Research article

Teacher's perceptions, institutional challenges, and educational sustainability during Covid-19 in Ecuador

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A B S T R A C T

The Covid-19 pandemic has affected global educational systems, especially in developing countries. Therefore, governments and educational administrators have adopted contingency measures to maintain the functioning and the sustainability of their national educational systems. These measures involved the use of technologies and have enabled a significant amount of teachers to continue working with their students around the globe. This article aims to analyze the perception of Ecuadorian teachers about the contingency measures taken at the governmental and institutional levels while facing the COVID-19 crisis. Also, several aspects regarding the teachers' perceptions about their technological skills, access to electronic devices, and implications of teleworking in their mental health and performance are also analyzed. A cross-sectional study was carried out with 3,183 Ecuadorian teachers working at all levels of education. An online questionnaire which obtained a reliability of 0.84 in Cronbach's Alpha was used. The results show that despite the high levels of uncertainty, most teachers agreed with the measures that had been taken by the Government, the Ministry of Education as well as their institutions and reported feeling comfortable with teleworking. However, the lack of technological resources in rural areas and the lack of trust in the effectiveness of online classes are aspects that need to be analyzed before considering the viability of long-term online education in Ecuador.

1. Introduction

Originally detected in Wuhan-China in 2019, the respiratory disease caused by SARS-COV-2, commonly known as Coronavirus, started the highest-scale pandemic of the 21st century. On January 30, 2020, the World Health Organization (WHO A and B) officially declared Covid-19 as a public health epidemic (Guo et al., 2019). In just a few months, the disease had reached every country on the planet and had become a global threat (Mukuka et al., 2021) creating unprecedented challenges for safety, health, education, the economy, and job stability (Ionescu et al., 2020, p. 21). Subsequently the rapid spread of the virus forced governments to implement measures to avoid propagation of the disease. Among them, were official statements declaring the closure of borders, restrictions on national and international travel, and more specifically, the imposition of curfews and quarantines. Additionally, the WHO recommended the wearing of masks in public and also the implementation of compulsory social distancing measures (Bahasoan et al., 2020; Basilaia and Kvavadze 2020; WHO, 2019a, 2019b). Within this context,

classrooms and schools were considered high-risk spaces of contagion, therefore, more than 90 per cent of countries opted for some form of remote learning after the temporary closure of their educational institutions (UNICEF, 2020).

Although, the 21st century could be considered the era of online education (Phan and Dang, 2017) due to the rapid technological change and the adoption of educational technology (Li and Lalani, 2020) the rapid spread of Covid-19 tested the ability of ministries of education and educational institutions worldwide to migrate to an online educational system (Mukhtar et al., 2020) which proved to be difficult since the contexts of each country differed dramatically in terms of economic, educational, and social development.

Particularly, the measures taken had a huge impact on teachers, students, and administrative personnel (Adnan and Anwar, 2020). For instance, in April 2020, more than 1.47 billion students in 173 countries were affected by the closures of educational institutions due to the pandemic, which represents 83.4% of all students globally enrolled on education programs (UNESCO, 2021). The WHO thus recommended

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implementing alternative learning activities to face-to-face classes so as to mitigate the effects of the pandemic in education (Lapada et al., 2020). These changes were based on the implementation of emergency and virtual remote education that required the development of more flexible strategies to cover large numbers of students in very diverse situations. Moreover, by responding to the health crisis in this way, the World Bank (World Bank, 2020) was able to begin working with various international ministries of education to support their efforts in the implementation of virtual education. Other international organizations such as UNICEF later joined the initiative.

Dill et al. (2020) had previously asserted that online teaching would be the main form of teaching during the pandemic. Within this context, each country began searching for alternatives– all of which, to a greater or lesser degree, would require the usage of the virtual mode of education.

During the Covid-19 outbreak, for example, the Chinese-run 'One Stop Learning' initiative was launched. The objective of this initiative was to develop a systemic program to respond to the Covid-19 pandemic and the major issues related to public health crises. Some measures taken by the Chinese government are: a. the promotion of online education, b. the training of teachers, c. development of academic research centers, and d. organization of logistics operations. The initiative's ultimate goal was to achieve undisrupted learning (Huang, 2020). Conversely, the Philippine Department of Education issued various memorandums to create a Working Group (Department of Education of the Philippines, 2020a) to deal with the educational challenges of the virus. Moreover, it subsequently established a support center for the development of online education available for public and private inspection (Department of Education of the Philippines, 2020b). These two cases are rather interesting since Ecuador took a similar approach by promoting online education like China and creating working groups to deal with the operational aspects like the Philippines, however, the lack of logistics management, teachers training and other strategies present in the agenda of other countries are important to consider in the future.

According to Mhlanga and Moloi (2020), COVID-19 is the first pandemic that occurred within the context of the digital age. Indeed, it may be argued that neither studies prior to 2020 actually exist about the adoption of online learning platforms within the educational sector during a pandemic, nor about the impact on the daily tasks of teachers, their emotional responses or their perceptions about training, i.e. especially with regard to dealing with online teaching and the measures taken by the State, educational ministries, and educational institutions. This study thus aims to provide evidence about the perceptions of Ecuadorian teachers. At the same time, it also aims to generate information for future comparative education. For this reason, the question that still remains to be answered is: What is the perception of Ecuadorian teachers regarding personal, institutional, and governmental training when facing the challenges generated by the transition to an online education caused by COVID-19?

