# **Rural and urban university students and their vulnerability with respect to technology:** a systematic review*

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## Abstract

The Covid-19 pandemic forced universities to shift to an online learning modality and to dispense with face-to-face education, highlighting the inequality of opportunities and fewer education options in some sectors of the population. Students from rural areas had the greatest difficulties due to the possible lack of access to technological means and the quality of their internet connections. The present article is a systematic review of the literature about rurality and the use of technology in the university setting during Covid-19, through the analysis of 105 articles extracted from the Web of Science and Scopus, which were screened following the PRISMA guidelines, for a total of 17 valid articles. The results describe the university policies developed, the technologies utilized, the difficulties, and the good practices conceived. It is possible to conclude that the challenges experienced by rural students were greater than urban students, and being aware of this, the university policies worldwide opted for ensuring financial resources that could serve as support to these more vulnerable student sectors, so that they could follow the online classes. There is still much to be done, and it is necessary to adapt higher education to the specificities of rural areas and online education, to achieve a greater equality of opportunities.

## Keywords

Rural area – University – Pandemic – Information and communication technologies – Research on scientific literature

***** The authors take full responsibility for the translation of the text, including titles of books/articles and the quotations originally published in Spanish.

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https://doi.org/10.1590/S1678-4634202551279787en

## Theoretical framework

The pandemic had many repercussions in every area of life (Balluerka *et al*., 2020; Bartlett *et al*., 2020; Roy *et al*., 2020; Xie; Chen, 2020; Wu; McGoogan, 2020): in health (high death rate and other health alterations), social aspects (low or no physical contact with other people), psychology (appearance of anxiety states, depression, etc.), education (obligation of stopping face-to-face classes to make them virtual), and the economy (high rates of sick leaves due to Covid-19, high number of individuals without work...), etc. All of these had repercussions with respect to the habits and behaviors of people: the performance of physical activity decreased, the use of technological devices increased (mobile phones, computers, TVs,...), and fear of uncertainty increased, having an effect especially on individuals who were excluded or at risk of exclusion, as well as the most vulnerable ones (Apaza *et al*., 2020; López; Rodó, 2020; Mengin *et al*., 2020).

In the area of education, this emergency situation led to the massive closure of education centers worldwide, including universities. According to the UNESCO data (2020), by the middle of May, 2020, more than 1.2 billion students at all levels of education were forced to dispense with face-to-face education, in benefit of virtual teaching. The digital space became a fundamental resource for access to information, education, to participate in the economy, leisure, and for any activity that involved social interaction (Bonilla; Muñoz, 2022). This forced, massive, and abrupt transition of face-to-face education to a virtual format posed challenges regarding issues such as the quality of teaching, the participation of students (Del Arco *et al*., 2021a), and access equality to technological resources, among others. This transition, which was not planned, exposed and amplified inequalities such as the existing divides in terms of access to technology, digital competences, and the learning conditions at home. Likewise, the adaptation to virtual teaching was a significant challenge for teachers, who only had a very scarce preparation on the pedagogic use of technology, and in most of the cases, the structure, strategy, and manners of teaching in face-to-face education were transferred to the virtual modality, ignoring that both environments require a different pedagogical approach. Authors such as Bates (2022) and Cellini (2021) argue that the effectiveness of online learning depends on the capacity of the teacher to create learning experiences that are intrinsically interactive and adapted to the peculiarities of the virtual environment, and this was difficult to achieve during the emergency situation experienced.

The UNESCO (2020) and authors such as Zhao (2020) point out that these issues are particularly critical in contexts of low resources and in rural areas, where the internet infrastructure and the availability of adequate resources is limited, and where we find an isolated population that is not well connected.

Rurality, worldwide, is somewhat ignored due to the attention given to the urban sector, which ultimately prevails, creating endemic deficiencies that affect access to opportunities, manifested as depopulation, isolation, dependence on urban areas for their socioeconomic development, etc. Thus, the pandemic exacerbated the inequality in the access to educational opportunities through digital means, increasing the pre-existing divides (CEPAL, 2020; Barrantes *et al*., 2020) associated not only to access to equipment or

connection to the internet, but also to the mastery of a series of skills for the educational use of technology.

