Preferences for Study Modalities Based on the Experience of E-Learning in Pandemics

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Abstract. The probability of changing preferences for study modalities was evaluated based on the experience of distance education during the COVID-19 pandemic among students of Marketing at a university in the Ecuadorian Andes. The analysis was based on the application of a questionnaire concerning factors associated with institutional conditions, as well as personal factors. Based on the data, the probability of changing the mode of study was estimated using a discrete choice model (logit - probit). The selection of the most appropriate model was based on the correct classification of the data (confusion matrix). The results show that certain aspects of personal satisfaction (physical space, dedication, time, commitment, content assimilation), Internet connection and flexibility of study plans are statistically significant. Student satisfaction with pedagogical planning, virtual platform, communication with teacher, virtual tutoring process, autonomous learning, teaching methodology, virtual classroom materials, complementary materials, evaluation process, variety of evaluation instruments and resolution of doubts do not generate changes in preferences. Therefore, the institution could promote this modality of studies by offering scheduling facilities and greater flexibility in the curriculum.

Keywords: e-learning, study modalities, student preferences, higher education, pandemic

Introduction

With the consolidation of the concept of globalization and the elimination of physical borders, Castells (2006) summarizes the changes in what he calls “the information age,” resulting from technological advances and the Internet. The changes are becoming more marked as the intervention of technologies is disseminated across the globe, making it clear that there is also a situation of inequality associated with this process in terms of access and dissemination of modern technologies.

In this context, higher education institutions (HEIs) cannot remain isolated from the dynamics of

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the information age, which is why they need to consolidate themselves into virtual organizations. Cuchillac (2016) states that “the characteristic that differentiates virtual organizations from other types of organizations is the preponderant use of ICT (Information and Communication Technologies) to provide for the interaction of individuals remotely” (p. 92).

All these elements lead us to think of education, and especially higher education, as the fundamental means to consolidate and take advantage of information and communication technologies and all technological advances to eliminate borders and increase the flow of knowledge without considering geographical restrictions.

This need to maintain the flow of knowledge was strengthened from 2020 onwards, when humanity was faced with the pandemic generated by SARS-CoV-2, decreed by the World Health Organization on 11th March 2020. In response, the pandemic demanded that HEIs develop processes of virtualization to give continuity to the students who received mostly in-person lessons at that time, given that “the decision about the temporary closure of HEIs has been urged by the principle of safeguarding public health, in a context in which large accumulations of people generate serious risks” (Pedró, 2020, p. 2).

University and education authorities, in general, responded to the conditions imposed by each country to conduct activities in view of the need for isolation, confinement and social distancing to avoid potential sources of contagion, thereby preventing in-person interaction in classrooms. In Ecuador, the Comité de Operaciones de Emergencia Nacional (COE, 2020) agreed to the suspension of activities in the public and private sector as of 17th March 2020, so in-person educational activities at all levels were suspended and distance learning was established as the study modality, according to the ministerial agreement No. MINEDUC-MINEDUC-2020-00013-A (Ministerio de Educación, 2020) for primary and secondary education and the resolution of the Consejo de Educación Superior (CES; 2020) in the case of HEIs.

Article 4 of the regulations applied to the HEIs establishes that "in order to give continuity to the planned academic activities, they may execute the courses or programs approved in face-to-face or blended mode through other study modalities" (CES, 2020, p. 3).

Thus, HEIs opted for classes delivered through platforms such as Google Meet or Zoom to what were called synchronous classes, or recorded classes that the student could review without the presence of the teacher (asynchronous).

Indeed, in the resolution of the CES (2020) it was established that HEIs that had "technological tools that allow the execution of classes through virtual or telematic means in a synchronous manner between the teacher and the student, must have a repository containing the recordings of the class sessions" (p. 4).

Thus, the solutions identified that could not be applied immediately (Figallo et al., 2020) involved distance learning with either synchronous or asynchronous classes or a combination of both, without even basic conditions in most cases, especially in Latin America and the Caribbean where, according to Economic Commission for Latin America and the Caribbean and United Nations Educational, Scientific

and Cultural Organization (ECLAC & OREALC/UNESCO Santiago, 2020), more than 160 million students were affected by the suspension of face-to-face activities. In the 33 countries of the region before the pandemic, there were already gaps in connectivity and access to technology, along with deteriorating economic conditions and even, in some situations, a lack of electricity, particularly in rural and remote areas with a significant indigenous component.

In this context, the higher education institution that is the subject of this study has a student population that comes from various parts of the country, a significant percentage of whom are indigenous and live in rural areas. The challenge of modifying the educational offering that was entirely face-to-face to a virtual modality has required a great deal of effort from students, teachers, and authorities, even more so if one considers the budgetary restrictions to which the institution has been subjected during the pandemic, going from a 2019 budget of USD 21.2 million to USD 17.8 million in 2020 (Ministerio de Economía y Finanzas, 2020).

These restrictions have also limited the possibilities of acquiring technology to strengthen online learning processes, both in terms of virtual classrooms, specialized software, servers and even extending the connection facilities on the university campus, as well as the hiring of suitable personnel to accompany the process and train teachers in virtual learning environments. This reality is repeated in most state universities in the country, which at the aggregate level have seen their budgets systematically reduced in recent years.

Therefore, this research analysed student satisfaction with the process of online learning experienced over four semesters, starting in March 2020, through analysis of students' assessment of institutional conditions and personal conditions, in addition to examining emotions as a fundamental part of the process.

Based on this analysis, the question arises of whether these components and their evaluations could indeed influence students' intentions to change study modality, and which of them could be a determinant of an increase in the probability of transferring to a virtual training process. The answer, at least as indicated in the literature, seems to lie in a continued preference for in-person classes, due to the difficulties of tutoring sessions, the need to modify assessment systems and the absence of materials and resources for working in virtual environments (Tejedor et al., 2021).

This possible change of preferences in the students' choice process could be due to the experience generated from the individual and institutional conditions of the e-learning process and the emotional experience, mainly associated with anguish, uncertainty, fear and even the pain of the loss of life, conditioning the choice towards the virtual modality which, during their initial decision process, was not preferred.

Identifying the variables that may explain the shift in preferences from mostly face-to-face to virtual education would allow an assessment of the possibility of expanding educational offerings in this direction. In the case of Ecuador, before the pandemic, university-level education offered very few distance learning options, due to technological limitations and budgetary restrictions. But the reality of

the country, in terms of a large part of the university population having to travel to other regions to have access to the system, could boost distance education as an alternative to respond to the needs of students from other areas. This possibility is being evaluated by the different institutions as mechanisms to expand online offerings, the availability of places and the alternatives to broaden the scope of higher education.

For this it is necessary to understand, and this is the contribution of this research, whether students would be willing to opt for another type of study modality other than face-to-face, identifying the variables that can modify these preferences, so that universities can strengthen these dimensions and thus the interest in blended or distance modalities.

