

## Virtual Teaching in Confinement due to Covid-19. Case of the Faculty of Agricultural Economics of the Agrarian University of Ecuador

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### Abstract

*With the purpose of encouraging research related to the economic, social, technological and health aspects of education, we present quantitative data from the teachers of the Faculty of Agricultural Economics of the Agrarian University of Ecuador, in order to learn about factors that intervened in the virtual teaching modality, in confinement by COVID-19. The survey format originally consisted of 49 questions containing educational, technological, health and economic data. A Principal Component Analysis (PCA) was performed, resulting in 11 components, with a cumulative percentage of 72.948, of which 7 were related among the variables (Discontinuity of virtual classes, Food budget, Labor distinction by gender, Health, Monthly expenditure, Virtual teaching, Use of virtual platforms), reflecting positive and negative factors of this modality, such as the easy adaptation of teachers to the platform, fuel savings by not moving to the institution, openness to the capacity of students on a platform. However, there are problems such as power failures, new internet service contracting, lack of commitment and student participation and above all the lack of contact between teacher and student.*

**Keywords:** *confinement – teachers - principal component analysis – Institution.*

### Introduction

The unexpected confinement due to the COVID-19 virus has produced severe records of crises around the world, affecting health, social relationships and above all the economy in general. This lethal virus, which spreads easily from person to person, led to the implementation of protective measures dictated by the World Health Organization (WHO), such as the use of masks, alcohol, gloves and social distancing, which is linked to serious conditions.

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Around the world, the virtual modality was implemented for the educational process. In some institutions it is the new teaching-learning methodology adopted in some cases without prior preparation, in this way great expectations arise from both the teacher and the student.

As mentioned by Sánchez (2022), virtual teaching in basic education was an alternative to avoid losing the current school year, but it currently reflects unexpected results, such as the lack of interaction with children, and economic inequality, thus preventing them from continuing learning.

From another perspective, Vidal, González, and Armenteros (2021) virtual teaching in higher education shows a great reception by most teachers, since they have greater ease when teaching, on the other hand there are teachers who perceived the increase in hours in the workload, together with the lack of computer culture that they have as a challenge in this teaching methodology.

As indicated by Guerrero (2020), virtual teaching, in order to be a successful experience for both links of communication: sender-receiver, must be based on the use of appropriate technologies and connectivity for all participants, especially when the teaching topics require the establishment of a dialogic dynamic. (p. 2)

Carabelli (2020) indicates that, in Higher Education Institutions in Uruguay, teachers feared the great challenge of returning to the synchronous teaching modality, using the new platforms where their tools would be used for videoconferencing, in turn it was necessary to implement courses or workshops on this teaching. (p. 168)

Valero et al. (2020) argue that virtual teaching is complex, as it also depends on the academic level of the students, but there are multiple tools that are of help, videos and software for university students that have indefinite access. (p.1211)

In their research Cabrera, Sánchez, and Rojas (2016), virtual learning objects (VOLs) are digital teaching-learning tools, used by teachers as support material inside the classroom or outside it, thus raising the academic level of students at the University of Colombia.

Cabrera, Sánchez, and Rojas (2016), consider in their section benefits of putting into practice the (OVAS) for teachers, allows monitoring the use of materials by students, standardizes content for wider use, streamlines administrative and knowledge management processes, facilitates communication with students, on the other hand, there are also disadvantages, It requires access to broadband internet, it is necessary to have economic resources, lack of training for teachers in the use of ICTs and educational tools.

The objective of this research article is to identify the different factors that intervened in virtual teaching, due to the confinement during the Covid-19 pandemic, which takes as a sample the professors of the Faculty of Agricultural Economics of the Agrarian University of Ecuador. Based on this premise, the study seeks to contribute to the development of research on highly relevant topics with a high impact on both education and health.

## Materials and method

For the selection of the questions addressed to the teachers, an important research was carried out, so it is necessary to represent them as variables to each of the aspects that have been considered for the study.