The university context was not unaware of these circumstances. The pandemic provoked a certain level of stress and concern in the university system, particularly in academic administration, professors, and students, as the teaching-learning process is generally designed to be conducted in person (Del Arco *et al*., 2021a). The university population also needed to use technological tools to take part in the virtual classes. Although most universities have platforms to support learning (virtual campus), it is also true that not all of them give a response to the users and the moment of crisis that had to be faced (Espinel *et al*., 2021).

Although it may seem that universities would be less affected than the rest of the levels of education, this was not the case. An example of this confusion was the generalized increase in the permanent training offered to teachers, especially on aspects related with technological tools, but also on everything related to virtual teaching methodologies, communication subjects, etc. (Al Terenko; Ogienko, 2020; Suárez Monzón, 2020; Toquero; Talidong, 2020; Del Arco *et al*., 2021b; Ramos-Pla *et al*., 2021; Ramos-Pla *et al*., 2022), to overcome their deficiencies in technological skills.

In the context, one of the most vulnerable collectives was that of university students in rural areas. The rural population, confined and fenced in by perimeter closures, suffered great restrictions with respect to their social interactions, which increased by the deficient internet connections and information networks (Dasinger; Gibson, 2022; Makgahlela *et al*., 2021; Mhandu *et al*., 2021; Rotas *et al*., 2020). In fact, a study conducted with African students in rural areas underlined that they were relatively satisfied with the support received, in first place, from hospitals, followed by banks, and lastly, the government. However, many students were disappointed with the support received from the university (Chinaza; Jogymol, 2021).

Other studies conducted at universities in Latin America provided evidence on the structural contrasts and differences between rural and urban areas. The unequal coverage and the connection costs indicated discrepancies among the university student population. In most of Latin American countries, more than 90% of the rural homes did not have an internet connection, and the rest did not have unlimited access (CEPAL, 2020). Thus, students had to think of different strategies to be able to continue with their virtual education, and for this, a mobile phone with a data plan was an essential resource. However, this did not help with the practical training that is part of most university degrees, which was strongly affected.

In summary, the pandemic served as a catalyst for re-assessing and re-thinking the use of digital technologies in education. The experience highlighted the urgent need for education policies that promote the technological and pedagogical capacitation of teachers, as well as the development of infrastructures that guarantee equal access to digital technologies for all students. Education of the future must be resilient, inclusive, and able to take advantage of digital technologies to overcome physical and socio-economic barriers, instead of amplifying them.

The aim of the present study is to analyze prior studies that combined rurality, technology, university, and the pandemic. Given that many studies have been published

on the subject in the last few years, it is important to systematically read them, review them, and analyze them.

It is thus important to ask a series of questions such as: in what countries and university contexts in the world did the studies take place? What specific university policies were developed during the pandemic? Did they involve students in rural areas? What technologies were used? What possibilities and difficulties did the available studies describe? Therefore, a systematic review of the literature is needed to provide answers to these questions.

## Methodology

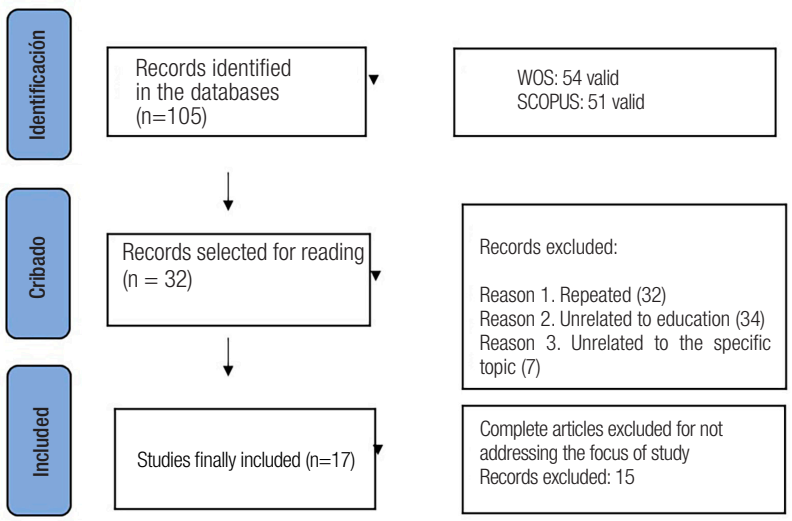
The general objective of the present study was to analyze the international scientific production with respect to four large areas: (1) rural areas, (2) technology, (3) the university, (4) Covid-19. The intention is to obtain a global view of the situation of rural university students during the Covid-19 years, with respect to access and use of technology. Likewise, the intention is to identify good practices developed by universities and to provide guidelines for improvement in similar contexts in the future.