In this way, answers are given to questions such as: how satisfied are students with the conditions offered by the institution?; how satisfied are they with their own study conditions during the pandemic?; which are the facilities for access to and use of the technology associated with distance education?; which variables are included in the intention to change to distance learning?; and which are the variables that influence the intention to change to distance learning?

This study is limited to one degree programme and a small number of students, and it is necessary to complement it with an analysis of the preferences of students in other programmes. A larger sample could allow an approach using other methodologies such as structural equation modelling, based on the construction of latent variables such as the acceptance and use of technology, as well as the intention to opt for distance education.

Literature review

Arteaga-Flores et al. (2021) analyse the impacts of virtual education in Ecuador during the pandemic, finding that there is a positive effect on teaching processes derived from the flexibility of ICT use, but it is conditioned by the possibilities of access to the necessary devices, software, and connectivity. As Williamson et al. (2020) propose, distance learning as a response to the emergency has challenged the belief that young people are digital natives and has revealed the existing gaps, which cannot be overcome by connectivity alone.

Despite the availability of technologies worldwide, there is a huge digital divide and numerous problems regarding learning and methods to achieve the desired results. Miguel Román (2020) makes it clear that not only at the basic and intermediate levels but also in higher education, this gap is exacerbated by the socio-economic conditions of families, to which we can add the teachers and students' situations, linked to the obstacles, challenges, shortcomings and weaknesses of a process to which they were not adapted, trained and even which had not been their choice.

Indeed, García and Pascucci (2022), in the context of the pandemic, analyse the preferences of students at an Argentinean university, finding that they prefer face-to-face education (corroborated in studies such as Contreras et al., 2021; Matarirano et al., 2021; Sotelo et al., 2022), given how poorly

prepared students and teachers were to work with online learning, the difficulties of connectivity and the existence of unfavourable environmental conditions, despite recognizing the benefits of distance education, such as for assessment and the ease of understanding theoretical classes. This could lead to a preference for a hybrid modality (Águeda et al., 2021).

The hybrid mode is defined for the case of Ecuador by CES (2020) as one that combines "blended, online and distance modes. This teaching modality will emphasise the autonomous learning of students, which requires that all courses, subjects or their equivalent contain a study guide developed by academic staff" (p. 4).

Similar concerns associated with the availability of adequate equipment, broadband connection, particularly in rural areas, and the need for internships in certain courses are identified in the study by Muthuprasad et al. (2021).

Sotelo et al. (2022) with regard to internships and fieldwork warn about the restrictions of distance education, as in this sense, the face-to-face modality leads to a higher level of student learning since these activities were not possible to execute during the pandemic (Barton, 2020).

At the same time, there are also studies, such as that by Castro and George (2021), which do identify a change in preferences towards virtual learning because of the degree of student commitment, but not due to the interaction with classmates, teachers and the materials used in the courses.

These preferences for one modality or another are also affected by variables such as gender, age and those associated with work activities (Estrada et al., 2022), as well as previous experience with distance courses (Roy & Covelli, 2021).

Furthermore, it is necessary, in line with Ploj-Virtič et al. (2021), to include student satisfaction as a predictor of preference for continuing in the distance model in the analysis. The authors state that "students' satisfaction with open and virtual learning significantly influences their preferences to continue learning online. However, students' attitudes towards online learning do not have a statistically significant influence on satisfaction with online learning" (p. 405).

About teachers, studies such as those by Chanto Espinoza and Mora Peralta (2021), in the case of the National University of Costa Rica, identify the challenges they have taken on in terms of the need to manage other tools, as well as access to the Internet and the necessary technology. They determine that these conditions make it difficult for teachers to mediate pedagogically. In addition to facing changes in technology, training in new techniques, rethinking their subjects and designing materials, teachers have had to deal with the emotional management of their students, which has meant an even more demanding process (ECLAC & OREALC/UNESCO Santiago, 2020).

This situation is aggravated in an environment of economic recession, in some countries such as Ecuador experienced contractions of gross domestic product close to 10%. Thus, some governments have decided to reduce public funding to educational institutions, which further limits the possibilities of improving or providing the technological resources required for the process of virtual learning. This funding reduction for state or state-funded educational institutions was in some cases as high as 9%

according to a UNESCO study on educational inequalities (2020).

Alongside physical restrictions in terms of access to connectivity or adequate devices for teachers and students, and the need for larger budgets at the institutional level to acquire better technology to support virtual training processes, it is necessary to incorporate a third element in the understanding of the complex reality of the pandemic, associated with the management of emotions and crises, which influences the performance of the actors (ECLAC & OREALC/UNESCO Santiago, 2020).

Indeed, according to ECLAC & OREALC/UNESCO Santiago (2020), during the pandemic, educational institutions had to take on the task of emotionally supporting their students, who suffered not only due to the global context of the health crisis but also conditions of overcrowding in study spaces, poor housing conditions, episodes of family violence and even emotions linked to illness and death.

All these variables that try to explain the preferences for distance learning are analysed by the models on technology adoption. These include the Technology Acceptance Model (TAM); the Unified Theory of Acceptance and Use of Technology (UTAUT); Technology Acceptance Model 3 (TAM3) and the Motivational Model.

These models consider factors such as perceived usefulness and perceived ease of use (TAM), in addition to social and cognitive variables associated with emotions (TAM3), performance, effort, facilitating conditions and social influence (UTAUT), as well as intrinsic and extrinsic motivation that influence intention to use (Motivational model).

There are authors who have applied these models in different contexts, most notably Park et al. (2012) who analyse the intention to use mobile devices in learning, which is explained through attitude, subjective norms and the studies being pursued. Liu et al. (2010) study the adoption of online learning in the subject of English.

Aguilera-Hermida (2020), meanwhile, analyses preferences for distance learning during the pandemic period, showing that students choose face-to-face education, with attitude, motivation, self-efficacy and use of technology being the determining factors in this decision.

Raza et al. (2020) also address distance education in the pandemic, but through the UTAUT model, finding a direct relationship between willingness to opt for distance education and improvements in performance, social influence, and effort.

Al-Emran et al. (2020), unlike previous research in the case of mobile phone use in education, group technology acceptance models (TAM), the theory of planned behaviour (TPB) and the expectancy-confirmation model (ECM), are unable to identify the impact of perceived usefulness or satisfaction.

Other important findings during the pandemic period were those of Pal and Vanijja (2020) who conclude that the platform used for distance education does not condition the decision, while Al-Maroof et al. (2023), consider that it is the fear of using the platform that determines preferences.

Based on the findings of the different research studies presented and following the approach proposed by Khan, Alshahrani, and Jacquemod (2023), Khan, Parvaiz, Dedahanov, et al. (2022), and

Khan, Parvaiz, Ali, et al. (2022), hypotheses can be put forward about the relationships between the variables analysed and the intention or probability of selecting distance learning as a study alternative.

Firstly, the higher the level of student satisfaction with the conditions offered by the university in terms of distance education, the higher the probability of selecting this mode of study. Thus, as the literature reports, there should be a direct and significant relationship (H1).

