

## Virtual education and digital divides in Peru

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### Abstract

The objective of the research was to analyze virtual education and the factors existing in the digital divides in Peru. The research was applied, with systematic review design. The population was 20 scientific articles selected in the search engines of Scielo, Google scholar and BASE the same that have been ordered in an Excel matrix to facilitate their quick location. The variables were: virtual education and digital gaps. The technique used was the documentary review, through the analysis of the results and the conclusions obtained, qualitative, quantitative and descriptive research predominates. Data collection sheets from scientific articles were used. Virtual education is a high-impact strategy in improving coverage, relevance and educational quality at all levels and types of training, due to its multimedia, hypertextual and interactive characteristics. However, in this pandemic crisis, not all students have been able to access this educational modality, generating a considerable dropout due to different factors.

**Keywords:** virtual education, digital divide, technology, equity.

### INTRODUCTION

The health crisis that is currently facing worldwide, has led to face-to-face education to virtual environments in an unexpected way, this unprecedented situation led teachers to focus all their efforts on the tools available to facilitate virtual education, in most cases making use of their personal resources. In turn, some digital platforms offered their content for free to facilitate this process (Cueto, et al., 2020). A recent UNESCO report notes that almost one and a quarter million (which is 67.7% of the total number) of students have been affected by the pandemic worldwide, in most countries, the primary and compulsory secondary education sectors have faced a more difficult challenge than that faced by higher education. The deficient or in many cases non-existent technological infrastructure and the limited technological experience of teachers, instructors and parents, makes the delivery of virtual education difficult or even impossible. The latter, added to phenomena such as social exclusion and the digital divide where thousands of households do not have adequate access to broadband Internet, Wi-Fi infrastructure and personal computers hinder promising and strenuous virtual solutions (Georgiadou, et al., 2020).

In this regard, the University of Kansas (2020), notes that the United States, is particularly well positioned to take advantage of the various virtual learning options that are available, high-speed Internet can be found in most regions with an average Internet speed more than double that in the rest of the world. However, despite this, access to virtual education is not uniform, students especially those in low-income households, are at a clear disadvantage when it comes to education and technology, and this was true before the pandemic. Given these circumstances, Archer and De Gracia (2020), specify that it has begun to accelerate the use and adaptation of virtual education, which has evidenced a problem already known, such as inequality in access to technology and its effective application. Inequalities that will imply that governments define inclusion strategies, as far as possible, to avoid that school shelling is not permanent or significant. Inequality is a central problem, which appears and is reproduced throughout all levels of the system (initial, primary, secondary and higher) and limits the possibilities of impoverished sectors.

According to the Economic Commission for Latin America and the Caribbean - ECLAC (2020), in Latin America, 90% of households in the rural sector do not have access to the internet and, of these, the age group that has the least connectivity are children from five to twelve years old; also, the connection speed is so low that it limits or does not allow remote education. In fact, the use of student learning has been conditioned by multiple variables, such as devices or the available internet connection, the student's initial digital competence, the emotional situation of the family or the ease of parents to help them, among other factors. So, leaving aside the health aspects, one of the evils of confinement during the pandemic has been the increase in the digital divide, which has aggravated inequalities among students. For their part, Murillo and Duk (2020), point out that virtual education is a chimera, an alternative for those who have equipment of a certain quality with internet access at home, but unfortunately there are too many students who do not have that resource, nor with the material, environmental and space conditions to benefit from this option. It is worth noting that there are millions of people in Latin America who do not have electricity in their homes. More specifically, only 4 out of 10 households in Latin America have an internet connection. Under this perspective, Michelena (2021) affirms that Chile and Uruguay are the countries with the best connectivity, but that Peru, Ecuador and Bolivia present problems, among other reasons, due to the great geographical dispersion of the population. The problems also originate because government policies do not encourage investment but collection from the treasury. The comparison made between the aforementioned countries demonstrates the commitment that each State has focused on education, it is impossible not to mention the government policies that should encourage properly planned investment situation that is further aggravated by the pandemic.