In this study, the term "preparation" is first and foremost defined as the ability to anticipate and effectively respond to the impact of any danger (OCHA, 2020). The evaluation and reflection of the preparation of states, educational ministries, and educational institutions prior to the pandemic is a new concept in the 21st century, and therefore has a profound impact on the sustainability of educational systems, that is, within the context of the pandemic i.e. preparing for future scenarios, for example, or for predicting the apparition of new strains of the disease, or determining the effects of climate change, bellicose conflicts, or, indeed, managing any other event that will prevent the implementation of face-to-face classes. For this reason, this article aims to demonstrate the perceptions of Ecuadorian teachers with respect to contingency measures at the governmental, institutional, and personal level that have been used to deal with the COVID-19 crisis (Rasmitadila et al., 2020).

1.1. Online learning

One of the main characteristics of online learning involves the usage of digital computer systems. Today, for example, many online teaching systems consist of Internet-based computer programs that have been designed to manage and to impart courses and to facilitate bi-directional communication between students and teachers (Mukhtar et al., 2020). This teaching-learning model has gained popularity over the last decade – i.e. a result of flexibility in terms of time, place, access, innovation, and rhythm of study, as well as of providing easy access and a greater variety and enhanced information that can be changed or easily modified at a minimal cost (Sukmadinata, 2011; Dong et al., 2020).

Other authors, however, argue that online learning is, pragmatically speaking, an effective and sustainable solution under the current conditions that restrict face-to-face attendance (Ionescu et al., 2020). Moreover, previous research about the ability of the teachers readiness to teach in virtual environments (Fedina et al., 2017; Ventayin, 2018) show that although teachers could have a limited knowledge of online education, they are also able to motivate and to adapt to this type of educational model. Therefore, it could be considered as a long-term solution not only in dangerous situations, but also in contexts in which face-to-face education is not currently possible. The virtualization of education thus could be considered as a viable alternative, however, aspects such as the impact in teachers' mental health of tele-working should be considered since previous studies (Meo and Dabenigno, 2021) found that approximately 6 out of every 10 teachers (55%) had felt overwhelmed by virtual work.

In theory, online education is a good option, but its management requires prior and continuous planning and training of teachers and students, as well as an operational, technological, and pedagogical framework that responds to a model that supports these features.

There is, in fact, a significant number of institutions globally that use consistent online education systems, just in the US 88% of institutions offered online courses before the pandemic (Brooks et al., 2020) which are characterized by the training of teachers and students and their participation in a virtual environment, i.e. with educational resources and didactic methods that are adapted to their needs. These models have not been viewed as having hegemonic structures in any country. Instead, they were largely seen as a minority that was viewed with a certain level of suspicion. With the onset of Covid-19, many countries thus insisted on the adoption of online education programs. However, several key problems have arisen since then. For instance, most teachers and students who were accustomed to having online face-to-face education model were not fully prepared for online education (Bahasoan et al., 2020).

The pandemic has likewise shown that the current system of education is, in fact, vulnerable to external threats (Bozkurt and Sharma, 2020). Furthermore, in view of possible similar scenarios, it is crucial that governments and their citizens are prepared to continue for the long-term or to resume work when circumstances demand it. To achieve this goal, Al Lily et al. (2020) have presented a broad classification of the requirements that are required for carrying out emergency remote (distance) education. Among the requirements, we can mention the following: a) Sponsorship - Sponsorship could be provided by central governments by means of their ministries and institutions, sponsors, and the implementation of online education systems, e.g. via the issuance of decrees, regulations, and plans, etc., b) Infrastructure - Both teachers and students must have technological tools such as computers, smartphones, and access to the Internet to facilitate online communication, c) Pedagogical preparation - Teachers, students, and administrative personnel are prepared pedagogically for online classes, and d) Psychological preparation- Both teachers and students must be prepared psychologically for a virtual learning environment.

The conditions in which emergency online education was implemented should fulfill, at least partially, the basic characteristics described above, especially in developing countries. Therefore, it is important to review the status of each of these elements in Ecuador to determine the sustainability potential of this type of long-term education.

1.2. The Ecuadorian context

According to Ammar et al. (2021), the difficulties in making an effective transition to an online learning environment have been enormous in developing countries. For instance, in Ecuador, only a 53.2% of the population has internet access (INEC, 2020) which made any attempt of transition difficult. This transition started when face-to-face activities were suspended on March 12, 2020, which led to the commencement of a contingency support plan for families. Subsequently, this helped to provide families with emotional support during the pandemic. Governments, ministries of education, and educational institutions around the world were thus obliged to develop plans and to take appropriate measures for the rapid transition from traditional classes to online classes. Although this was not a simple task, they had *a priori* resources to accomplish it.

In order to continue with an online education system, the Ecuadorian Government, by means of its Ministry of Education, has developed protocols for the teaching of online students. Among these measures, we can highlight the creation of radio programs, virtual learning environments, and a proposal related to didactic and administrative guidelines. This proposal consisted of the creation of executive and instructional plans, as well as guidelines for the proposal of prioritization strategies for curricular elements based on the integration of knowledge, didactic strategies for the flexibilization of schedules, incentives for virtual strategies, training, and continuous evaluation. Moreover, strategies that have helped to maintain classes virtually during the first days of the month of April, 2020, were likewise emphasized. The organization of schools was also a challenge since some private institutions with more resources were better equipped than others, i.e. both materially and pedagogically for achieving these tasks. Additionally, it could be logical to think that those schools have managed to provide better responses to the current pandemic by prioritizing active communication with parents and community practices and teacher- learning by sharing experiences.

However, we cannot confirm that there was a uniform transition to online education, or that the professors or students had the same opportunities within the migration process to virtual classes.

According to Romeiro et al. (2021), Emergency Virtual Education Strategies have increased the risk of implementing pedagogical approaches, i.e. based on the transfer of content, namely those which lack deep-critical analysis and reflection or which are based on the massification of education.