Likewise, the more satisfied the student is with the conditions or facilities for distance learning, considering the physical environment, time, dedication, commitment, content assimilation, use of the device (shared or personal) and type of internet connection (high speed or mobile data), the higher the probability of selecting distance learning should be (H2).

In terms of emotions, the negative experiences suffered during the pandemic may condition the acceptance of distance mode as a study alternative. Indeed, to the extent that the emotions experienced are related to a period of grief, sadness, anxiety, the probability of choosing distance learning is reduced (H3).

All these results can be affected by moderating variables associated with socio-demographic conditions that are raised by various authors in the literature and are related to technology use and acceptance (Khan, Alshahrani, and Jacquemod, 2023, Khan, Parvaiz, Dedahanov, et al., 2022; Khan, Parvaiz, Ali, et al., 2022).

Methodology

In order to respond to the research objectives, an ad hoc instrument was designed with 25 questions divided into sections, the first associated with the students' socio-demographic variables, the second with their satisfaction with regard to institutional variables, resources and teachers, the third with their satisfaction with personal conditions and the availability of resources for access to distance education, a fourth section with emotion management, and finally the preference for a change of study modality. The second and third sections on satisfaction ratings were presented on a Likert-type scale with the options of very dissatisfied, dissatisfied, neutral, satisfied and very satisfied.

This instrument was designed according to the variables or dimensions considered by different authors in their research related to the preferences for study modes or the acceptance and intention to continue with the distance mode, as detailed in Table 1.

This instrument was answered by 138 students in the Marketing course, whose population is 160, so the sample is representative with an error of 3.10%. This error is calculated considering the size of the population, the sample of responses obtained and a 95% confidence level.

The instrument was sent via institutional e-mails. The internal reliability of each of the dimensions was validated through Cronbach's Alpha and McDonald's omega, exceeding the minimum accepted value of 0.70 (Table 2).

The starting point was the estimation of the mean evaluations of student satisfaction with respect

to institutional variables associated with the e-learning process and linked to the conditions themselves.

The first group included opinions on the platform used by the institution, communication with the teacher, synchronous classes, tutorials, autonomous learning, methodology used by the teacher, basic materials, complementary materials, assessment processes, variety of assessment instruments, the

Table 1. Design of the instrument

Dimension	Variables	Authors
Socio-demographic characteristics	Age; Gender; Marital status; Area of residence	Almaiah et al. (2019); Estrada et al. (2022); Ferrer-Cascales et al. (2011); Patil and Undale (2023)
Satisfaction about institutional variables	Pedagogical planning; virtual platform; communication with teacher; synchronous class processes; virtual tutoring process; autonomous learning; teaching methodology; virtual classroom materials; complementary materials; evaluation process; variety of evaluation instruments; handling of questions	Castro and George (2021); Estrada et al. (2022); Tejedor et al. (2021)
Satisfaction with personal conditions and the availability of resources for access to distance education	Physical environment; time; dedication; commitment; content assimilation; devices used; use of the device (shared or personal); type of internet connection	Arteaga-Flores et al. (2021); Castro and George (2021); Chanto Espinoza and Mora Peralta (2021); Miguel Miguel Román (2020); Muthuprasad et al. (2021); Ploj-Virtič et al. (2021); Williamson et al. (2020)
Emotion management	Link between pandemic and emotions; experienced emotions	Estrada et al. (2022)

Table 2. Internal reliability of dimensions

Dimension	Cronbach's Alpha	McDonald's Omega
Satisfaction about institutional variables	0.940	0.940
Satisfaction with personal conditions and the availability of resources for access to distance education	0.909	0.913
Emotion management	0.734	0.735

teacher's handling of students' questions, technological support provided by the institution, adjustments to study plans and teacher training in distance education processes.

The second group included variables such as the time and physical space allocated to the process, dedication or effort, commitment, learning the content, devices used, use of the devices and type of internet connection.

Regarding the emotions experienced by the students, they were initially asked to specify whether the pandemic affected their emotional state in a way that hindered their learning process, and then to mention the emotions experienced in order of importance.

Finally, the study focused on exploring preference in terms of study modality and whether they would be willing to change to distance learning. The last question was left as an open question for students to write the reason for their preference.

With the results obtained in terms of satisfaction assessment, the probability of changing preferences in terms of the modality of study was estimated by means of a discrete choice model. This type of model is because the dependent variable is dichotomous, taking the value 1 if you intend to change to the distance mode and 0 if you are not willing to do so.

Thus, the estimation of the desire to change modality is given by equation 1, which considers as explanatory variables the dimensions associated with institutional and personal factors and emotions during the pandemic.

$$\text{Change of modality} = \beta_0 + \beta_1 x_1 + \cdots + \beta_n x_n + \alpha_1 z_1 + \cdots + \alpha_n z_n + \mu \qquad (1)$$

Where the independent variables are given by the valuations of the institutional component, the conditions of the student, the semester being studied, marital status, gender, province, help received from the institution, teacher training, use of devices, type of connection and presence of emotions that affected the training process.

As the dependent variable is dichotomous, a linear regression estimated by ordinary least squares cannot be used, as the values obtained are not guaranteed to be between 0 and 1, since the function fitted to the data is not linear. The consequences are also related to regression errors that are not normally distributed and their variance is not constant (Greene, 2009).

The estimation of this type of variables must be done using discrete choice models, either logit or probit, which are non-linear in the parameters and are estimated through maximum likelihood. These models do not minimise the sum of the differences between the observed and estimated value of the dependent variable but maximise the correct classification of the data in each group (accuracy). These groups are linked in this case to those who wish to change their mode of study and those who do not.

Given that the estimation is not linear, other sinusoidal distribution functions are used, such as the logistic distribution function or the normal distribution function; in the first case it is associated with the logit estimation and in the second with the probit model (Greene, 2009; Train, 2009). Between the two models, the one with the highest percentage of correct classification of the data or the one with the

highest precision (accuracy) is selected.

For this purpose, the confusion matrix is estimated, which consists of a contingency or double-entry table in which students who intend to change modality are considered and the model classifies them as such (sensitivity), and those who do not intend to change modality are considered and the model classifies them as such (specificity). The sum of the two proportions gives the accuracy of the model (accuracy). The errors to be minimised are associated with classifying those who intend to switch as those who do not, or those who do not wish to switch as those who do.

The model selected will then be the one with the highest accuracy and from there the marginal effects will be estimated, which are the interpretable coefficients that allow the impact of changes in the explanatory variables on the probability of selecting the distance modality to be measured (Greene, 2009; Train, 2009).

Results

About the socio-demographic variables, the results show that the average age is 20.91 years, 96.38% report that they are single and 57.25% of the students indicate that they are female. A minority (38.4%) live in the same province as the educational institution, Cotopaxi, while half (50%) live in the neighbouring province, Pichincha, which contains the country's capital city.

The assessment of student perceptions, as mentioned, is associated with institutional components, satisfaction with teachers and the adjustments made for the virtual modality, and satisfaction with personal dimensions and changes in emotions throughout the process of social distancing and isolation.

