	Always	Always, Almost Always
	1	0	0	0 0,00 %
Family/friend/other relative/friend/other, Other	**0,68 %**	0, 00 %	0,00 %	
Home	55 37,67 %	3 2, 05 %	63 43,1 %	2 5 1,37 %
Home, Family/friend/other relative/friend/other	un 5 3,42 %	0 0, 00 %	5 3,42 %	0 0,00 %
Home, Relative/friend/other's house, Others	un 1 0,68 %	0 0, 00 %	1 0,68 %	0 0,00 %
Home, Others	3 2,05 %	0 0, 00 %	5 3,42 %	0 0,00 %
Others	2 1,37	0 0,	0 0,00	0 0,00 %

	%	00 %	%	
Total per Column	67	3	74	2
	45,89 %	2, 05 %	50,6 8 %	1,37 %

Table 5 presents the test of independence, showing the results of the hypothesis test performed to determine whether or not the idea that row and column rankings are independent is rejected. Since the P-value is greater than or equal to 0.05, the hypothesis that rows and columns are independent cannot be rejected at the 95.0% confidence level. Therefore, the observed value of "Place where you receive classes" for a particular case might have no relationship with its value in "Does it enhance your learning?".

Table 5

Independence tests. Source: Own elaboration.

| Test	Statistician G l		Value -P
Chi-Square	4,802 5	1	0,9937

Dependency "place where you receive your academic activities vs. family support"

Figure 3 shows the frequencies for the place where they receive classes with support from family members, in this case, it should be noted that in the case of the "Home" place, of the 148 observations, 97 (66.4%) feel that they are supported by their family members.

Figure 4

Bar chart for the location of classes according to support from relatives.
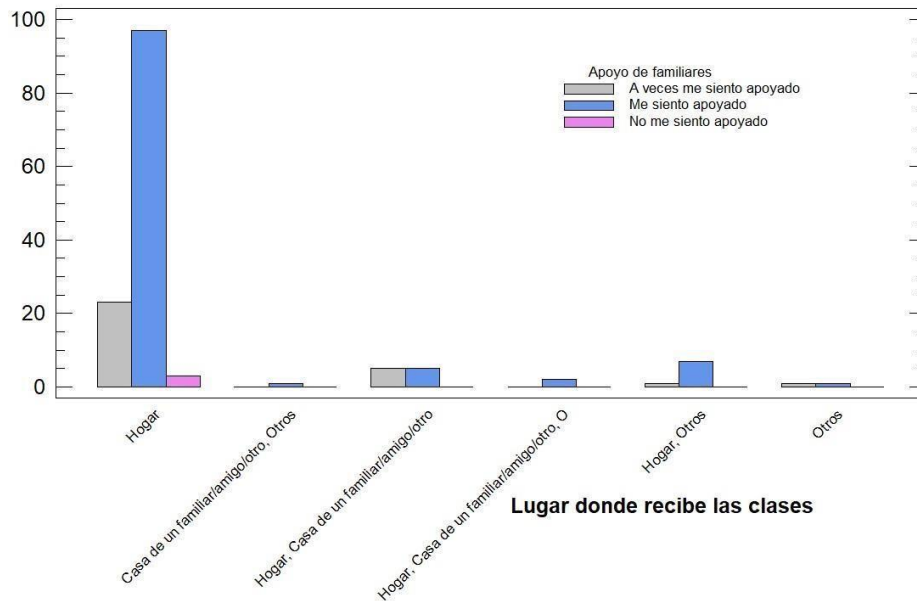
Source: Own elaboration.

Table 6 presents the test of independence, which shows the results of the hypothesis test performed to determine whether or not the idea that the row and column classifications are independent is rejected. Since the P-value is greater than or equal to 0.05, the hypothesis that rows and columns are independent cannot be rejected at the 95.0% confidence level. Therefore, the observed value of "Location of classes" for a particular case may be unrelated to its value in Relative support.

Table 6

Independence Tests.

Test	Statistician	Gl	Value-P
Chi-Square	8,201	10	0,6092

Analysis 3.

H1 (null): The hybrid modality can generate that 50% of the students perform other non-teaching activities during their classes.

H2 (alternative): The hybrid modality can generate that more than 50 % of the students perform other non-teaching activities during their classes.

Hypothesis Testing

A hypothesis test is performed using Statgraphics Centurion software. This analysis shows the results of performing a hypothesis test relative to the proportion (tit) of a binomial distribution. The two hypotheses to be tested here are:

Null hypothesis: teta = 0.5

Alternate hypothesis: teta > 0.5

In this sample of 146 observations, the sampling ratio is equal to 0.7. Since the P-value for the test is 0.000001 less than 0.05, the null hypothesis can be rejected with a 95.0 % confidence level. The confidence level shows that the teta values supported by the data are greater than or equal to 0.631493.

The results express the current reality, which will progressively become the trend in university education. The students reveal one of the characteristics of the contemporary classroom, where the learning space is diverse; the temporality is flexible to receive the teaching orientations in their subjects and to be the protagonist of the learning activities. The involvement of the family will be increasingly greater in the learning of university students, which will favor the relationship between the cognitive, affective, and volitional aspects of the teaching-learning process. Individual mobility exists and will exist, and learning methodologies will have to offer didactic answers with relevance and effectiveness.

4 Conclusions

The evolution of the hybrid learning context is an essential source for the construction of the paradigm shift in Higher Education currently under development.

In their learning reality, students mostly use mobile devices with an emphasis on the use of cell phones, which limits their results and interactivity, according to the didactic resources used.

The new qualities of the learning context related to the diversity of space, time, environment, resources, and educational communication, make emerge a new performance of teachers, and students and a necessary revaluation of the non-personal didactic components.

The characterization of the university teaching-learning process in hybrid formative modality, based on the perception of the students of SEK International University Ecuador on the type of devices used and the learning environment, is a contribution to the improvement of the didactic strategies applied in the curricular subjects of their careers.

These results constitute a starting point for the improvement of the institutional teacher training process and the self-preparation of teachers, recognizing the diversity of spatial, functional, connectivity, and family conditions, as well as the limitations and strengths in the personal development of students. Likewise, the necessary feedback to the Educational Model, whose fundamental differentiators are personalized training, where ICT is an essential didactic resource for the development of hard and soft competencies foreseen in the curricula.

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