2. Materials and methods

The present article was based on a quantitative design (Bloomfield and Fisher, 2019), using descriptive and inferential statistics to analyze the data. In this research the perceptions of Ecuadorian teachers about measures taken by the National Government, the actions of the Ministry of Education of Ecuador and educational institutions were mutually evaluated. In addition, other aspects related to teachers were likewise analyzed, namely about their own technical preparation (e.g. technological skills), access to electronic devices, and the implications of teleworking in their teaching. All these issues were taken into consideration when dealing with the educational crisis caused by COVID-19.

The data collection procedure was carried out by means of a survey on the "SurveyMonkey" platform, which took into consideration data about teachers from all over Ecuador who attended training sessions for virtual education during the pandemic, organized by a university specializing in distance and virtual education processes. The data were collected during the month of May, 2020. The management of the data was objective and was performed according to the evidence collected. The research that has been carried has thus aimed to protect any ethical issues, namely those stemming from the individual consent of participants to assimilate the information for academic purposes, etc. The dissemination of the results guarantees total privacy and anonymity of the participants. This study was approved by the Institutional Research Directorate of Universidad Técnica Particular de Loja.

2.1. Participants

The participants from the study consisted of 3,183 Ecuadorian teachers, that were self-selected to participate in this study. The answers given by the participants were collected after the attendance to a series of trainings organized by a well-known university in the country. The index of participation was 31.83%. Due to the nature of the self-selection sampling, the teachers demographic profile, i.e. ranging from the pre-school education level (11.8%), elementary (51.8%), and baccalaureate (34.3%), and with varied profiles of generation, gender, years of experience, study level, etc. Table 1 shows the demographic profile of the participants, namely where the generation and or "millennials" born between 1981 and 1996 predominated in number (53.3%). On the other hand, the population researched has a clear majority for the female gender (73.3%), i.e. those who had 1–5 years of experience (30.6%), and a higher academic title, such as an M.A. (61.4%). Additionally, 62.6% of respondents worked in public institutions and came from mostly from

Table 1. Demographic profiles of the samples.

Criterion	Description	Frequency	Percentage
Generation	Baby boomers	227	7,1%
	Generation X	1250	39,3%
	Generation Y	1706	53,6%
	Generation Z	0	0,0%
Gender	Feminine	2348	73,8%
	Masculine	829	26,0%
	Not stated	6	0,2%
Years of Experience	From 1 to 5 years	975	30,6%
	From 6 to 11 years	799	25,1%
	From 12 to 17 years	522	16,4%
	From 18 to 23 years	408	12,8%
	From 24 to 29 years	312	9,8%
	More than 30 years	139	4,4%
	Not stated	28	0,9%
Level of Education	Other (specify)	3	0,1%
	High-School	72	2,3%
	Technical College	97	3,0%
	University undergrad	161	5,1%
	Master	1953	61,4%
	Ph.D.	890	28,0%
	Not stated	7	0,2%
Type of institution	Public	1993	62,6%
	Private	829	26,0%
	Fiscomisional (Both state and public funded)	296	9,3%
	Municipal	42	1,3%
	Not stated	23	0,7%
	Public	1993	62,6%
Type of educational institution based on its geographical location	Urban	2439	76,6%
	Rural	723	22,7%
	Not stated	21	0,7%
Education levels where one teaches/works	Pre-school	376	11,8%
	Elementary	1648	51,8%
	High-school	1093	34,3%
	Not stated	66	2,1%
	Coast or Coastal Region	1454	45,7%
	Highlands or Inter-Andean Region	1563	49,1%
Geographic Region	The Oriente or Amazonian Region	157	4,9%
	The Galapagos or Insular Region	4	0,1%
	Not stated	5	0,2%

urban areas (76.6%). Finally, 51.8% of teachers taught at the elementary education level and were almost equitably distributed between the highlands (49.1%) and the coastal region (45,7%). All the participants were informed of the study's purposes and expressed explicit consent to be part of it and will receive the results after the study is concluded.

2.2. Ethics

This study followed a strict ethics protocols. First of all, a document with a detailed explanation of the study (aims, objectives, the data that would be gathered, etc.) and a consent form were developed by the research team and given to the participants in section 1 question 1 of the instrument. The participants were advised to read the consent form and the information about the study thoroughly before accepting to start. The participants could only continue to fill the instrument if they read and consented to participate in it. The data gathered for this study is planned to be sent to the participants after the publication of this article.

2.3. Instruments

The instrument titled "Effects of the Covid-19 pandemic in the National Educational System of Ecuador" was used, which was an ad-hoc study designed and prepared by the researchers of the study.

As part of this process, content, construct and expert validity were considered. The analysis consisted of several specific stages: In the first instance, a broad literature review search was carried out to allow the development of each item of the measurement instrument in accordance with the objectives of the study. Secondly, the measurement instrument was sent to a coordinator of the expert judges for an initial review and sending of the instrument to the different international experts. Thirdly, 7 expert judges, academics and researchers from Latin-America and Europe: Spain, Brazil, Peru and Portugal participated in the analysis of the measurement instrument developed. Most of them were experts on the subject of the research and members of the Alfamed Network, which is dedicated to the analysis of media competencies in Ibero-America. The participants were selected by convenience, which implies that it was not based on statistical probability. After attending to the comments of the first review of the experts, the instrument was forwarded to seven other experts in Ibero-America for final consideration, which implied the participation of fourteen (14) experts on the subject of media competencies at the international level. The judges had the opportunity to evaluate quantitatively and qualitatively each item of the measuring instrument considering some parameters established by the team of researchers. The evaluating judges gave a score between 3 and 1 for each of the questions of the measuring instrument, where 3 represented that the item was adequate, 2 adequate with changes and 1 inadequate. Once the results were obtained, we proceeded with the corresponding statistical analyses, including Cronbach's Alpha, which measures the reliability of the instrument with the scores given by the expert judges, and Kendall's index, which analyzes the concordance in the appraisals between them with respect to each item of the instrument.

