

## Teaching through digital devices during the COVID-19 pandemic

La enseñanza a través de dispositivos digitales durante la pandemia COVID-19

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### ABSTRACT

**Introduction:** In December 2019, an outbreak of a new virus called COVID-19 originated in the city of Wuhan in the country of China, which spread to countries around the world in a very short time, forcing schools, schools, universities and other institutions, both work and educational, to temporarily close their doors. **Objective:** To describe the importance of technological devices in virtual education caused by COVID-19, through a systematic review of the bibliography. **Methodology:** 12 publications appropriate to the search keywords and according to the estimated inclusion and exclusion criteria for their choice were selected. **Results:** The use of technological devices means that the student can obtain a more personalized learning, improving their work style and their way of acquiring knowledge, in such a way that the quality of education has been increased. **Conclusions:** New technologies and the use of technological devices have favored student learning, providing better interaction in real time and allowing the teacher to give more prominence to the student for the development of their learning.

**Keywords:** Technological Devices, COVID-19, education, technological tools.

### RESUMEN

**Introducción:** En diciembre del año 2019 se originó un brote de un nuevo virus denominado COVID-19 en la ciudad de Wuhan del país de China, el cual se dispersó por los países de todo el mundo en un tiempo muy corto, obligando a escuelas, colegios, universidades y demás instituciones tanto de trabajo como educativas a cerrar temporalmente sus puertas. **Objetivo:** Describir la importancia de los dispositivos tecnológicos en la educación virtual ocasionada por el COVID-19, por medio de una revisión sistemática de la bibliografía. **Metodología:** Se seleccionaron 12 publicaciones apropiadas a las palabras clave de búsqueda y de acuerdo a los criterios de inclusión y exclusión estimados para su elección. **Resultados:** El empleo de dispositivos tecnológicos trae consigo que el estudiante pueda obtener un aprendizaje más personalizado, mejorando su estilo de trabajo y su manera de adquirir conocimientos, de tal manera que se ha podido aumentar la calidad de educación. **Conclusiones:** Las nuevas tecnologías y el uso de los dispositivos tecnológicos han favorecido el aprendizaje de los alumnos, aportando una mejor interacción en tiempo real y permitiendo que el docente pueda dar mayor protagonismo al estudiante para el desarrollo de su aprendizaje.

**Palabras clave:** Dispositivos Tecnológicos, COVID-19, educación, herramientas tecnológicas.

### INTRODUCTION

In December 2019, an outbreak of a new virus called COVID-19 originated in the city of Wuhan in the country of China, which spread to countries around the world in a very short time, forcing schools, colleges, universities and other institutions both work and educational to temporarily close their doors, which harmed students around the world because the study was delayed for a period of time to deploy an accelerated distance learning solution by public and private institutions, since there was no plan of action to certain situation (Eliana et al, 2020)

Traditional face-to-face education was mostly applied on a day-to-day basis in the institutions that provide educational services with minimal implementation of information and communication technologies, showing students and teachers to be poor in technological knowledge, However, the pandemic caused by COVID-19 brought teachers and students to face new challenges in terms of pedagogical education, unleashing greater technological needs and tools for learning both in direct contact as well as self-learning. (Mentasti, 2021)

This situation generated a worldwide crisis and in turn triggered a complete modification in terms of the provision of educational services since the use of platforms and especially technological devices such as cell phones, tablets, laptops, desktop PCs, among others, was required. The use of these devices and technological resources helped to ensure that students do not lose the continuity of the learning process, even though this was unexpected and with an emergency planning, since society was not ready for a confinement and much less for the implementation of a massive online education plan, either due to the lack of economic and physical resources and the impact of the transformation from a face-to-face to a virtual education. (Aguilar, 2020)

During virtuality, the use and implementation of Information and Communication Technologies (ICT), especially platforms such as Zoom or Teams, had a great impact on the access to the students' study system since they are applications that can be installed in mobile and desktop devices to receive classes through video conferences interacting in real time with the teacher.

These platforms were provided to students and teachers all over the world free of charge since they are easy to

understand due to their user manual. The use of these resources made it possible for teachers to evaluate and monitor academic activities. (Cornejo et al, 2021)

Technological devices and media were carriers of resources to obtain knowledge and content that can be used for the acquisition of knowledge, impacting the pedagogical development of students through the use of educational practices, as well as the skills that the student and the teacher have to strengthen their abilities as well as their intellect, using technology and the opportunity to access the content offered by virtual sites in a favorable way for the reinforcement and development of knowledge. (Díaz et al, 2021)

The use of technological devices was part of the great impact that exists between education and the COVID-19 pandemic since they contributed as fundamental tools for the formation of knowledge based on scientific information, thus managing to develop the learning level contributing to satisfy the needs of acquiring new thoughts and achieving a great contribution in the virtual educational process, despite the different difficulties faced by educational institutions with the change in the modality of classes. (Bárceñas & Morales, 2023)

The objective of the present research is to describe the importance of technological devices applied during virtual education caused by COVID-19, by means of a systematic review of the bibliography.

## RESEARCH METHODS

A systematic search on the proposed topic was carried out in databases based on the last 5 years. The method used for the collection and grouping of the information is called PRISMA method, in order to ensure the severity and multiplication of the research in other media.

The criteria used to select the articles were as follows:

### ***The following articles were incorporated:***

- Match the eligibility principles supported by the words "Information Technologies" "Pandemic COVID-19" "Education in COVID-19" and all possible combinations.
- Research that explains its methodological course and complies with the research criteria guaranteeing its rigorosity.
- - Research that contributes to the criterion and the benefits of the research being conducted.