For this, searches were conducted in the Web of Science (WOS) and Scopus databases, as these are currently the most important and complete databases internationally, given the quality and high number of high impact scientific publications stored in them. The method followed was a Systematic Review of the Literature, in line with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Page *et al*., 2021). In summary, the aim of this method is to systematically identify, assess, and interpret the works published in a given field, to provide an answer to one or more research questions in a defined period of time (García-Martínez; Martín Romera, 2019; Page *et al*., 2021). The review process is composed of different actions: a research equation is created based on keywords; inclusion and exclusion criteria of the articles are defined; the analysis variables on which the reading of the selected texts will be focused are defined, and the results are screened.

In the present study, the systematic review began with the design of a search equation that was common for both databases: [TITLE (rural OR town)] AND [TOPIC (universit* OR “high* educat*” OR “tertiary educat*” OR undergraduat* OR bachelor OR master OR college)] AND [TOPIC (internet OR moodle OR blackboard OR sakai OR virtual OR “online educat*” OR “mobile phone” OR computer OR laptop OR tablet OR connect* OR device OR platform OR technology OR videocall* OR “cisco webex” OR zoom OR teams OR skype)] AND [TOPIC (Covid-19 OR pandemic OR lockdown)]. The TOPIC field in WOS is equivalent to TITLE-ABST-KEY.

The search yielded a total of 105 articles to begin the study, of which 54 came from the WOS, and 51 from Scopus. After screening, 31 repeated articles were excluded, as well as 34 not related to the area of education, while 7 did not fit the specific topic. The 33 articles that passed the initial screening were analyzed, after which 15 were excluded as they did not fit the aim of the study. Ultimately, 17 articles were used for the final analysis.

**Figure 1-** Flow diagram




Source: Created by the authors.

From each of the 17 articles, information on the variables object of study was extracted, and a matrix table was created, which was analyzed quantitatively (descriptive analysis) and qualitatively (categorization). The variables object of study were:

A. country where the study took place;
B. university context in which the study was conducted;
C. university policy during the confinement or pandemic due to Covid-19;
D. students involved in the study;
E. technologies used by the universities during the confinement or pandemic due to Covid-19;
F. possibilities from this situation;
G. difficulties from this situation;
H. good practices employed.

All the articles analyzed can be found in the bibliographical references (Aydin; Kose, 2021; Barros de Melo *et al.*, 2022; Blattner *et al.*, 2022; Boulger; Onello, 2020; Browne *et al.*, 2021; D'Amico *et al.*, 2022; Essel *et al.*, 2020; Fengwei; Wang, 2020; Fields *et al.*, 2020; Gocotano *et al.*, 2021; Dadhe and Kuthe, 2021; Melendez Grijalva *et al.*, 2021; Mhandu *et al.*, 2021; Motaung; Dube, 2020; Omodan, 2020; Pattison-Meek, 2021; Siddiqui *et al.*, 2021). From each of these articles, information was extracted related with the variables of analysis. This descriptive work is detailed in the results, summarized in the conclusions, and problematized in the final discussion.

## Results

The results are organized based on the variables object of study. The two main variables are analyzed jointly.

### Countries and university contexts

The 17 articles analyzed came from different parts of the world, except for Europe, where no studies were conducted: 7 studies were conducted in the Americas, 5 in Asia, 4 in Africa, and 1 in Oceania. With respect to the university contexts in which the studies took place, a great disparity was observed: some were conducted at the level of university, while others at the level of the faculty, academic year, course, etc.