In this sense, a Kendall's W concordance coefficient of 0.763 and a Crombach's alpha of 0.847 were obtained, indicators that allowed concluding that the instrument was valid to be applied.

Finally, the instrument was organized into 4 dimensions: (1) knowledge, compliance and conformity of teachers about the measures taken by the government, the ministry of education and their institution, (2) the availability of technological resources and their ability to use them, (3) perceptions about their own pedagogical skills to implement an online education and (4) implications of telework in their own teaching performance, each of which contains their respective questions.

2.4. Data analysis

The data were analyzed using descriptive and inferential statistics. First, Kolmogorov Smirnov test was used to analyze the normality of the data as explained in the following table. Afterwards the normality tests indicated that the data follow a normal distribution. These served to test hypotheses (Quevedo Ricardi, 2011) and to determine whether there was a significant difference between the group averages (SEFO, 2014) through Chi Square and t-test.

For the quantitative analysis, the survey data were aimed at teachers with the aid of the SPSS program (V.22.0) and were processed in a systematic manner. A "data analysis protocol" was used and the scientists in charge of the study were divided in three groups in order to examine the data independently to afterwards share the results with their fellow colleagues. These analyzes supported the discussion regarding the interpretations and the valid and reliable conclusions. Finally, it is necessary to note the following dimensions: (1) Knowledge and compliance of teachers about the measures taken by the Government, the Ministry of Education and its related institutions, namely those which are associated with components 2.1, 2.2, 2.3 and 2.4 of Table 2, plus dimension (2), the provision of technological resources, and the ability to use them with component 2.5; (3), the perceptions about their own pedagogical skills needed to implement an online education with component 2.7; and (4) Tele-working implications regarding teaching performance with the component 2.6.

3. Results

The results are shown in the four dimensions mentioned above: (1) the knowledge and conformity of teachers with regard to the measures taken by the Government, the Ministry of Education and its institutions, (2) the provision of technological resources and the ability to use them, (3) perceptions about one's pedagogical skill to implement online education and (4) implications of teleworking in one's own teaching performance. It is important to keep in mind that for the reading of the data, i.e. in relation to the concordance figures, sometimes the criteria "totally disagree" and "disagree" are linked with one another- thus constituting a single quantity. The same issues applies to the categories - "agree" and "totally agree ", while the category "neither agree nor disagree "was maintained as a neutral option. With regard to frequency, some items were grouped together such as "almost never and never". Also, the criteria "often, almost always and always" were used.

1). Dimension 1. Knowledge and compliance of teachers regarding the measures taken by the Government, the Ministry of Education and its Institutions.

Table 3 shows that a high percentage of teachers affirm that the measures dictated by the government were suitably clear for their application and also appropriate for the crisis without them being considered exaggerated (64.9%). However, various opinions were also presented with respect to the existence of adequate conditions for the implementation of the aforesaid measures. Finally, there are opinions stating disagreement (48.4%), namely with respect to the actions planned by the government and its relevance for each stage of the pandemic.

Sixty three point nine percent (63.9%) of teachers agree or totally agree that sanitary measures are suitable for its application: 53.4% believe that they are adequate, and 48.3% think that there are adequate conditions for implementation. For 48.4% of the respondents, the government's planning actions were not pertinent for each stage of the pandemic. Whereas, only 17.1% think that the measures were exaggerated.

Based on this information, it is clear that Ecuadorian teachers were, in general, aware of the measures taken by the government.

Table 4 shows that 61.4% of teachers approve of the measures taken by the Ministry of Education regarding the health crisis; 95.9% approve the quarantine of children; 72.7% approve of the implementation of teleworking; and, in general, 58.5% considered relevant the actions planned by the MINEDUC. With regard to the relevance of the actions planned by the Ministry of Education, 17.6% remained neutral.

Table 2. The Kolmogorov-Smirnov Test for samples.

		2.1. Regarding knowledge of the government in light of COVID-19	2.2 Knowledge of the actions carried out by the Ministry of Education related to the health crisis.	2.3 Knowledge of the actions of the school with regard to the health crisis	2.4. Knowledge of the measures regarding Covid-19	2.5. Technological skills which you depend on for online teaching	2.6 Perceptions of the implications of teleworking in school teaching	2.7 School curriculum and specific didactic guidelines that are necessary for virtual teaching
N		3183	3183	3183	3183	3183	3183	3183
Normal Parameters	Average	3,0331	3,8711	3,5427	3,4604	3,5272	3,2868	3,7512
	Deviation	0,80330	0,73648	0,92287	0,66878	0,95514	0,45994	0,65705
Absolute Categories	Absolute	0,077	0,134	0,120	0,048	0,147	0,084	0,054
	Positive	0,048	0,062	0,063	0,032	0,110	0,084	0,035
	Negative	-0,077	-0,134	-0,120	-0,048	-0,147	-0,059	-0,054
Statistics Test		0,077	0,134	0,120	0,048	0,147	0,084	0,054
Sig. asymptotic (bilateral)		,000[c]	,000[c]	,000[c]	,000[c]	,000[c]	,000[c]	,000[c]

Table 3. Teachers' knowledge about the government's measures regarding COVID-19.