Firstly, the institutional dimensions evaluated were pedagogical planning, the virtual platform used by the university, communication with the teacher, synchronous class processes, virtual tutorials, autonomous learning, the methodology used by the teacher, the materials available in the virtual classroom, complementary materials, assessment processes, the variety of assessment instruments used and the teacher's handling of students' questions, as shown in Table 3.

In such a way, students report that they are satisfied or very satisfied with the virtual platform, the basic and complementary materials, the handling of students' questions by the teacher and the evaluation processes. To a lesser extent, they expressed satisfaction with the virtual tutoring process and the synchronous classes. The percentage of students who are on average satisfied or very satisfied with the institutional component is 53.69%.

In addition, students were asked about their perception of whether the teachers had received training to deal with the e-learning process, where 72.26% stated that they had. About the support provided by the institution, only 6.52% of the students received some support, 70% of which was linked to Internet connection via mobile data plans and 30% to support in the areas of health and welfare.

In this group of variables, the approach to the curriculum that was developed during the virtual period was also identified; 68.84% considered that the approach was more theoretical than practical,

14.49% that it maintained a balance between theoretical and practical, 10.14% that it was more flexible and only 6.52% that it was more practical.

Regarding the evaluation instruments used by the teacher, not only did the survey ask what variety was used but teachers were also asked to list those uses according to which was used more. 72.46% indicated that option one was the test with reagents, 82.30% stated that option two was synchronous classroom lectures by the teacher, 78% chose autonomous learning as their third option and 100% asserted that option four comprised research projects.

Table 3. Assessment of satisfaction with institutional dimensions

Component	Rating (proportions)				
	Very dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied
Pedagogical planning	0.029	0.0725	0.3913	0.3551	0.1522
Virtual platform	0.029	0.0435	0.2536	0.4783	0.1957
Communication with teacher	0.0435	0.1087	0.3768	0.3261	0.1449
Synchronous class processes	0.0507	0.1159	0.3841	0.3261	0.1232
Virtual tutoring process	0.0725	0.1812	0.3406	0.3043	0.1014
Autonomous learning	0.0362	0.1449	0.3333	0.3841	0.1014
Teaching methodology	0.0290	0.1014	0.3551	0.3696	0.1449
Virtual classroom materials	0.0290	0.0580	0.2681	0.3986	0.2464
Complementary materials	0.0217	0.0507	0.3696	0.3996	0.1884
Evaluation process	0.0217	0.0797	0.3406	0.3768	0.1812
Variety of evaluation instruments	0.0217	0.1667	0.3043	0.3768	0.1304
Handling of questions	0.0072	0.0870	0.2681	0.4058	0.2319
Average institutional assessment	**0.0326**	**0.1000**	**0.3321**	**0.3751**	**0.1618**

Secondly, the variables related to personal satisfaction were related to physical space, time, dedication, commitment, and the ability to assimilate the contents, the results of which are shown in Table 4.

The dimension that received the highest rating (satisfied or very satisfied) was engagement, with 65.94%, while the least satisfactory was knowledge assimilation. Despite this, the proportion of satisfied and very satisfied students averaged 57.39%.

Additionally, students were asked about the type of connection, with 89.78% of students indicating that access was via high-speed internet, 8.03% via mobile data and the rest via shared Internet access. Regarding the devices used as their first choice, the answer was laptops (59.85%), mobile phone (15.33%) and personal computer (21.90%). The difference is associated with tablets or more than one of the mentioned devices; 63.04% of these devices were being used individually.

Throughout the distance learning process, emotions associated with confinement, contagion and even death were also experienced, which is why it was first asked whether negative emotions associated with the context had been experienced, to which 73.01% responded positively. We asked the students to establish a hierarchy of emotions, with fear (37.62%) in first place, boredom, and sadness (18.81% each) in joint second place, confusion (16.63%) in third place and anger (7.92%) in last place.

Given this assessment of the satisfaction generated with e-learning, it was asked whether there was a desire to change modality towards remaining in virtual education; 42.03% responded that their preferences were inclined towards remaining in this study modality.

Table 4. Assessment of satisfaction with personal dimensions

Component	Rating (proportions)				
	Very dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied
Physical environment	0.0217	0.058	0.3551	0.4203	0.1449
Time	0.0290	0.0362	0.3478	0.4130	0.1739
Dedication	0.0217	0.0435	0.3768	0.3696	0.1884
Commitment	0.0290	0.0362	0.2754	0.4058	0.2536
Content assimilation	0.0362	0.1449	0.3188	0.3478	0.1522
Average personal evaluation	**0.0275**	**0.0637**	**0.3347**	**0.3913**	**0.1826**

Estimation of the assessment of institutional satisfaction

Given the results described above, an estimate was made for the assessment of satisfaction with the institutional component, considering as explanatory variables those related to the student's own characteristics and the conditions and assessments of personal satisfaction. The estimate selected based

on the lowest values of the information criteria (AIC and BIC) for each is shown in Table 5.

Table 5. Estimation of the assessment of institutional satisfaction

Variable	Coefficient	Standard error	t statistic
Age	0.0478 ***	0.0172	2.77
Semester	-0.0803 **	0.0387	-2.07
Marital status	-0.2936 **	0.1255	-2.34
Personal satisfaction	0.7941 ***	0.0445	17.82
Type of connection	-0.0995	0.0754	-1.32
Constant	0.3230	0.3577	0.368

Note: Significance levels- 1% (***) and 5% (**)

The variables that proved to be significant in explaining the assessment of satisfaction with the institutional component were age, the semester attended when the instrument was applied, marital status and the assessment of personal satisfaction. In the first case, age shows a positive relationship, in that the score is higher among older students, as does the assessment of personal satisfaction, in the sense that a student who is more satisfied with his or her personal dimension values the work of the teachers and institution to a greater extent.

Semester and marital status show an inverse relationship because students in more advanced semesters who are married are more dissatisfied than those who have just started their studies and are single. Although the type of Internet connection was not a statistically significant variable, the relationship is as expected in the sense that students who have a full-time high-speed broadband connection are more satisfied with the institutional component than those who connected via mobile or shared data.

Sharing internet use with other members of the household, or using a mobile phone to connect to classes, limits the use of technological tools, makes it difficult to download and upload information, and increases the time required for networking.

The results obtained were validated for compliance with the necessary assumptions so that the estimators are unbiased and of minimum variance, using the variance inflation factor to verify non-multicollinearity, the Breusch and Pagan test for homoscedasticity of variance, the correct specification of the model (Ramsey test) and the non-existence of extreme values, as well as the normality of the residuals (Belsley et al, 1980; Breusch and Pagan, 1979; Wooldridge, 2020).

Estimation of the assessment of personal satisfaction

Similarly, the model was estimated to determine the explanatory variables of personal satisfaction by selecting the model with the lowest values associated with the information criteria (AIC and BIC). Problems of heteroscedasticity were detected, which were corrected through the estimation of robust standard errors (RSE), the results of which are shown in Table 6.