Consequently, Gómez and Mamani (2021) state that the Peruvian educational system has been marked by features of inequality in access to a quality educational service, even before the pandemic, these features refer to coverage, type of management of educational institutions, geographical area, infrastructure and information and communication technologies (ICT) with which they have. However, these inequalities have increased during the health emergency, causing many students to leave the system, reducing educational coverage and, even more, its quality. Virtual education in Peru has increased the weaknesses that the educational system already had, especially widening the gaps of social and digital inequality to demonstrate, among many other aspects, that education in times of pandemic ceases to be a right of every human being and becomes a commodity that can only be acquired by those who have economic and technological resources. Thus, levels of access to education

have been formed, and those groups of students who have all the necessary technological resources for this virtual education system are privileged; relegating other groups to receive an educational service of low or very low quality (Gómez and Mamani, 2021).

Faced with this, a clear inequality is justified both in the inclusion and in the insertion of students as the central axis of the learning process, although it is true that it is not the direct responsibility of the State to acquire equipment considered high-end for each home, solutions must be sought that help mitigate the problem of the digital divide. Likewise, there is no other option than to adapt to virtual education to achieve educational processes, so it takes special relevance the fact that teachers have digital skills for the management of resources that are useful in their classes and of benefit to students, thus reducing the existing digital gaps in the educational system. Hence, the objective of the research was to analyze the development of virtual education in relation to digital gaps in Peru.

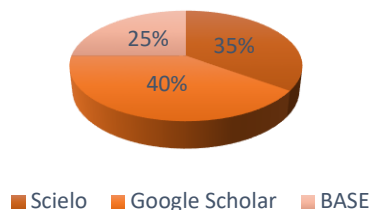
### **METHODOLOGY**

The research was applied, under a systematic review design. The population was made up of 20 scientific articles selected in the search engines of Scielo, Google scholar and BASE. The variables considered in this research were: virtual education and digital gaps. The technique used to measure the variables, their dimensions and indicators was the bibliographic, systematic review of documents. Data collection sheets from scientific articles were used, allowing a database registration of research. The data collection sheet of the documents contains the following data: reference, objective summary, type/design of research, keywords, statistical techniques used and contributions of the study for this research. The documentary review considered research articles at the international and national level, whose priority was to analyze virtual education and digital gaps. We considered pertinent the inclusion of the most important articles, according to the evidence they presented, excluding those that did not meet the established criteria. The search and selection of the articles began in the period 2017 to 2021.

### **RESULTS**

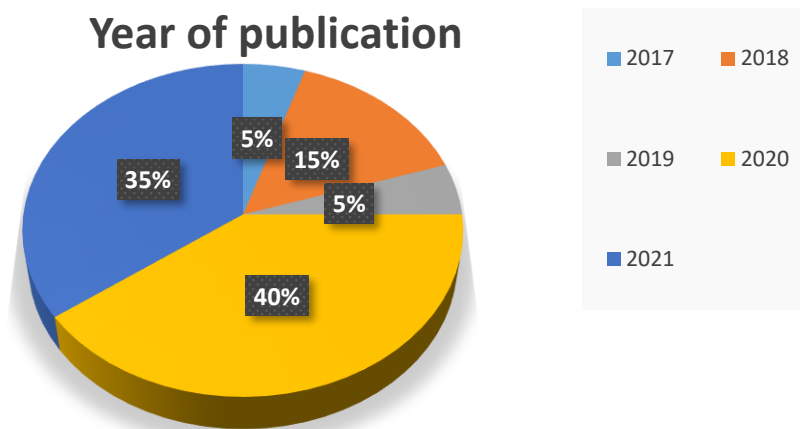
Figure shows that 40% of the systematic review of articles with respect to the search engine in the educational process of secondary education belongs to the Google search engine, this is due to the greater use and access it has by students, while 35% belongs to Scielo and 25% based on the articles that will be useful for research. It was evidenced that most articles in the last 5 years between 2017-2020, contain very recent information on the subject, therefore, its verification will be very useful in the development of research. There is also a greater approach to the issue, given the concern about virtual education and digital gaps, in the context of the pandemic.

### Selected articles



**Figure 1.** Percentage of articles according to search engine.

Figure 1 shows that 40% of scientific articles according to the year of publication correspond to the year 2020, followed by 35% of publication for the year 2021, 15% for the year 2018 and finally 5% respectively for the year 2017 and 2019.