Issues	Totally disagree		Disagree		Neither Agree, nor disagree		Agree		Totally agree		Not stated	
	F	%	F	%	F	%	F	%	F	%	F	%
1. The measures are sufficiently comprehensible for their application	176	5,5%	527	16,6%	437	13,7%	1461	45,9%	573	18,0%	9	0,3%
2. The measures are adequate for dealing with the period of the health crisis	225	7,1%	759	23,8%	489	15,4%	1282	40,3%	416	13,1%	12	0,4%
3. There are suitable conditions for the implementation of the measures	219	6,9%	846	26,6%	561	17,6%	1266	39,8%	270	8,5%	21	0,7%
4. The actions planned by the government were suitable for each stage of the pandemic.	381	12,0%	1159	36,4%	579	18,2%	856	26,9%	201	6,3%	7	0,2%
5. The measures were exaggerated regarding the crisis	761	23,9%	1338	42,0%	525	16,5%	385	12,1%	160	5,0%	14	0,4%

Table 4. Knowledge of the actions taken by the Ministry of Education related to the health crisis.

Issues	Totally disagree		Disagree		Neither Agree nor Disagree		Agree		Totally Agree		Not stated	
	F	%	F	%	F	%	F	%	F	%	F	%
1. Approves of the measures of the Ministry of Education with regard to the health crisis.	170	5,3%	582	18,3%	466	14,6%	1478	46,4%	477	15,0%	10	0,3%
2. The situation demands that the children remain at home for their safety/ protection from the virus.	63	2,0%	20	0,6%	32	1,0%	679	21,3%	2375	74,6%	14	0,4%
3. The actions planned by MINEDUC were pertinent for each of the stages of the pandemic.	145	4,6%	601	18,9%	560	17,6%	1383	43,4%	482	15,1%	12	0,4%
4. The teleworking and online education activities are viewed as being a good strategy.	92	2,9%	308	9,7%	454	14,3%	1446	45,4%	869	27,3%	14	0,4%

With regard to the knowledge of teachers about the actions of the educational institutions related to the COVID-19 pandemic, Table 5 shows that teachers were aware that their educational institution had worked steadily with training plans (62.4%), instructional material, and had developed procedures to facilitate their adaptation to the new reality (60.2%), thereby indicating that there was comprehensibility (52.0%).

Table 5. Knowledge of the actions of the educational institution related to the health crisis.

Issues	Totally disagree		Disagree		Neither Agree nor Disagree		Agree		Totally Agree		Not stated	
	F	%	F	%	F	%	F	%	F	%	F	%
1. The school has applied training plans to face the new teaching modality.	232	7,3%	575	18,1%	382	12,0%	1425	44,8%	559	17,6%	10	0,3%
2. There was clarity in the guidelines used for the undertakings of teachers and managers in online education.	183	5,7%	735	23,1%	603	18,9%	1250	39,3%	405	12,7%	7	0,2%
3. The school had worked on instructional materials and procedures for clarifying how to work online.	191	6,0%	586	18,4%	483	15,2%	1432	45,0%	484	15,2%	7	0,2%
4. The school had provided new technological tools for this type of online work.	139	4,4%	457	14,4%	466	14,6%	1541	48,4%	558	17,5%	22	0,7%
5. Decisions about curricular adjustments are guided by considering the problems of time and space.	143	4,5%	403	12,7%	435	13,7%	1606	50,5%	570	17,9%	26	0,8%
6. Work related to courses and academic subjects is geared towards the concept of teamwork.	138	4,3%	426	13,4%	364	11,4%	1559	49,0%	670	21,0%	26	0,8%

However, 28.8% of teachers considered the guidelines to be unclear. In addition, most teachers who were surveyed (65.9%) stated that the school had provided new technological tools to work with, thereby developing curricular adjustments in response to the problems of time and space (68.4%) and that teamwork would be enhanced by motivation strategies. (70, 0%).

2) Dimension 2. The Provision of technological resources and one's ability to use them

Table 6 shows that most teachers (95.6%) have a computer at home and that 87.2% possess a smart phone, and only 82.3% have an Internet connection. Indeed, for the latter group these teachers resorted to using other ways to be able to access online classes. Finally, only 66.2% of teachers were supported by additional resources to guide their teaching practices.

A particularly important factor is the difference between urban and rural areas in Ecuador, since the latter tends to be more vulnerable, for instance Table 6.1 was designed to show this disparity. It may be observed that the rural sector is in a clear disadvantage with respect to the urban sector since only 21.4% of the rural area teachers have a computer versus 74.2% of the urban area. What's more, only one 17, 6% of them have stable Internet connection compared to 64.4% from urban areas.

3) Dimension 3. Perceptions about their own pedagogical skills to implement online education and teleworking

Table 7 shows teaching perceptions about their pedagogical skills. A high percentage of teachers (77.3%) stated that they felt completely safe when new learning activities were being proposed. Moreover, 49.1% stated that they had parental support. On the other hand, many teachers considered online education to be suitable for school training (40.3%). In addition, they stated that they inserted new didactic strategies to generate learning and to organize the online classes via a sequential didactic process (71.6%). On the other hand, 36.5% declared that online methodologies were the same as those used in person and that they had opposing views about whether online education had had the same effectiveness as face-to-face classes. Finally, the number of teachers who said that they had worked on the integration of skills with performance criteria to facilitate online work was 74.3%. What's more, the number of those who had diversified didactic resources was 73.2%. In addition, the number of those who had reviewed and had given feedback about online students was 72.9%. The number of those who had made curricular adjustments to meet specific educational needs was 73.8%, i.e. some of the strategies that had been used to work online with students. Finally, 29.0% of teachers considered online education to have had the same effectiveness as face-to-face classes.