Personal satisfaction is significantly explained by marital status, satisfaction with the institutional component and by emotions, this relationship being inverse with marital status and emotions. Therefore, students who are married and who report negative emotions generated by the pandemic gave a lower score for their personal satisfaction. Meanwhile, the relationship between institutional and personal, the score is stronger among older students, as is the assessment of personal satisfaction. Multicollinearity assumptions were validated through VIF, indicating lower values than those established to detect problems of this type of assessment is evident. Multicollinearity assumptions were validated through VIF, indicating lower values than those established to detect problems of this type.

Table 6. Estimation of the assessment of personal satisfaction

Variable	Coefficient	Standard error	t statistic
Age	-0.0199	0.0216	-0.92
Semester	-0.0587	0.0409	1.44
Marital status	0.3054 **	0.1246	2.45
Gender	0.0358	0.0728	0.49
Province	0.0036	0.0273	0.13
Institutional satisfaction	0.8580 ***	0.0668	12.84
Emotions	-0.2479 ***	0.0863	-2.87
University support	0.1053	0.1295	0.81
Connection type	0.0453	0.1155	0.39
Device used	-0.0922	0.0746	-1.24
Teacher training	0.0327	0.1006	0.33
Curriculum	-0.0065	0.0460	-0.14
Constant	0.7236	0.4814	1.50

Note: Significance levels- 1% (***), 5% (**) and 10% (*)

Estimating the probability of change in study modality preferences

To identify the statistically significant variables that explain the intention to opt for distance learning, logit and probit models were estimated. As indicated in the methodology, the explanatory variables considered were institutional and personal satisfaction as proxy variables for the experience, as well as the curriculum, teacher training, shared or unshared use of the device, type of connection (broadband or mobile data), having received financial support from the university and the emotions experienced throughout the pandemic.

After estimating the confusion matrix for each model, the logit model was selected as it had a higher percentage of accuracy in classifying the data. The results of the marginal effects were estimated in terms of elasticities since the institutional and personal satisfaction variables, being the average of the approaches, are continuous. These coefficients are interpreted as the percentage change in the probability of opting for the distance mode when varying the explanatory variable by 1% (Table 7).

The variables of personal satisfaction, curriculum and type of connection were found to be significant. Thus, a 1% increase in personal satisfaction levels leads to a 73.04% increase in the

probability of switching to the virtual modality. Furthermore, switching to broadband connection and having more flexible curricula also improve the probability of switching to distance learning.

Concerning the goodness of fit of the estimated model, associated with reliability in terms of the correct classification of those who change their preferences and those who do not, i.e., the predictive capacity of the model for the probability of changing modality, the percentage is 66.67%. Thus, the model correctly classifies 30 students as changing their preferences and 62 students who do not change

Table 7. Estimated marginal effects of the logit model.

Variable	Coefficient	Marginal effects (ey/ex)
Personal satisfaction	0.9263 **	1.8888 **
	(0.4741)	(0.9618)
Institutional satisfaction	-0.7304	-1.4653
	(0.4791)	(0.9780)
Curriculum	0.5651 ***	0.4612 ***
	(0.2076)	(0.1538)
Teacher training	-0.3827	-0.1576
	(0.4772)	(0.2027)
Device used	0.0245	0.0198
	(0.3960)	(0.3198)
Connection type	-1.099 *	-0.7519 *
	(0.5843)	(0.4161)
University support	0.8423	0.0247
	(0.9698)	(0.0224)
Emotions	-0.4562	-0.2080
	(0.4495)	(0.2128)
Constant	-0.3071	
	(1.5265)	

Note: Significance levels- 1% (***), 5% (**) and 10% (*). Values in parenthesis are standard errors.

Table 8. Model classification accuracy with respect to modality change

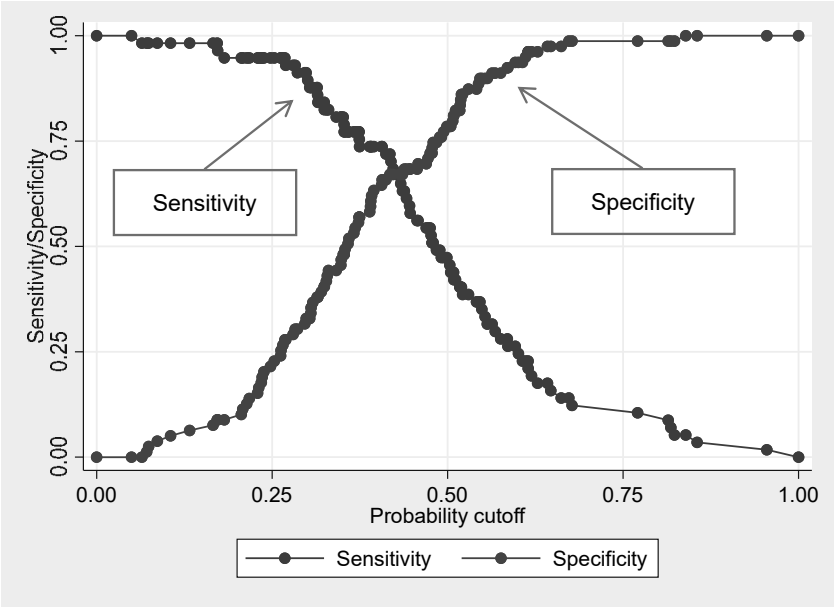
Classification	Estimated modality changers	Estimated non-modality changers	Total
Modality change to virtual	30	17	45
No modality changes to virtual	29	62	91
Total	**59**	**79**	**138**
Sensitivity		50.84%	
Specificity		78.48%	
Correctly classified		66.67%	

their preferences, although 17 are classified as not changing when they indicated that they do, and 29

do not change their preferences when they were classified as doing so, as shown in Table 8.

These results were analysed as the model's sensitivity and specificity. The former denotes the probability of correctly classifying those who change (it is estimated that they will) and here it was equivalent to 50.84%, while the latter, which is the probability of correctly classifying those who do not change (it is estimated that they will not), was 78.48%. Although there is a trade-off between specificity and sensitivity, the estimate could be improved by considering the optimal cut-off point at which the probability of the difference between specificity and sensitivity tends to zero, as shown in Figure 1.