**Figure 2.** Search result of articles by year of publication.

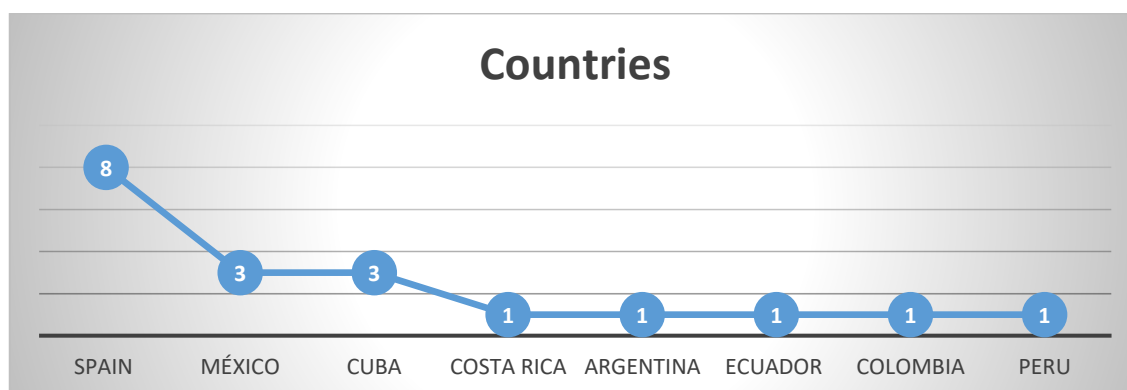
Table 1 shows the origin of the authors of the selected scientific articles, both from Europe and Latin America, with Europe contributing the largest number of articles, with a similar proportion between those that present a single author and those articles that have two or three authors.

**Table 1.** Authors of articles by country of publication.

N°	Author	Country
1	Mariño, S. & Bercheñi, R.	Cuba
2	Gómez, A.	Mexico
3	Gómez, I. & Mamani, F.	Cuba
4	Anaya, T., Montalvo, J., Calderón, I. & Arispe, C.	Peru
5	Huanca, W., Supo, F., Sucari, R. & Supo, A.	Costa Rica
6	Arellano, A.	Mexico
7	Juanes, Y., Munévar, R. & Cándelo, H	Cuba

8	Blanc, G. & León, G.	Ecuador
9	Ruiz, M.	Spain
10	Torres, C. & Torres, M.	Colombia
11	Fernández, N., Moreno, M. & Guerra, J.	Spain
12	Rico, J. & Bosagain, X.	Spain
13	Crisol, E., Herrera, L. & Montes, R.	Spain
14	Martínez, O.	Spain
15	Stribor, K., Calderón, D. & Sanmartín, A.	Spain
16	Matamala, C.	Spain
17	Lombana, A.	Mexico
18	Ávalo, I.	Argentina
19	González, R., Díaz, C. & Navarro, I.	Spain
20	Infante, E., Hernández, C., Romero, E. & Bravo, S.	Ecuador

Figure 3 shows the results of the 20 articles selected according to the country of publication; having 8 articles from Spain, 3 from Mexico, 3 from Cuba, while Costa Rica, Argentina, Ecuador, Colombia and Peru only 1 article was selected from each, these data show according to Martínez (2020), that the adaptations of the school year to the current situation of socio-health emergency, have been based fundamentally on virtual education, that is, on the continuity of the school year through the internet.



**Figure 3.** Distribution of articles according to country of publication.

Table 2 shows the contributions of the studies compiled according to Gómez and Mamani (2021), where the educational system has had to transform urgently and unexpectedly to a virtual modality, as a result of the closure of educational centers, because of this, virtual education has been implemented, which glimpsed and accentuated even more the existing digital gaps, where students within vulnerable groups, with insufficient income to cover their needs, victims of violence or catastrophes, with families without employment, very limited infrastructure, lack of internet connection or students with disabilities, the educational situation becomes more difficult implies a greater challenge.