Table 8 shows that by May 2020, approximately 3 months after the pandemic initiated and two months after online classes officially started in the country, 75.3% of teachers reported having had some experience

of using teleworking (agree and totally agree), while 46.8% reported having prior knowledge of online education.

4) Dimension 4. Implications of tele-working in teaching

Table 9 shows that a large number of teachers consider it vital to have specific knowledge for online teaching (54.7%), thus guaranteeing feedback from students (66.0%). However, a considerable amount (24.64%) feel afraid of, or are cautious of the results of the students. 27.5% perceive a lag and delay in the acquisition of skills by students. Additionally, (17.3%) expressed a certain degree of tension (very frequently and always) at the time of planning and developing educational activities.

On the other hand, 42.7% of teachers believe that improvisation in the online classroom has led to a deterioration (in teaching quality) for teachers and students. Although 78.1% agreed on developing online activities during the quarantine period, 37.3 % of teachers said that virtual work makes communication more difficult with students.

Finally, with respect to the life and mode of work of a teacher, it was reported that the majority of them (61.3%) had managed to mediate online activities with their family-led activities. Lastly, less than half of respondents reported problems related to sleeping patterns (20.4%), and that 27.8% reported changes in their feeding patterns. In general, 80.0% of respondents declare having maintained motivation levels to perform their teaching activities.

5) Correlations between teachers' demographic profile and knowledge of COVID-19 and preparation in distance education

Correlations with Sig. (bilateral) less than 0.05 show statistically significant relationships between the variables analyzed, although most of them are weak correlations (see Table 10).

The results of the T Test for establishing the equality of averages of independent samples have been clearly set out in Table 11. Moreover, they show the difference between the demographic profile of the respondents and the knowledge of the COVID-19 pandemic. Conversely, from among the demographic profiles of the respondents, only gender has shown a significant difference with regard to the knowledge of the MED actions with respect to the health crisis ($t = 3.25$, $p = 0.06$), and the other actions taken by the school with respect to the crisis ($t = 4.29$, $p = 00$). Likewise, the geographical area of the location of the teachers shows significant differences with respect to the knowledge of the government's measures regarding Covid-19 ($t = -2.65$, $p = 0.01$) and their knowledge of the actions taken by the Ministry of Education related to the health crisis. ($t = -2,10$; $p = 0,04$).

4. Discussion and conclusions

The findings of the present study have multiple implications at the governmental, ministerial and institutional level in terms of emergency preparedness policies that restrict or avoid the holding of in-person classes.

First, the government is expected to "sponsor" the implementation of online education during times of emergency and those which motivate the alignment of efforts and communication between national, local, and institutional education agencies. Although it is true that teachers declared they had prior knowledge of and supported the measures taken by the National Ecuadorian Government, the Ministry of Education and its institutions, not all agreed with the schedule in which the aforesaid measures had been issued. Teacher training measures are thus essential for the success of any public policy.

Second, although it is true that the Ecuadorian Government had sponsored the transition of face-to-face education to a virtual model (remote emergency education), it is also true that it did not grant teachers and students the necessary "infrastructure", i.e. seeing that only 21.4% of teachers in rural areas had stated that they had a computer and 17.6%

Table 6. Technological resources teachers were able to access.

Issues	Yes		No		No stated	
	F	%	F	%	F	%
1. Teachers have a computer at home	3043	95,6%	128	4,0%	12	0,4%
2. Teachers have a smart phone	2777	87,2%	393	12,3%	13	0,4%
3. Teachers have an adequate Internet connection for online work	2619	82,3%	552	17,3%	12	0,4%
4. Teachers rely on other resources such as radio and television to guide their teaching practices	2108	66,2%	1056	33,2%	19	0,6%

Table 6.1. Technological resources in urban and rural areas.

	Urban Area						Rural Area					
	Yes		No		Not stated		Yes		No		No stated	
	F	%	F	%	F	%	F	%	F	%	F	%
1. Teachers have a computer at home	2347	74,2%	83	2,6%	9	0,3%	678	21,4%	42	1,3%	3	0,1%
2. Teachers have a smart phone	2156	68,2%	274	8,7%	9	0,3%	601	19,0%	118	3,7%	4	0,1%
3. Teachers have an adequate Internet connection for online work	2044	64,6%	387	12,2%	8	0,3%	557	17,6%	162	5,1%	4	0,1%
4. Teachers rely on other resources such as radio and television to guide their teaching practices	1570	49,7%	856	27,1%	13	0,4%	524	16,6%	193	6,1%	6	0,2%

Table 7. Pedagogical abilities for implementing online education.