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### Personal aspects

(G)	Gender
(E)	Age

(S)	Headquarters
(PV)	Number of people who lived with you during the lockdown
(CPA)	The house where he lived in confinement was owned or rented

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Educational aspects

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(PE)	People who were studying at home during lockdown
(DC)	His lectures regarding the syllabus were uninterrupted or interrupted
(MFH)	Taught the subject outside of class hours
(PP)	Percentage of virtual classes taught
(PA)	Percentage of student learning in virtual classes
(RE)	Relationship with the student in virtual classes
(AL)	I had more work activities than in face-to-face classes
(M)	Methodologies applied in virtual classes
(ICE)	Enrolled in an online educational-pedagogical course
(CEL)	The knowledge will enable students to cope with the work environment
(PV)	I knew of a virtual teaching-learning platform
(NPM)	She was trained to manage new platforms for the educational process
(PE)	Educational platform I used most often
(PUF)	How often you used virtual educational platforms
(IMV)	I would like to teach classes in the virtual modality

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Technological aspects

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(AI)	During the lockdown, did you have access to the internet at home?
(CI)	Quality of the internet where he connected
(DE)	Ease of an electronic device at your fingertips
(DCV)	What device you used to teach the virtual classes
(DE)	Electronic devices for teaching virtual classes
(HDE)	Hours a day he spent in front of an electronic device
(PDE)	People connected from the same electronic device
(DEU)	I used electronic devices to study, telework

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Health Aspects

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(C19)	Had COVID-19
(CC19)	Someone close to you had COVID-19
(FC)	Someone close to you has passed away
(MPO)	Had medical, psychological, or dental care
(DDC)	You have a disability that makes it difficult for you to comply with virtual teaching

(TD) | Point out the type of disability

Economic aspects

(IM)	Monthly Household Income
(PAE)	People who carried out economic activity at home during the lockdown
(OFI)	I had some other source of income
(MFI)	Under what modality did it do it?
(GET)	What were the household's monthly expenses on education and technology?
(GS)	What were the household's monthly health expenses?
(GM)	What were the monthly expenses of the household in mobilization?
(GAL)	What were the household's monthly food expenses?
(NGPA)	He had to make new expenses for his academic process

The data used in this article are cross-sectional, since they were collected at a single moment and for a single time, based on a principal component analysis (PCA) method for their reduction, whose analysis is exploratory, which have been collected through primary source, information given by the 49 teaching professionals of the Faculty of Agricultural Economics of the campuses corresponding to the Guayaquil campuses. Milagro y el Triunfo of the Universidad Agraria del Ecuador, whose form contains 46 questions, seeking to identify those factors that affected virtual teaching, in times of confinement due to COVID-19, during the period from 2020-2021.

To obtain the results, the statistical program Statgraphics was used together with the methodology to be used (PCA), this technique studies the relationship between correlated variables allowing their number to be reduced to a set of uncorrelated variables (Tello & Díaz, 2020), in the field of scientific research it is very feasible in the treatment of quantitative data by allowing the transformation of multidimensional information or set of simple indicators in new variables or a set of composite indicators, known as components, that explain most of the original variables and their interrelationships (Quindemil & Rumbaut, 2019).

The principal components are characterized by being a linear combination of all the original variables, so that they are independent of each other and are estimated in order to contain, in the order in which they are estimated, the maximum information contained in the original data. Therefore, principal component analysis is associated with the idea of reducing the mass of data with the least possible loss of information (Medeiros, Goncalves, and Camargos).

Principal component analysis is shown as:

$$Y_{ij} = Z_{i1}X_{1j} + Z_{i2}X_{2j} + Z_{i3}X_{3j} + \dots + Z_{im}X_{mj} \dots$$

Where:

Z: Component load.

Y: Component scoring.

X: Measured value of a variable.

i: Component number.

j: Sample number.

m: Total number of variables.

## Results

The Principal Component Analysis model was carried out, where 30 questions were selected from the teacher survey form, which were the most relevant for this study.

A general rule to identify the number of components to be extracted is by means of the Eigenvalor indicator and observe that the results are greater than 1, for this work, a total of 11 main components have been extracted, obtaining a cumulative of 72, 948% that explains the variation in the data.