**Table 1-** Continents, countries, university contexts and authors of the studies analyzed

| Continent | País | University context | Authors |
|---|---|---|---|
| America (7 studies) | Brazil | Specific online university course created for the prevention of Covid-19 | BARROS DE MELO *et al.*, 2022 |
| | United States | Faculty of Medicine. Universidad de Minnesota. | BOULGER; ONELLO, 2020 |
| | United States | Subjects related to Medicine and Social Work at a university in South Carolina. | BROWNE *et al.*, 2021 |
| | United States | Two colleges in rural North Carolina | D'AMICO *et al.*, 2022 |
| | United States | Texas A&M University-Commerce (Mid-sized regional rural university) | FIELDS *et al.*, 2020 |
| | Canada | Ontario Institute for Studies in Education, Universidad de Toronto | PATTISON-MEEK, 2021 |
| | Mexico | National Pedagogical University of the State of Chihuahua | MELENDEZ GRIJALVA *et al.*, 2021 |
| Asia (5 studies) | Turkey | Ankara Yildirim Beyazit University (AYBU) | AYDIN; KOSE, 2021 |
| | China | University subjects organized around three modules: theoretical, skills development and management. | FENGWEI; WANG, 2020 |
| | Filipinas | Cebu Technological University- Moalboal | GOCOTANO *et al*, 2021 |
| | India | Lokmanya Tilak Mahavidyalaya University | DADHE; KUTHE, 2021 |
| | Pakistan | Liaquat University of Medical and Health Sciences | SIDDIQUI *et al.*, 2021 |
| Africa (4 studies) | Ghana | Kwame NKrumah University of Science and Technology | ESSEL *et al.*, 2020 |
| | South Africa | University of KwaZulu-Natal - Howard College Campus | MHANDU *et al.*, 2021 |
| | South Africa | South African State University | MOTAUNG; DUBE, 2020 |
| | South Africa | N.A. | OMODAN, 2020 |
| Oceania (1 study) | New Zealand | Postgraduate degree in rural medicine | BLATTNER *et al.*, 2022 |

Source: Created by the authors.

## University policies

The university policies were centered on various lines of action:

• First, on the adoption of measures to preserve the health of the university community and the population in general: closing of installations, informational campaigns, hygiene and use of alcohol-based gels, ventilation, etc. Also, the students in their last academic years of health-related degrees made themselves available to the population.

• A decision was made to stop face-to-face classes and move onto digitalized education. Most of the universities were partially prepared, although with little experience in combining face-to-face teaching and online teaching. This change from face-to-face teaching to virtual teaching was performed under important challenges of equality created by the unequal universal access to internet and technological infrastructures, the capacity of the broadband connection, and also the lack of competences and pedagogy to perform this digital education. The World Bank (2020) points out that different distance learning formulas were created, from the sending/submitting of tasks via email, to the use of normal mail, the television, the radio, telephones, and mobile applications where a broadband connection was limited. Support for the most vulnerable students with technological resources: lending technological devices.

• Support to teachers, by expanding the offers of continuous training for the development of digital skills and didactic strategies for development.

The IESALC UNESCO (2020) report concluded by affirming that with respect to university policies, except for the different specificities, the different countries tended to limit themselves to three things:

a) Administrative measures to guarantee education, such as, for example: modifications in the enrollment or exam calendars, re-programming the teaching, and re-organization of university access tests, etc.

b) creation of financial funds to support Higher Education, to be able to tend to the virtualization of teaching or to tend to the most vulnerable students, or to make teaching or administrative work more efficient at home;

c) the promotion of continuous training activities, especially related to the use of digital platforms, the training of teachers in the development of virtual teaching, and the creation of digital resources and materials (Blackman *et al.*, 2020).

## Students involved

In the different texts analyzed, the students who participated in the studies were preferably from rural areas, who had to face important challenges for follow the online classes, fundamentally due to the lack of infrastructures to connect with and the isolation of the population.

## Technologies used

Of the total articles analyzed, 14 mentioned the technologies used. For the development of teaching activities, the most utilized technological solution was the videoconference, observing that the Zoom tool was the most utilized, as explicitly mentioned in 5 of the studies: on the one hand, Blattner *et al.* (2022), Boulger; Onello (2020), who only pointed to the use of this tool, and on the other hand, Fields *et al.* (2020), Pattison-Meek (2021) and Melendez Grijalva *et al.* (2021), who complemented the use of Zoom with other tools (emails, forums, WhatsApp, Meet, or virtual platforms such as Moodle). In addition, 2 studies indicated the use of solutions that were different from Zoom: Browne *et al.* (2021), who used Polycom RealPresence Utility Carts, and Essel *et al.* (2020), who conducted audio teleconferences with smartphones.