Figure 1. Determination of optimal cut-off point

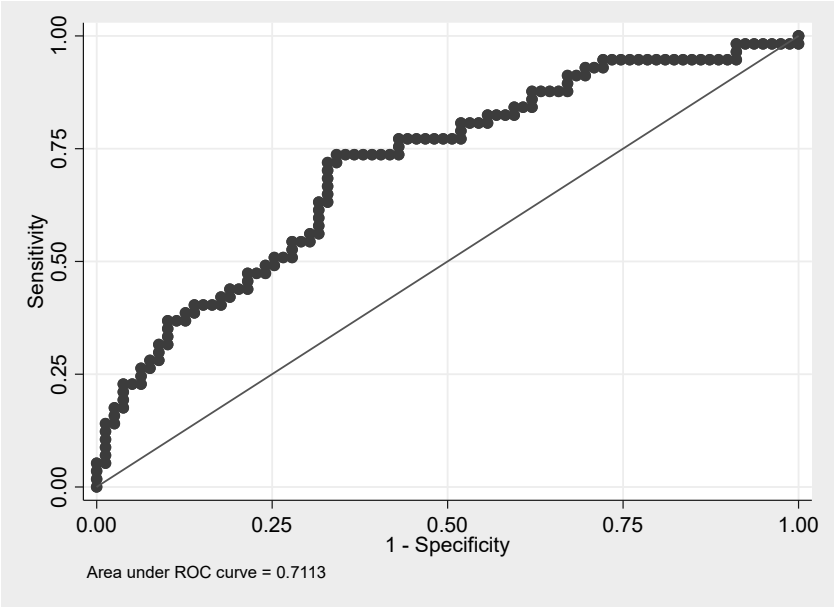


Under this new cut-off point (0.4317) the specificity percentage is 67.09%, i.e., the model correctly classifies 67.09% of the students who do not change modality and in terms of sensitivity it correctly classifies 66.67% of the students who change modality, which brings the validity (accuracy) of the model to 66.91%.

These results could be presented graphically (Figure 2) through the diagnostic performance curve (ROC), which indicates the goodness of fit by considering the area under the curve and the minimum acceptable area associated with the 45º straight line representing a probability of 0.50.

As can be seen, the ROC curve has an area greater than 0.50 and is close to 1 (0.7113); therefore, it is a model that can predict the probability of modality change in study preferences in an acceptable way.

Figure 2. Diagnostic performance curve for the model



Discussion

Findings and Implications

The pandemic situation has forced higher education institutions to incorporate distance learning as a study modality to preserve the physical health of the community, students, teachers, and authorities. Yet, there was no prior preparation, both in institutional terms (resources, trained teachers, and technology) and for students, who, although it might be assumed that they are digital natives, had neither the devices, Internet connection nor the necessary tools to undertake a virtual training process.

As research such as Williamson et al. (2020) suggests, the modality change during the pandemic era has generated natural experiments in which students and teachers worldwide have been subjected to "treatments" that otherwise would not have been possible. Analysis of these results has shown that there is no certainty that distance learning has been better, nor has there been evidence of a shift in preferences towards distance learning.

The empirical evidence in this study does seem to show a change of preferences in study modality, considering that the students initially opted for a degree course with face-to-face classes; in fact, 42.03% wish to remain in distance learning, which is in line with the results of the Castro and George (2021) study. This change in preferences is related to personal satisfaction, measured as the valuation of the physical space, time spent in this modality, dedication, commitment and assimilation of content, in addition to the adjustments made institutionally to the curriculum (greater flexibility) and the type of connection (high-speed broadband, mobile data or shared), such that that a more satisfied student, who

has experienced a more flexible curriculum and has a broadband connection, is more likely to change his or her preferences towards online learning.

In terms of personal satisfaction, the most highly rated dimension was commitment as a proxy variable for attitude, which, as reported by Ploj-Virtič et al. (2021), is a predictor of preference change. While the worst-rated one was content learning, as reiterated in several studies, such as Barton (2020).

This personal satisfaction is determined by sociodemographic variables, as stated by Estrada et al. (2022), with marital status and emotions experienced throughout the pandemic being significant for this study. In the first case, married students reported higher levels of satisfaction, while those who experienced negative emotions, such as fear, boredom, sadness, confusion, and anger, indicated a lower level of satisfaction with personal conditions.

Despite explaining the degree of personal satisfaction and showing an inverse relationship with the probability of preference change, emotion-based experience was not significant in this estimation.

With respect to the technology gap, it seems that the literature does present a consensus on the barriers to better learning outcomes (Arteaga-Flores et al., 2021; García & Pascucci, 2022; Muthuprasad et al., 2021; Sotelo et al., 2022; Williamson et al., 2020) related to access to devices and connectivity, precarious rural conditions, lack of previous experience and activities related to face-to-face practices. This is evident in the study, as limitations in Internet access are a predictor of the likelihood of changing study modality preferences.

Whilst adjustments made to study plans were found to be significant in predicting the likelihood of changing preferences, satisfaction with institutional conditions was not, and showed an inverse relationship with this likelihood. In fact, Tejedor et al. (2021) consider the set of institutional variables as a barrier to modality change, associated with tutorials, an absence of adequate materials and technological resources (platforms) for distance learning. Indeed, the study showed that the lowest scores for satisfaction within the conditions of the institution was experienced with tutorials and synchronous classes.

In general terms and in the same way, Estrada et al. (2022) corroborate the influence of socio-demographic conditions that explain the assessment of satisfaction with institutional conditions, whereby age, semester completed at the time the instrument was applied and marital status are statistically significant, in addition to personal satisfaction.

Thus, an older student who is more personally satisfied with the conditions in which the education was carried out also values the institutional conditions more, while a student in more advanced semesters who has had more experience with the virtual modality, as well as married students, indicate a lower level of satisfaction with the resources and teachers.

These results establish the starting point for further research into other universities to compare conditions and experiences, especially in Latin American countries where the literature reports limitations in terms of gaps and inequalities in access to technology, connectivity, and adequate devices, as well as significant budget restrictions at the institutional level. There is an overall scarcity of studies

regarding the impact of the pandemic, especially in higher education.

Theoretical and management contributions

The results obtained allow us to corroborate at least two of the three hypotheses put forward, in the sense that satisfaction with personal conditions (Ploj-Virtič et al., 2021; Barton, 2020), favourable emotions and the type of internet connection (Arteaga-Flores et al., 2021; García & Pascucci, 2022; Muthuprasad et al., 2021; Sotelo et al., 2022; Williamson et al., 2020), have a positive impact on the selection of distance education as a mode of study. Satisfaction with the conditions offered by the university, especially about the flexibility of the curricula, does not.

Although there are a considerable number of studies on the analysis of distance education during the pandemic period, in this case the contribution of this study is linked to offering a specific understanding of the intention to change the mode of study, having initially selected face-to-face education as the option mostly offered in Ecuador.

Secondly, this approach incorporates both demand-side (students) and supply-side (university) factors, to offer added value in terms of identifying the relevant variables in the change of preferences, not only considering one of the actors in the process.

Thirdly, in the case of the university, the analysis of satisfaction with institutional conditions is relevant, as it contributes to identifying opportunities for improvement that allow for the strengthening of the lowest rated factors. This improvement process, together with the use of investments in technology, as well as the willingness of students to change to a distance learning modality, are key elements in the expansion of the academic offering.

This becomes even more relevant when considering the characteristics of the higher education system in Ecuador, especially in areas other than the most important capitals, associated with limitations in terms of access to higher education, the need to travel from the area of residence and infrastructure limitations in most institutions.

At the aggregate level, based on the evidence and given the public policy guidelines in Ecuador, which since before the pandemic proposed the design of e-learning study programs, it seems that it is necessary to reconsider the technological gaps, the students' experience and commitment, the conditions of rural living, the methodologies for synchronous classes and tutorials, and the possibility of making the study plans more flexible.