The values are represented on a descending scale, with the first component of Eigenvalue representing 3.30962, explaining 11.032 of the percentage of variance.

With respect to the table of weight of the components, the coefficients of linear correlation between each main component and the indicators are identified, the highest absolute value is observed, and then groups are formed and renamed.

Component 1 groups 3 of the 30 variables, which are: (DC), 20.4% of teachers reported having had interruptions during class hours, on the other hand, 79.6% of teachers had not had any type of interruption. (MFH), 73.5% indicated that they did not have to teach classes outside the established hours, but 26.5% for reasons such as power failures, experimental hours, and because students requested it, they had to extend classes, outside of the schedule. How do you consider the quality of the internet where you connected? (CI), 24.5% of the teachers indicated having very good internet quality, but for the vast majority, 65.3% had only a good internet connection, and finally, 10.2% had a regular internet service. That is why we call this first component as the discontinuity of virtual classes.

Component 2, unlike the previous one, groups 4 of 30 variables, (PP), (MNP), (C19) and (MPO), this component is equivalent to 10.179 percent of the variance, however, no agreement was found between the variables.

With regard to component 3, it is called the food budget, since it has 2 of the total variables which are (OFI), 79.6% of the teachers indicated that they have no other source of income, but 38.8% have rented apartments, interest that they generate in accounts of financial institutions, carry out training and work part-time in another institution. Regarding the second variable (GAL), ranges of expenses were established, 16.3% spend from \$0 to \$200, 12.2% spend between \$201 to \$400 per month on food, with respect to 34.7% spent between \$401 to \$600 monthly during confinement, 22.4% spent from \$601 to \$800, 10.2% of teachers spent approximately \$801 to \$1000 and finally only 4.1% spent more than \$1001 on food. Any other source of income was used for food, because they preferred to be better fed than to have to go to the doctor.

Component 4, called labor distinction by gender, includes the variables, (G) identifying that 46.9% are men and 53.1% are women who work in the Faculty of Agricultural Economics of the 3 campuses corresponding to the cities of Guayaquil, Milagro and El Triunfo. In the second variable (LA), 28.6% said they did not have a longer workload, but with respect to the 71.4% who said they had a greater workload in times of pandemic, this is due to the change of position of some teachers who, apart from being teachers, were also thesis tutors or were promoted to the position of coordinators. 47.8% of the total number of respondents represents men who say they have not had an increase in work activities during confinement, on the contrary, 52.5% indicate that they have increased their working hours. In contrast to women, 11.5% indicated that they did not have more working hours during the confinement. On the other hand, 88.5% of the total number of women indicated that they taught more hours of virtual classes.

With respect to component 5, it is equivalent to 44.247 of the cumulative percentage, which groups 3 variables (RE), (PV) and (GAL) given the null relationship between the elements indicated, it would not have any type of relationship.

Component 6, which is called health, accounts for 50.986 of the cumulative percentage, which groups together 2 of the 30 variables (HDE) showed that about 20.41% of teachers spent 5 to 6 hours in front of an electronic device, 28.57% indicated that 7 to 8 hours were the most they spent in front of an electronic device, Due to working hours, 46.94% of teachers indicated that they spent 9 hours or more, for their teaching hours, tutorials, preparing material for the following sessions. Regarding the variable (DCV), 10.20% used desktop computers, 75.51% taught classes from a laptop, and 14.29% used 2 devices for classes.

The variables that were grouped in this component showed a series of records, laptops were more used because of their ease, but the more hours the teacher spent in front of a computer, the more back pain, cramps and numbness of the feet increased, in other cases they began to have spots on the skin, due to the light reflected by the electronic device.