**Table 2.** Title and contribution of the articles analyzed in terms of virtual education and digital gaps.

N°	Article title	Contribution to the study
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1	Identification of digital gaps in pandemic: two experiences of higher degrees in the discipline Informatics	The health emergency has determined that, in an obligatory way, it is mandatory to migrate to a virtual learning environment, which brings with it challenges for all the actors involved in the process.
2	Use of information and communication technologies by Mayan university students in a context of digital divide in Mexico	Despite the disadvantages faced by indigenous peoples in the digital field, the process of expansion of ICTs and national trends in the use of cell phones and the Internet are having an impact on forms of local organization, as well as on social and cultural practices.
3	Virtual education in times of pandemic: increasing social inequality in Peru	Virtual education dismembers educational services by establishing levels based on the economic, geographical and technical conditions of students and their families.
4	Rural schools in Peru: factors that accentuate digital gaps in times of pandemic (COVID-19) and recommendations to reduce them	The digital divide between students in urban and rural schools is associated with a variety of underlying factors, such as minimal connection speed and limited presence of fixed networks in the area.
5	The social problem of virtual university education in times of pandemic, Peru	He states that there are social differences between students of public universities and private universities, according to their position, occupying the old economic determinism, which includes: Those with higher incomes will be able to study in private universities, while those who do not have money will only stay in the state institution which lacks quality.
6	Digital divides in Mexico: a relevant balance sheet	It should be noted that it is imperative to design and implement public policies in this field, so its direction should be considered to stimulate the development of the country's digital ecosystem, so that the possibility of making universal access for citizens a reality should be considered.
7	Virtuality in education. Key aspects for the continuity of teaching in times of pandemic	Given this, he states and concludes the inclusion refers to the still insufficient policies and resources with the aim of guaranteeing access to virtual education for the entire population without any distinction, with the aggravating factor of the disarticulation between equity, quality, relevance and coverage.
8	University digital divide, appropriation of Asynchronous tools in Higher Education teachers: ECOTEC University case	It is important that the teacher recognizes the generation gap raised here and is willing to update himself in the teaching-learning models that Millennial and Generation Z students (digital natives) learn today.

9	Pandemic natives: virtual education in Early Childhood Education during the COVID-19 lockdown	The different agents involved must assume their respective responsibilities so that a potential closure of schools in the future does not entail a detriment to the development and learning of children in Education. Something that was already necessary before the pandemic and that has been accentuated during it.
10	Digital divides in Dabeiba and Frontino, Colombia: a challenge for virtual education for peace	Digital gaps are part of the social inequalities in force in the modern economic model, this fragments the understanding of rural and urban dynamics, which are understood as disconnected from each other, omitting their interdependence.
11	Digital divide in time of COVID-19	The closure of schools is causing real differences between contexts within the same autonomous community, and it is precisely the students with Specific Need for Educational Support who are the most vulnerable in these circumstances to be served by the Educational System under a virtual teaching model.
12	Computational Thinking: Breaking Digital and Educational Gaps	It is evident that access to ICT is one of the difficulties you have when you want to generate changes that involve technology, this does not happen only Colombia, all countries worldwide must implement strategies and projects so that there is educational equity. These social gaps, which are related to the development of a country, must be broken and that all students, regardless of whether they belong to a private or public education, have the same resources to access knowledge, information and education.
13	Virtual education for all: a systematic review	Inclusive virtual education is possible, if it is designed considering a methodology that involves knowing the students, developing accessible content, having a usable platform, considering flexible didactics and evaluations that promote the constant motivation of the student.
14	Educational digital divide. When territory is important	In conclusion, in the face of an unknown scenario such as the current one, the need for the educational system to be more flexible, and to have a greater capacity to work in virtual environments, has been highlighted. At the same time, it must address in depth the necessary measures to ensure equal opportunities for all children and adolescents.
15	Education and the digital divide in times of COVID-19. Profiles and problems experienced by	Inequality in facing academic challenges is a structural element prior to the pandemic, but the confinement situation has intensified many of the difficulties experienced by students which have been intensified.

	young students to face their studies during confinement	
16	Digital Capital in Higher Education: Digital Strengths and Gaps to Tackle Distance Education.	Research that has been aimed at studying digital gaps, suggests that digital capital is distributed heterogeneously and unequally among the population.
17	The evolution of digital divides and the rise of Artificial Intelligence (AI)	To face rapid technological change and digital transformation in an inclusive, fair and ethical way, one must think critically about how ICTs operate and are appropriate, particularly those that are new, such as AI through the multiple layers of structural inequality, recognizing the complexity of the social fabric and its economic and sociocultural particularities.
18	Biolearning in virtual education. A reflection from the meaning of learning	In this sense, the cartographies that support it must be different from those that consolidated traditional education in modernity, continuing to walk on this route is essential will determine how virtual education can really become that transformative vehicle of postmodern society in which it has the potential to become.
19	Education, pandemic and digital divides: lessons from an unusual moment	The hierarchy gap in the network has become especially evident in the debates raised by the use of one or other applications and tools by teachers.
20	Inclusive Virtual Education in times of Covid-19: study in law, UNIANDÉS, Ibarra	The diagnosis made on the process of virtual education in the Law Career, at UNIANDÉS, Ibarra, allows to detect that the knowledge and skills for the proper management of computer systems applied to virtual education are insufficient; In addition, limited critical positions are manifested by the subjects immersed in the process, in this situation.