Limitations and Future Research Directions

Given the limited number of responses obtained, it is possible to strengthen the findings of this study by increasing the number of students involved in the research, in order to apply other methodologies such as structural equation models (SEM) that will allow us to consider the institutional and personal

dimension as latent variables, which in turn affect the change of study modality, evaluated through a dimension that can be constructed as the intention to use distance education, as proposed by the models of acceptance and use of technology (TAM and UTAUT).

In future research, the intention is to expand not only the number of students from the institution analysed, but also to incorporate other universities in the area (Ecuadorian Andes), to contrast the theoretical causality model proposed in this research, by means of the SEM approach.

Conclusion

The results obtained in this research validate the hypothesis that socio-demographic variables condition the assessment of satisfaction with institutional conditions associated with distance education. Older age, being enrolled in the first semesters, being single and indicating greater satisfaction with personal conditions increase satisfaction with the conditions offered by the university.

While personal satisfaction increases as the student is married, satisfaction with institutional conditions rises and the negative emotions experienced during the pandemic are reduced.

Finally, the likelihood of switching to distance learning increases the higher the personal satisfaction, the greater the flexibility of the curriculum and the greater the access to a broadband internet connection and full-time dedication. Satisfaction with institutional conditions associated with distance education has no impact.

References

Águeda, B., Dogan Yenisey, K., Khanna, K., Masis, M. F., Monge, R. M., Tugtan, M. A., Vega Araya, L. D., & Vig, R. (2021). Changes that should remain in higher education post COVID-19: A mixed-methods analysis of the experiences at three universities. *Higher Learning Research Communications*, *11*(0), 51−75. https://doi.org/10.18870/hlrc.v11i0.1195

Aguilera-Hermida, A. P. (2020). College students' use and acceptance of emergency online learning due to COVID-19. *International Journal of Educational Research Open*, *1*, Article 100011. https://doi.org/10.1016/j.ijedro.2020.100011

Al-Emran, M., Arpaci, I., & Salloum, S. A. (2020). An empirical examination of continuous intention to use m-learning: An integrated model. *Education and Information Technologies*, *25*(4), 2899–2918. https://doi.org/10.1007/s10639-019-10094-2

Almaiah, M. A., Alamri, M. M., & Al-Rahmi, W. (2019). Applying the UTAUT model to explain the students' acceptance of mobile learning system in higher education. *IEEE Access*, *7*, 174673–174686. https://doi.org/10.1109/ACCESS.2019.2957206

Al-Maroof, R. S., Salloum, S. A., Hassanien, A. E., & Shaalan, K. (2023). Fear from COVID-19 and technology adoption: The impact of Google Meet during Coronavirus pandemic. *Interactive Learning Environments*, *31*(3), 1293–1308. https://doi.org/10.1080/10494820.2020.1830121

Arteaga-Flores, R., Mero-Mero, R., Palacios-Briones, N., & Cruz-Mera, R. (2021). La virtualidad y su impacto en el proceso educativo ante el COVID-19 en Ecuador [Virtuality and its impact on the Educational Processin the Face of COVID-19 in Ecuador]. *Revista Científica FIPCAEC*, *6*(4), 320–335. https://www.fipcaec.com/index.php/fipcaec/article/view/484/845

Barton, D. C. (2020). Impacts of the COVID-19 pandemic on field instruction and remote teaching alternatives: Results from a survey of instructors. *Ecology and Evolution*, *10*(22), 12499–12507. https://doi.org/10.1002/ece3.6628

Belsley, D. A., Kuh, E., & Welsch, R. E. (1980). *Regression diagnostics: Identifying influential data and sources of collinearity*. John Wiley & Sons. http://doi.org/10.1002/0471725153

Breusch, T., & Pagan, R. (1979). A simple test for heteroscedasticity and random coefficient variation. *Econometrica, 47*(5), 1287–1294. https://www.econometricsociety.org/publications/econometrica/browse/1979/09/01/simple-test-heteroscedasticity-and-random-coefficient-variation

Castells, M. (2006). *La era de la información: Economía, sociedad y cultura* [The information age: Economy, society and culture] (4th ed.). Alianza editores.

Castro, E., & George, J. (2021). The impact of COVID-19 on student perceptions of education and engagement. *E-Journal of Business Education & Scholarship of Teaching*, *15*(1), 28–39.

Chanto Espinoza, C. L., & Mora Peralta, M. (2021). De la presencialidad a la virtualidad ante la pandemia de la COVID-19: Impacto en docentes universitarios [From face-to-face to virtual mode

because of COVID-19: Impact in the teaching-learning process]. *Revista Digital de Investigación en Docencia Universitaria*, *15*(2), Article e1342. https://doi.org/10.19083/ridu.2021.1342

Comité de Operaciones de Emergencia Nacional. (2020). *Informe de situación COVID-19 Ecuador* (Informe 008) [COVID-19 progress report Ecuador (Report 008)]. https://www.gestionderiesgos.gob.ec/wp-content/uploads/2020/03/Informe-de-Situaci%C3%B3n-No008-Casos-Coronavirus-Ecuador-16032020-20h00.pdf

Consejo de Educación Superior. (2020). *RPC-SE-03-No.046-2020.* https://www.ces.gob.ec/lotaip/2021/Marzo/a3/Normativa%20transitoria%20para%20el%20desarrollo%20de%20actividades%20acad%C3%A9micas%20en%20las%20IES,%20debido%20al%20COVID.pdf

Contreras, C. P., Picazo, D., Cordero-Hidalgo, A., & Chaparro-Medina, P. M. (2021). Challenges of virtual education during the COVID-19 pandemic: Experiences of Mexican university professors and students. *International Journal of Learning, Teaching and Educational Research*, *20*(3), 188–204. https://doi.org/10.26803/ijlter.20.3.12

Cuchillac, V. (2016). Descripción de la organización virtual [Virtual organizations]. *Realidad y Reflexión*, *43*, 87–96. https://doi.org/10.5377/ryr.v43i0.3551

Economic Commission for Latin America and the Caribbean & Regional Bureau for Education in Latin America and the Caribbean of the United Nations Educational, Scientific and Cultural Organization. (2020). *Education in the time of COVID-19*. https://repositorio.cepal.org/server/api/core/bitstreams/5760ee36-f6b9-44c9-af8c-3d791e25ae2a/content

Estrada Araoz, E. G., Gallegos Ramos, N. A., & Puma Sacsi, M. Á. (2022). Percepción de los estudiantes universitarios sobre la educación virtual durante la pandemia de COVID-19 [University students' perception of virtual education during the COVID-19 pandemic]. *Revista San Gregorio*, *49*, 74–89. https://revista.sangregorio.edu.ec/index.php/REVISTASANGREGORIO/article/view/1967/6-nestor

Ferrer-Cascales, R., Walker, S. L., Reig-Ferrer, A., Fernández-Pascual, M. D., & Albaladejo-Blázquez, N. (2011). Evaluation of hybrid and distance education learning environments in Spain. *Australasian Journal of Educational Technology*, *27*(7). https://doi.org/10.14742/ajet.906