Issues	Never		Very rarely		Occasionally		Very Frequently		Always		Not stated	
	F	%	F	%	F	%	F	%	F	%	F	%
1. I feel confident when proposing new learning activities.	33	1,0%	108	3,4%	581	18,3%	1000	31,4%	1451	45,6%	10	0,3%
2. I feel that there exists some support by students' parents during the proposed activities.	90	2,8%	487	15,3%	992	31,2%	953	29,9%	638	20,0%	23	0,7%
3. I believe online education is adequate for training in the school environment.	189	5,9%	575	18,1%	1122	35,2%	866	27,2%	417	13,1%	14	0,4%
4. I can include online teaching didactic strategies to generate learning.	23	0,7%	117	3,7%	747	23,5%	1172	36,8%	1107	34,8%	17	0,5%
5. I organize the class online by means of a sequential didactic process.	44	1,4%	135	4,2%	710	22,3%	1107	34,8%	1166	36,6%	21	0,7%
6. The didactic methodologies that I use are the same as those that are foreseen for face-to-face classes.	237	7,4%	837	26,3%	928	29,2%	785	24,7%	376	11,8%	20	0,6%
7. I integrate the skills with performance criteria to facilitate online work.	22	0,7%	100	3,1%	679	21,3%	1083	34,0%	1282	40,3%	17	0,5%
8. I diversify didactic resources for online classes.	37	1,2%	110	3,5%	682	21,4%	1180	37,1%	1148	36,1%	26	0,8%
9. I review and provide feedback about the students' online work.	41	1,3%	136	4,3%	652	20,5%	984	30,9%	1336	42,0%	34	1,1%
10. I carry out curricular adjustments to serve specific educational needs.	39	1,2%	141	4,4%	619	19,4%	1076	33,8%	1274	40,0%	34	1,1%
11. Online education has the same effectiveness of face-to-face education.	585	18,4%	717	22,5%	934	29,3%	718	22,6%	205	6,4%	24	0,8%

Table 8. Technological skills which one has at one's disposal for teaching.

Issues	Totally disagree		Disagree		Neither Agree nor Disagree		Agree		Totally Agree		Not stated	
	F	%	F	%	F	%	F	%	F	%	F	%
1. I am knowledgeable about tele-working.	86	2,7%	253	7,9%	428	13,4%	1674	52,6%	722	22,7%	20	0,6%
2. I have previous experience with online education.	294	9,2%	815	25,6%	568	17,8%	1024	32,2%	464	14,6%	18	0,6%

had said that they had standard Internet connections. Therefore, in a developing country such as Ecuador. where only half of the population has Internet access, online education is not a sustainable short or long-term solution. This finding demonstrates that national support for education should give priority to institutions in the least prosperous regions by providing human, financial, and technical resources to ensure quality online education and to develop material and didactic capacity to respond to these emergencies. Public policies about access to technology and good quality Internet are thus essential for educational development in Ecuador.

Thirdly, with respect to the "preparation" dimension, i.e. at the time when the sample information was collected, institutions had just started to transition from face-to-face education to virtual education. However, teachers also claimed to have knowledge about online education. Moreover, this is not surprising since previous investigations show that although some teachers may have limited knowledge of online education, they are also able to motivate and to adapt to this type of educational model. The resilience of teachers thus merits new studies especially within the context of Covid-19. Also, mostly lifelong learning and professionalization programs for teachers are organized and delivered online, for instance, a significant amount of teachers had some level of online learning and teaching.

Fourth, and contrary to previous findings in other Latin countries showing that more than half of the teachers felt overwhelmed by doing virtual work, Ecuadorian teachers who participated in this study did not report excessive changes in their work or personal life (i.e. feeding or sleeping habits), which may indicate that the distance education model could be sustainable in the long-term in Ecuador since it is a model that is progressing in terms of training policies, access to technology and the Internet, and in the psychological and emotional preparedness of teachers.

Fifth, it is necessary to do a long-term analysis about the government's actions and their acceptance by teachers from throughout the country. Although it is true that 95.9% of them had approved of the measures taken such as the quarantine of students and teleworking (72.7%), only 51.4% had actually found these to be pertinent measures.

Moreover, although positive aspects of forced migration to virtual learning environments were found, Ecuadorian teachers also expressed their distrust with respect to the effectiveness perceived with respect to student learning. Therefore, it is considered necessary to develop a system of reliable long-term online teaching and learning models. Moreover, it is necessary to work on the training and confidence of teachers using this model. In addition, although 40.3% of teachers considered online education to be suitable for school development and training, 71.0%

Table 9. Implications of teleworking in teaching.

Issues	Never		Hardly ever		Sometimes		Almost Always		Always		Not stated	
	F	%	F	%	F	%	F	%	F	%	F	%
1. I feel that I have sufficient knowledge to do online teaching.	70	2,2%	346	10,9%	1019	32,0%	1081	34,0%	659	20,7%	8	0,3%
2. I feel that I have sufficient knowledge to guarantee feedback.	29	0,9%	201	6,3%	830	26,1%	1141	35,8%	973	30,6%	9	0,3%
3. I am sometimes fearful of the results in the students' learning.	467	14,7%	885	27,8%	1043	32,8%	556	17,5%	225	7,1%	7	0,2%
4. I perceive a sense of linguistic decay and delay in the acquisition of skills by the students.	198	6,2%	800	25,1%	1289	40,5%	632	19,9%	242	7,6%	22	0,7%
5. I often feel tense at the time of planning and developing educational activities.	820	25,8%	1097	34,5%	707	22,2%	413	13,0%	136	4,3%	10	0,3%
6. I believe that improvisation with online classes has generated a sense of linguistic deterioration for students and a diminution of professionalism by teachers.	320	10,1%	515	16,2%	968	30,4%	798	25,1%	560	17,6%	22	0,7%
7. I agree in developing online activities during the quarantine period.	67	2,1%	145	4,6%	474	14,9%	966	30,3%	1521	47,8%	10	0,3%
8. I have managed to mediate (balance) family activities with online teaching.	81	2,5%	273	8,6%	853	26,8%	1148	36,1%	803	25,2%	25	0,8%
9. I have the motivation to develop teaching activities.	54	1,7%	126	4,0%	435	13,7%	917	28,8%	1630	51,2%	21	0,7%
10. Virtual teaching work often makes interaction more difficult with my students.	312	9,8%	684	21,5%	965	30,3%	800	25,1%	388	12,2%	34	1,1%
11. I experience problems in my sleeping patterns.	856	26,9%	919	28,9%	715	22,5%	414	13,0%	237	7,4%	42	1,3%
12. I have experienced some changes in my eating habits, i.e. in eating either more or less than usual.	616	19,4%	782	24,6%	878	27,6%	573	18,0%	311	9,8%	23	0,7%

Table 10. Correlations.