It must be stressed that the use of mobile phones was highlighted in many of the articles analyzed, such as Mhandu *et al.* (2021). In other articles, the use of WhatsApp was specified as the solution for achieving connectivity (Gocotano *et al.*, 2021; Melendez Grijalva *et al.*, 2021; Motaung; Dube, 2020; Omodan, 2020).

Lastly, 3 of the articles referred to learning management tools, such as Moodle (Fengwei; Wang, 2020; Barros de Melo *et al.*, 2022; Mhandu *et al.*, 2021), and only one indicated that to solve the situation, they used channels such as YouTube or MOOC platforms (Dadhe; Kuthe, 2021).

Siddiqui *et al.* (2021), Aydin and Kose (2021) and D'Amico *et al.* (2022) did not mention the tools used to deal with the situation of access and use of technologies of university students in rural areas in the Covid-19 years.

## Possibilities

The analysis conducted allow us to glimpse many possibilities once the situation had been overcome. In first place, many of the studies mentioned possibilities related with the students (Aydin; Kose, 2021; Boulger; Onello, 2020; Browne *et al.*, 2021; Melendez Grijalva *et al.*, 2021; Motaung; Dube, 2020). Their positive assessment and the satisfaction of being able to follow the courses virtually stood out, as well as their participation, the performance and acquisition of knowledge, which were not affected. In addition, no dropouts was observed despite the problems that occurred.

With respect to the teachers, D'Amico *et al.* (2022) highlighted the fact of observing a strong commitment by students to overcome the obstacles that emerged. Also, Fields *et al.* (2020) observed that the situation was interesting for improving teaching. On their part, Blattner *et al.* (2022) and Pattison-Meek (2021) underlined the fact that teachers positively assessed their ability to continue teaching through virtual classes.

Lastly, possibilities were observed in the university setting itself (Barros de Melo *et al.*, 2022; Blattner *et al.*, 2022; Gocotano *et al.*, 2021; Essel *et al.*, 2020; Fengwei; Wang, 2020; Mhandu *et al.*, 2021; Omodan, 2020). In this case, considering online teaching as a valid and valuable alternative for students in rural or remote areas was highlighted. The institutional challenge was mentioned, which implied developing a technological strategy,

and ensuring that the students received the human and technical support needed. The need to have contingency plans to use technologies in case of emergencies was also proposed.

In their work, Dadhe and Kuthe (2021) and Siddiqui *et al.* (2021) did not discuss the possibilities that emerged when dealing with an unprecedented situation such as the pandemic.

## Difficulties

Of the total articles analyzed that referred to the situation of university students in rural areas during the Covid-19 years, with respect to access and use of technology, 16 of them presented research on the difficulties that emerged. In this sense, 7 of the articles underlined limitations related with access to the Internet in a rural context, and the lack of technological devices to follow the classes (Gocotano *et al.*, 2021; Dadhe; Kuthe, 2021; Meléndez Grijalva *et al.*, 2021, Mhandu *et al.*, 2021; Motaung; Dube, 2020; Omadan, 2020; Siddiqui *et al.*, 2020).

Next, the greatest limitation perceived was the lack of training (analyzed in 4 articles), for both students and professors (Blattner *et al.*, 2022; Essel *et al.*, 2020; Meléndez Grijalva *et al.*, 2021; Motaung; Dube, 2020). This is due to the abrupt interruption of the face-to-face classes and the mandatory (without anticipation) transfer of the classes to virtual environments.

On the other hand, 2 articles (Fengwei; Wang, 2020; Boulger; Onello, 2020) underlined that the greatest difficulty was to perform the practical parts of the classes virtually (such as Medicine or Nursing practices, etc.). The lack of forecast of the confinement did not allow for planning laboratory practices, with patients, students, etc. (depending on the degree), so that the virtual setting would be as close to reality. Also, another 2 articles (Blattner *et al.*, 2022; Boulger; Onello, 2020), underlined the lack of human contact as a limiting factor in virtual teaching. However, in two studies (Browne *et al.*, 2021; Fields *et al.*, 2020), contrary to the rest, the students did not perceive any difficulty with respect to online education.