## DISCUSSION

With respect to the exhaustive search for articles related to virtual education and the factors existing in the digital divides in Peru, this result coincides with what was found by Georgiadou, et al., 2020 who demonstrates that learning mediated by technologies has been the subject of different analyses, where the closure of educational centers due to COVID-19, has evidenced a series of gaps and inequalities that must be faced by those who are in the educational system. While web technology and the growing education technology industry have greatly improved virtual learning, they have only benefited those who have access to an internet service. Therefore, it has highlighted and exacerbated the digital divide around the world, according to UNESCO, half of all students who were deprived of face-to-face classes due to the pandemic do not have access to a computer. Likewise, it can be reflected in the Community of Madrid, as indicated by the data of the Survey on Equipment and Use of



Information and Communication Technologies in homes, carried out by the INE in 2019, coincides with the study carried out by Martínez (2020), where it is found that 1.3% of households in which at least one person under 16 years of age resides do not have an internet connection, and 2.8% do not have a computer. Although the percentage itself does not seem alarming, it states that there are more than 600,000 households in the Community of Madrid that face this problem. What this survey does not present is the distribution of these households at the territorial level within the autonomous communities themselves, but it seems evident that the areas with a higher vulnerability index are the most affected, For its part, Huanca, et al. (2020), states that in the specific case of the problem of education in Peru, it is considered from the beginning that this is social, economic and political, rather than pedagogical and didactic, empirically endorsed in the contents of the guidelines of the National Educational Project (PEN) and the Regional Curricular Project (PCR), but that they are for the Peruvian State only declarative and decorative clichés; whereas, for its implementation, it appears that the necessary and sufficient economic budgets have not been allocated. Given this, Infante, et al. (2021) emphasizes that education is a fundamental right that cannot be suspended under any circumstances, being so that it is recognized in the Universal Declaration of Human Rights, which establishes, in its article 26, that education will have as its objective the full development of the human personality and the strengthening of respect for human rights and fundamental freedoms. Finally, we can conclude that, in virtual education, as in any other modality, educational agents must be aware of the quality requirements of the teaching, learning and evaluation processes, this commitment to quality, invites to value the training processes; commitment that requires the observation of the educational work, as a basis to achieve change, innovation and educational intervention. Therefore, among the demands that educational virtuality must assume is the reduction of existing digital gaps through the promotion of connectivity at all levels and especially in the groups of the population that have more natural disadvantages to access to new information and communication technologies. Not only bringing the service closer, but also worrying about training and teaching in the use of computational tools that are the channel through which these new technologies can be used, from a global vision, is a general recommendation of what must be done to shorten this gap.

### CONCLUSIONS

In general, it was evidenced that the most predominant research is qualitative, quantitative and descriptive; according to the database elaborated the studies are distributed among 8 articles of Google scholar, 7 Scielo and 5 of BASE for a total of 20 selected articles. These are organized from different educational realities, among them with greater relevance were localized articles of the European context specifically (Spain), it is worth specifying that the studies correlate with the focus of priorities around the concept of virtual education and digital gaps. Consequently, it is possible to sinter the analysis of the variables under study that, in reference to virtual education, is a strategy of high impact in improving coverage, relevance and educational quality at all levels and types of training, due to its multimedia, hypertextual and interactive characteristics, can be recognized as an evolution of distance education and a transformation for face-to-face and blended education, since it allows to acquire knowledge, through the incorporation of technological means, thus facilitating learning throughout life. Thus, the education sector, as an essential component of society, will have to adapt to these new demands where virtuality, which was previously an option, has already become a practically mandatory modality. However, in this pandemic crisis, not all students have been able to access this

educational modality, generating a considerable dropout due to different factors, this refers not only to the limitation of access to ICTs, either due to economic, social or geographical situations, but also to the limitation or non-use of these technologies, even if they are accessible, due to the lack of knowledge about their use or little appropriation of these. These factors further define and highlight the existing digital gaps, despite the efforts of education authorities to continue looking for quality, fair, easily accessible and fast solutions. The consequences are particularly severe for disadvantaged students and their families who have little access to educational opportunities outside the school community, which, according to the virtual education model, the education system offers students specific educational needs where the most vulnerable are those in these conditions, which greatly hinders their teaching and learning.

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