Component 7, called monthly expenses, yields 56.577 of the cumulative percentage, grouping the variables (GET), the results obtained were, 28.58% of the teachers had monthly expenses in the range of \$0 to \$200, 14.29% indicated spending between \$201 to \$400, 12.24% spent \$401 to \$600, 6.12% and 4.08% spent monthly during confinement between \$601 to \$800 and \$801 to \$1000 respectively, Finally, in this cycle of confinement, 34.69% of teachers spent \$1001 or more on education and technology, due to the acquisition of new equipment for the continuity of work in virtual mode. And with respect to (GS), approximately 71.43% of the University's faculty spent between \$0 and \$400 on health. In times of confinement, the biggest expenses were education and technology, to prioritize studies or teleworking remotely, since many did not contract the disease, did not spend on medicine, but saw the need to acquire a new electronic device.

In the case of component 8, it forms a cumulative percentage of 61,699 grouping 4 of the 30 variables which are (ICE), (DEU), (MPO), (IM), demonstrating nullity of relationship, for this reason no conceptual sense was found in the component.

Component 9, called virtual teaching, representing a maximum absolute value of -0.42 and explaining 65.871 of the total accumulated percentage where 4 variables were estimated which are, (M), the teaching-learning methodology used by 59.18% of the teachers corresponds to the flipped classroom, project-based learning and conventional education, with respect to (IMV), 26.53% of teachers stated that they do not want to teach classes in the virtual modality, due to the lack of interaction between the teacher and the student, lack of good management of virtual teaching platforms, while, for 73.47% of teachers expressed the desire to teach classes in the virtual modality, As it facilitates the breadth of parts to connectivity from anywhere in the world, it saves time, money, and fuel. The variable (DI) shows that 75.51% of teachers taught classes from a laptop, and 24.49% used 2 or more devices for classes. Finally, the NGPA indicates that around 51.02% had to make new expenses for the educational process, making purchases such as headphones, microphones, whiteboards and even a PC. 48.98% had no expenses for the new academic process of virtual teaching.

This mode of teaching was implemented for the first time in the Institution, so that, in the first instance, no one was prepared, therefore, they had expenses to provide the classes in a better way.

Component 10, which takes the name, use of virtual platforms, reflecting 69.509% of the accumulated percentage, grouped by 4 variables, which (S), 51.02% of the teachers surveyed are from the city of Guayaquil, 34.69% from the Milagro campus and 14.29% from Triunfo. Regarding (PUF), 61.22% of teachers used more than 2 platforms (Zoom, Teams, Edmodo, Moodle), due to the lack of knowledge in the manipulation of them, one

platform was used to assign homework and others for virtual classes. (DE), 57.74% of teachers had around 2 to 3 devices to teach classes, (Laptop, cell phone, desktop computer) therefore 46.94% spent more than 9 hours in front of an electronic device, (PDE), either teaching or preparing class material and teleworking.

Finally, in component 11, with a total of 72.948% of cumulative percentage, where the variables (AP) and (PAE) are grouped, no relationship was found between these variables, therefore, they lack conceptual sense.

## Conclusion

It is concluded through the survey addressed to the professors of the Agrarian University of Ecuador that the virtual teaching modality adopted unexpectedly was well received, obtaining as positive results, such as, they had more time to study a course or master's degree, use of several virtual platforms that allow improving the level of teaching, Above all, the wide access to virtual classes is considered, from anywhere in the world, covering with greater capacity the access to the platforms, that is, the teachers grouped 2 classrooms on the same platform and in this way the syllabus was effectively advanced. Teachers saw the possibility of receiving more income with another job, either training or being part-time teachers in another institution.

On the other hand, factors that are considered unfavorable for virtual teaching were detected, such as the interruption of classes due to lack of devices, failures in the internet, also stating that students were not prepared for virtual classes, due to distractions on social networks and simply because they are not committed to paying attention in virtual classes. Another negative factor, when the subject that is taught virtually is quantitative, it is difficult to graph, chart and explain them.

Regarding the academic level for the institution, it was beneficial to teach the classes virtually, favoring aspects of health, economy and technology. In addition, the increase in student averages was remarkable.

Hybrid classes should be considered for future school cycles, as 90% of teachers are willing to do so, and it is more practical for both teachers and students.

Finally, the COVID-19 pandemic came to accelerate, update and innovate in technology, although the study population was greatly affected at the beginning of the confinement, it was possible to adapt progressively to this change.

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