Categoría		13. Concerning knowledge of the government's measures regarding COVID-19	14. Knowledge of the actions of the Ministry of Education regarding the crisis.	15. Knowledge of the actions of the school regarding the crisis.	16. knowledge of the measures regarding Covid-19	17. Technological skills with which you count on for online teaching	18. Perception of the implications of tele-working in school teaching
Generation	Coeficiente de correlación	-0,026	-0,006	,087**	,040*	,074**	,081**
	Sig. (bilateral)	0,139	0,751	0,000	0,025	0,000	0,000
Gender	Coeficiente de correlación	-0,028	-,065**	-,073**	-,070**	0,007	-0,020
	Sig. (bilateral)	0,110	0,000	0,000	0,000	0,704	0,262
Years of experience	Coeficiente de correlación	-0,004	-0,029	-,112**	-,078**	-0,031	-,084**
	Sig. (bilateral)	0,803	0,098	0,000	0,000	0,084	0,000
Level of studies	Coeficiente de correlación	-,069**	-0,023	-,124**	-,110**	-0,001	-,035*
	Sig. (bilateral)	0,000	0,201	0,000	0,000	0,939	0,048
Type of institution due to geographic location	Coeficiente de correlación	,056**	,047**	-0,006	0,034	0,016	-0,029
	Sig. (bilateral)	0,002	0,008	0,739	0,056	0,355	0,099
Level of education in which the teacher works	Coeficiente de correlación	-,052**	-0,016	-,065**	-,066**	,035*	-,037*
	Sig. (bilateral)	0,003	0,378	0,000	0,000	0,046	0,036
Geographic location	Coeficiente de correlación	-,051**	-,112**	-,222**	-,183**	,052**	-,138**
	Sig. (bilateral)	0,004	0,000	0,000	0,000	0,003	0,000

**. Correlation is significant at the 0.01 level (bilateral).
*. Correlation is significant at the 0.05 level (bilateral).
6) Difference between the demographic profile of the respondents and their knowledge of the actions taken by the Ministry of Education.

believed that it does not have the same effectiveness as face-to-face education, i.e. as 27.5% had observed a gradual decline in the pace of learning of their students. This may be due to several causes, among them, using the same teaching methods in both modalities, which could have its roots in a lack of knowledge of online teaching methods.

The COVID-19 pandemic has without doubt caused serious changes in global education causing a deep reflection about teachers own practices and preparedness to face new teaching and learning contexts. As a preventive response to the massive outbreak and contagion of the disease, governments around the world have issued a mandate to implement remote emergency education (online or at a distance). In Ecuador, the presence of the virus has created an unprecedented situation in the national educational system. In just a matter of weeks, it had to be transformed from a predominantly face-to-face system to a virtual one (remote emergency). This article has reviewed some key aspects that affect the preparation and sustainability of online educational programs in times of a health emergency and has analyzed the preparedness of this type of education as perceived by Ecuadorian teachers. Its general acceptance by Ecuadorian teachers is thus clearly evident in terms of the strategies raised by the Ecuadorian State and its related educational institutions.

Table 11. T test for establishing equality within the measures.

		13. Concerning knowledge of the government's measures regarding COVID-19	14. Knowledge of the actions of the Ministry of Education regarding the health crisis	15. Knowledge of the actions of the school regarding the health crisis	16. knowledge of the measures regarding Covid-19	17. Technological skills with which you rely on for online teaching	18. Perceptions of the implications of tele-working in school teaching	19. School curriculum and specific didactic guidelines needed for virtual teaching
Gender	t	1,86	3,50	4,29	4,06	-3,01	-0,34	1,08
	gl	3175,00	3175,00	1359,55	1349,55	1371,51	3175,00	3175,00
	Sig. (bilateral)	0,06	0,00	0,00	0,00	0,00	0,73	0,28
Geographic region	t	-2,65	-2,10	0,25	-1,56	0,38	-0,61	1,66
	gl	1147,95	3160,00	3160,00	3160,00	3160,00	3160,00	3160,00
	Sig. (bilateral)	0,01	0,04	0,80	0,12	0,70	0,54	0,10

5. Recommendations

Current technological advances have likewise facilitated this process, despite compulsory social distancing norms stemming as a result of the pandemic, i.e. that a large number of teachers will continue educating their pupils by virtual means. However, this is somewhat of a non-generalized phenomenon as the sample reported that in the rural areas of the country (Ecuador), only 21.4% of the teachers were in possession of a computer and that only 17.3% had a stable Internet connection, this may be due to, among other factors, the lack of generalized infrastructure in developing countries (Jogezai et al., 2021), for instance, it is necessary for governments to allocate sufficient resources to fill both the technological vacuum and the infrastructural weaknesses in terms of connectivity that became more evident during the onset of the Covid-19 pandemic. Finally, the cross-sectional design of the study prevented the observation of the evolution of teachers perceptions as well as the institutional and political changes adopted after the data for this study was collected. Therefore, additional studies are recommended to evaluate the possible development of the preparation (perceived and real) for the implementation and sustainability of online education in Ecuador and Latin America.

Declarations

Author contribution statement

Lucy Andrade-Vargas: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Artieres Estevao-Romeiro: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

Margoth Iriarte-Solano and Vicente Jacinto Riofrio-Leiva: Conceived and designed the experiments; Performed the experiments.

Deisi Yunga-Godoy: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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