Lastly, and to a lesser degree, other limitations of virtual education in rural environments were underlined, such as:

- the number of enrollments by students in rural contexts decreased during the confinement (D'Amico *et al.*, 2022);
- students in rural areas did not finish the academic year during the pandemic (Barros De Melo *et al.*, 2022);
- a great difficulty emerged in being able to implement and follow safety protocols that would avoid, for example, fake identities or plagiarized works (Essel *et al.*, 2020).
- the rural students perceived having insufficient digital competencies (Dadhe; Kuthe, 2021);
- low satisfaction with regard to virtual teaching (Meléndez Grijalva *et al.*, 2021);

• the students had little motivation to follow the university classes from home (Meléndez Grijalva *et al*., 2021);

• little diversification was perceived of teaching strategies in virtual environments (Meléndez Grijalva *et al*., 2021);

• one of the studies (Aydin; Kose, 2021) highlighted that the students in rural settings perceived less psychological, social, and economic difficulties than those who lived in cities due to the context where they lived.

## Good practices utilized

Of the 17 articles analyzed in the present study, 10 described the good practices used with university students in rural settings during the Covid-19 years, with respect to access and use of technology. In this sense, 3 articles (D'Amico *et al*., 2022; Mhandu *et al*., 2021; Motaung; Dube, 2020) mentioned good practices recommendations for the future, which were described starting from the actions performed in the studies. The recommendations cited were:

• having in mind, in future crisis situations, that students come from different geographical areas within rural settings, so that the cases are different. It is also recommended that new communication channels must be established with the students, considering the needs of the students who live in rural areas, and the performance of innovative actions (D'Amico *et al*., 2022);

• provide students (especially those in their first year) training on digital competence, and establishing strategies of action and support from professors to students (Mhandu *et al*., 2021);

• encourage professors to carry out effective tutoring with all the students and formulate frameworks of action about the use and abuse of the new technologies (Motaung; Dube, 2020).

Next, two of the articles (Barros de Melo *et al*., 2022, Browne *et al*., 2021), indicated that a very effective good practice was to train both students and professors on subjects related with the pandemic (especially about how to avoid infection).

Lastly, the remaining articles showed different reference practices:

• teaching classes in virtual environments, due to the pandemic, was an effective solution so that rural students could finish the academic year (Fengwei; Wang, 2020);

• rationalizing the contents that were taught in face-to-face classes, as teaching in virtual environments required different parameters and needs (Blattner *et al*., 2022);

• the use of videoconferencing tools for virtual classes was very useful for rural students (Essel *et al*., 2020);

• the efforts made by the professors to adapt to the new circumstances were highlighted, considering the students in rural areas (Boulger; Onello, 2020);

• the learning assistants were very functional to provide support to the virtual classes (Fields *et al*., 2020);

• the development of practical communities, where professors and students shared knowledge and experiences due to the pandemic, were significant for the improvement of virtual teaching (Fields *et al.*, 2020).

## Discussion and conclusions

Based on the analysis performed, different elements for discussion can be established. In first place, it is notable that no studies were conducted in Europe, with a predominance of studies from America observed (Barros de Melo *et al.*, 2022; Boulger; Onello, 2020; Browne *et al.*, 2021; D'Amico *et al.*, 2022; Fields *et al.*, 2020; Melendez Grijalva *et al.*, 2021; Pattison-Meek, 2021). Likewise, there were no comparative studies between countries. These facts could be due to the perception of rurality significantly varying in different parts of the world, reflecting the complexity and diversity of the rural reality (Basconzuelo, 2019).

With respect to the university policies developed during the confinement, the global alignment towards three key lines of action must be highlighted: in first place, health, ensuring the health of the university community. In second place, education, ensuring the continuity of education processes, by shifting from a face-to-face modality to a virtual one. And lastly, ensuring financial resources that would serve as support for the most vulnerable student sectors, who have difficulties when trying to connect or do not have electronic devices to follow the virtual classes. These financial resources must serve to update, modernize, and incorporate different platforms and compatible technologies with virtual education, at the same time guaranteeing the training of the professors on digital competences (IESALC UNESCO, 2020; Blackman *et al.*, 2020).

The technologies utilized by the universities during the confinement varied, with the predominance, aside from learning management tools, of the use of videoconference solutions. In some cases, through the use of tools for teaching, such as Zoom, which according to Merino Acosta *et al.* (2023), became indispensable for virtual teaching. In other cases, taking advantage of social networks such as WhatsApp, which was deemed to be useful as a teaching-learning platform during the pandemic (Vidal Ledo *et al.*, 2022).