Figallo, F., González, M. R., & Diestra, V. (2020). Perú: Educación superior en el contexto de la pandemia por el COVID-19 [Peru: Higher education in the context of the COVID-19 pandemic]. *Revista de Educación Superior en América Latina*, *8*, 20–28. https://rcientificas.uninorte.edu.co/index.php/esal/article/view/13404/214421444832

García, H. D., & Pascucci, E. (2022). Del aprendizaje tradicional al e-learning en el contexto de la pandemia por COVID-19; valoraciones por alumnos universitarios [From traditional learning to e-

learning in the context of the COVID-19 pandemic; assessments by university students]. *Revista Española de Educación Comparada*, *40*, 236–251. https://doi.org/10.5944/reec.40.2022.30176

Greene, W. (2009). Discrete choice modeling. In T. C. Mills & K. Patterson (Eds.), *Palgrave handbook of econometrics: Vol. 2. Applied econometrics* (pp. 473–556). https://doi.org/10.1057/9780230244405_11

Khan, M., Alshahrani, A. N., & Jacquemod, J. (2023). Digital platforms and supply chain traceability for robust information and effective inventory management: The mediating role of transparency. *Logistics*, *7*(2), 25. https://doi.org/10.3390/logistics7020025

Khan, M., Parvaiz, G. S., Ali, A., Jehangir, M., Hassan, N., & Bae, J. (2022). Model for understanding the mediating association of transparency between emerging technologies and humanitarian logistics sustainability. *Sustainability*, *14*(11), 6917. https://doi.org/10.3390/su14116917

Khan, M., Parvaiz, G. S., Dedahanov, A. T., Abdurazzakov, O. S., & Rakhmonov, D. A. (2022). The impact of technologies of traceability and transparency in supply chains. *Sustainability*, *14*(24), 16336. https://doi.org/10.3390/su142416336

Liu, I.-F., Chen, M. C., Sun, Y. S., Wible, D., & Kuo, C.-H. (2010). Extending the TAM model to explore the factors that affect intention to use an online learning community. *Computers & Education*, *54*(2), 600–610. https://doi.org/10.1016/j.compedu.2009.09.009

Matarirano, O., Gqokonqana, O., & Yeboah, A. (2021). Students' responses to multi-modal emergency remote learning during COVID-19 in a South African higher institution. *Research in Social Sciences and Technology*, *6*(2), 199–218. https://doi.org/10.46303/ressat.2021.19

Miguel Román, J. A. (2020). La educación superior en tiempos de pandemia: Una visión desde dentro del proceso formativo [An insider's view of the training process]. *Revista Latinoamericana de Estudios Educativos*, *50*(especial), 13–40. https://doi.org/10.48102/rlee.2020.50.ESPECIAL.95

Ministerio de Economía y Finanzas. (2020). *Informe anual de ejecución: Presupuesto general del estado: Enero–Diciembre 2020* [Annual execution report: General state budget: January–December 2020]. https://www.finanzas.gob.ec/wp-content/uploads/downloads/2021/03/Informe-Ejecucion-Presupuestaria-2020.pdf

Ministerio de Educación. (2020). *Acuerdo nro. MINEDUC-MINEDUC-2020-00013-A*.

Muthuprasad, T., Aiswarya, S., Aditya, K.S., & Jha, G. K. (2021). Students' perception and preference for online education in India during COVID-19 pandemic. *Social Sciences & Humanities Open*, *3*(1), 1–11. https://doi.org/10.1016/j.ssaho.2020.100101

Pal, D., & Vanijja, V. (2020). Perceived usability evaluation of Microsoft Teams as an online learning platform during COVID-19 using system usability scale and technology acceptance model in India. *Children and Youth Services Review*, *119*, 1–12. https://doi.org/10.1016/j.childyouth.2020.105535

Park, S. Y., Nam, M.-W., & Cha, S.-B. (2012). University students' behavioral intention to use mobile learning: Evaluating the technology acceptance model. *British Journal of Educational Technology*, *43*(4), 592–605. https://doi.org/10.1111/j.1467-8535.2011.01229.x

Patil, H., & Undale, S. (2023). Willingness of university students to continue using e-Learning platforms after compelled adoption of technology: Test of an extended UTAUT model. *Education and Information Technologies*, 1–23. https://doi.org/10.1007/s10639-023-11778-6

Pedró, F. (2020). COVID-19 y Educación superior en América Latina y el Caribe: Efectos, impactos y recomendaciones políticas. *Análisis Carolina*, *36*, 1–15. https://doi.org/10.33960/AC_36.2020

Ploj-Virtič, M., Dolenc, K., & Šorgo, A. (2021). Changes in online distance learning behaviour of university students during the coronavirus disease 2019 outbreak, and development of the model of forced distance online learning preferences. *European Journal of Educational Research*, *10*(1), 393–411. https://doi.org/10.12973/eu-jer.10.1.393

Raza, S. A., Qazi, W., Khan, K. A., & Salam, J. (2020). Social isolation and acceptance of the learning management system (LMS) in the time of COVID-19 pandemic: An expansion of the UTAUT model. *Journal of Educational Computing Research*, *59*(2), 183–208. https://doi.org/10.1177/0735633120960421

Roy, S., & Covelli, B. (2021). COVID-19 induced transition from classroom to online mid semester: case study on faculty and students' preferences and opinions. *Higher Learning Research Communications*, *11*(0), 10–32. https://doi.org/10.18870/hlrc.v11i0.1197

Sotelo Castillo, M. A., Barrera Hernández, L. F., Echeverría Castro, S. B., & Ramos Estrada, D. Y. (2022). Aprendizaje percibido de estudiantes universitarios en cursos en modalidad presencial y mixta: Un estudio comparative [Perceived learning of university students in face-to-face and b-learning courses: A comparative study]. *Revista Latinoamericana de Tecnología Educativa*, *21*(1), 115–127. https://doi.org/10.17398/1695-288X.21.1.115

Tejedor, S., Cervi, L., Pérez-Escoda, A., Tusa, F., & Parola, A. (2021). Higher education response in the time of coronavirus: Perceptions of teachers and students, and open innovation. *Journal of Open Innovation: Technology, Market and Complexity*, *7*(1), Article 43. https://doi.org/10.3390/joitmc7010043

Train, K. E. (2009). *Discrete Choice Methods with Simulation* (2nd ed.). Cambridge University Press. https://doi.org/10.1017/CBO9780511805271

UNESCO (2020). *Global Education Monitoring Report 2020: Inclusion and education: All means all* (3rd ed.). https://doi.org/10.54676/JJNK6989

Williamson, B., Eynon, R., & Potter, J. (2020). Pandemic politics, pedagogies, and practices: Digital technologies and distance education during the coronavirus emergency. *Learning, Media, and Technology*, *45*(2), 107–114. https://doi.org/10.1080/17439884.2020.1761641

Wooldridge, J. M. (2020). *Introductory econometrics: A modern approach* (7th ed.). Cengage Learning.