This new situation brought interesting possibilities for students (such as satisfaction and performance), professors (such as commitment and the possibilities of improvement) and the institution itself (such as the institutional challenge brought on by the development of a technological strategy). In this sense, we are in agreement with studies such as the one by Caguana Baquerizo *et al.* (2022) and Mayorga *et al.* (2020), about the value of e-learning and the new possibilities of incorporating technologies in teaching that respond to the demands of present society.

However, the studies also pointed out difficulties that must be mentioned. The most prominent in different studies was the difficulty imposed by the internet connection (or lack thereof) in rural areas and the lack of technological devices for students (Gocotano *et al.*, 2021; Dadhe; Kuthe, 2021; Meléndez Grijalva *et al.* 2021, Mhandu *et al.*, 2021; Motaung; Dube, 2020; Omadan, 2020; Siddiqui *et al.*, 2020). As Pávez (2023) indicates,

The Covid-19 pandemic has been a reminder of the barriers that they must overcome due to the unstable internet signal, lack of devices and digital skills.

Some other difficulties pointed out were the lack of training (Blattner *et al*., 2022; Essel *et al*., 2020; Meléndez Grijalva *et al*., 2021; Motaung; Dube, 2020), the difficulty in extrapolating the practical sessions to virtual environments (Fengwei; Wang, 2020; Boulger; Onello, 2020), and the lack of human contact with the professors and the rest of the students (Blattner *et al*., 2022; Boulger; Onello, 2020). However, in two studies, the students in rural contexts did not perceive difficulties during the virtual classes (Browne *et al*., 2021; Fields *et al*., 2020). Therefore, it can be concluded that although the universities tried to provide a response to the needs of the students, there were many difficulties that they were not able to overcome with the measures implemented. This must be considered as a lesson to be learned when making future decisions on the use of technologies in higher education teaching.

Three articles provided recommendations for the future, in case another contingency situation occurs (D'Amico *et al*., 2022; Mhandu *et al*., 2021; Motaung; Dube, 2020). Nevertheless, it is possible to identify some good practices, such as the training of professors and students about the pandemic (Barros de Melo *et al*., 2022; Browne *et al*., 2021). And we must also underline the ability to bring the face-to-face classes to a virtual environment (Fengwei; Wang, 2020), the use of videoconferences (Essel *et al*., 2020), the rationalization of the contents from face-to-face classes to virtual environments (Blattner *et al*., 2022), the use of learning assistants (Fields *et al*.,2020), the development of practical communities (Fields *et al*.,2020), and the effort by the professors to tend to the students, especially those living in a rural environment (Boulger; Onello, 2020).

In agreement with Guiot (2021), the Covid-19 pandemic, in a certain way, also drove some educational transformations. The virtual environments allowed for a more personal contact through diverse tools such as forums, videoconferences, and conversation platforms, facilitating collaborative work. Some universities are already considering the addition of education programs that are completely online, which will broaden the educational offering and institutional enrollment.

Nevertheless, these results must be taken with caution, as the present article has some limitations, such as the small number of existing publications that reviewed the process of tending to vulnerable collectives in universities, and specifically students in rural areas. Rural education in a context of Covid-19 has large gaps, especially when focusing on the university setting. Nevertheless, the present article has contributed to increasing the knowledge on the effects of the pandemic in this sector of the student population.

This is the first article that addresses the problem of Covid-19 within the university context from an international perspective and in the manner of a review. Its contributions are key for understanding the specific difficulties of rural students and how to overcome them starting with the implementation of good practices. In this article, we have tried to offer an up-to-date, complete, international, and deep perspective, starting with the scientific publications found in two of the most important databases, and the results help in the identification of specific guidelines for action.

Universities are true engines of knowledge production, innovation, cultural preservation, research, and social progress. They are based on fundamental values of

equal access, academic freedom, institutional autonomy, and social responsibility. It is when some of these values are not guaranteed for different population sectors, when their overseers must focus on these vulnerable students, by applying policies oriented towards keeping these students committed and connected, and supporting their educational process and its results (World Bank, 2020).

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*Received on October 23, 2023*
*Reviewed on March 21, 2024*
*Approved on April 23, 2024*

**Editor:** Prof. Dr. Agnaldo Arroio

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