### ***Items that were discarded were:***

- - Do not meet the incorporation criteria
- - Research that is not related to the topic
- - Research that does not provide scientific rigor
- - Research that is repeated

### ***The research was conducted using science research search platforms such as:***

- Scielo
- Pubmed
- Dialnet
- Google Scholar
- Redalyc

Likewise, the search strategies were taken into account through the use of keywords, making a first filter taking into account the year of publication of the articles, the most important ones being those from 2018 onwards. Then, in the academic search engine, the keywords "Information Technologies" "Pandemic COVID-19" "Education in COVID-19" were used and linked with the connectors specified in the Table 1.

**Table 1.** Bibliographic search strategies

<b>Key words</b>	<b>"Information Technologies" "Pandemic COVID-19" "Education in COVID-19"</b>
<b>Language</b>	Spanish, English
<b>Use of Boolean operators</b>	AND, OR, NOT
<b>Published years</b>	2018-2023
<b>Principal Research sources</b>	Google Scholar, Scielo, Redyalc, Dialnet

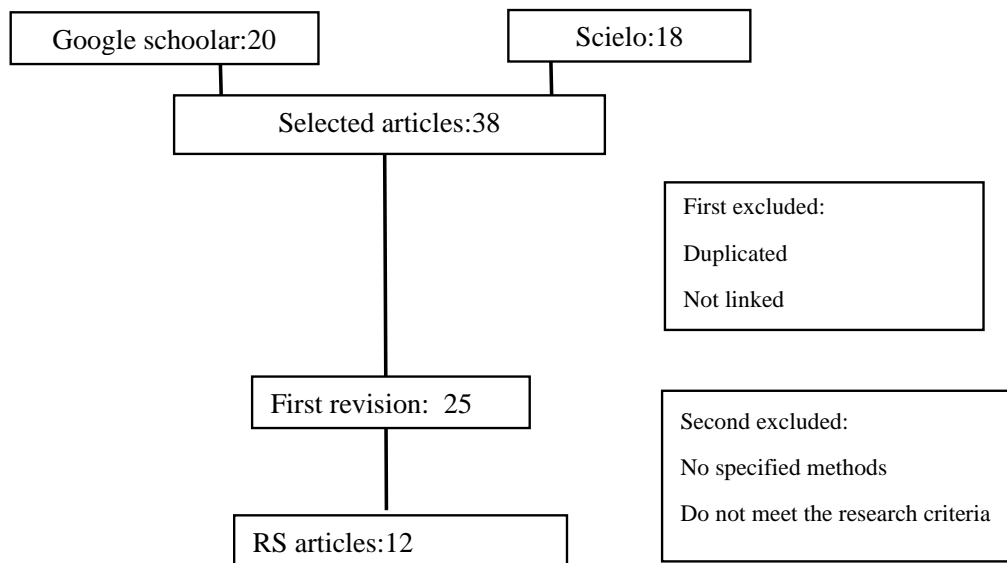
Source: prepared by authors (2023)

These considerations led to the choice of the studies detailed below:

### Study selection

**The studies examined were subjected to a successive selection phase based on the following criteria:**

- Reading the titles of the investigations found, taking into account that they are in the context of the investigation and discarding those that do not meet this criterion.
- Reading of the research summaries found, discarding those articles that were found to be repeated.
- Finally, a full reading of all the content of the selected articles was done.

**Graphic 1.** Study selection

Source: prepared by authors (2023)

### Data extraction process

Data extraction done using tables in which the indicators for classification of the articles were established, which are:

- Author, country, year of publication
- Title of the research
- Aims and objectives
- Methodology
- Results and conclusions, Significant aspects

The classification of the articles made it possible to group and compare them to then allow the writing of the systematic review article.

## Data list

Table 2. Main literature raised

Article title, author and published year	Study design	Results	Authors Interpretation.	Categories
Attitudes towards ICT and adaptation to e-learning in context COVID-19, students in Chile entering higher education. Romero Alonso, Rosa Eliana, Tejada Navarro, Carlos Alberto, & Núñez, Olga. (2021)	Descriptive-cross-sectional	For the students, adapting to the change of methodology in the online classes and the new learning method was complex.	The COVID-19 health crisis situation had several repercussions, especially on training strategies based on the use of digital media.	Online learning
Teaching in pandemic times: Reflections for rethinking school in the digital age. Mentasti, Silvina. (2021).	Descriptive-Bibliographical	Learning in times of pandemic was developed through the implementation of virtual spaces, however, the use of digital platforms did not contribute completely due to the lack of knowledge and interaction on the part of the students.	The health emergency brought with it the acceleration of replacements for face-to-face learning and the implementation of e-learning, giving rise to tools that serve the technological education process.	Sanitary emergency studies
From learning in face-to-face scenarios to virtual learning in times of pandemic. Aguilar Gordón, Floralba del Rocío. (2020).	Descriptive-retrospective	Subjects have different realities in terms of education, which is why different types of educational needs arise in which the learning process is incomplete and inadequate.	Learning in pandemic time was a great challenge for the educational community as it had several limitations in terms of social contact, one of the main ones being the limitation of the subjects' emotions.	Learning Challenges un pandemic times challenges
Higher education with new information and communication technologies in times of pandemic. Nivelá-Cornejo, María Alejandrina, Echeverría-Desiderio, Segundo Vicente, & Santos Méndez, Marcos Manuel. (2021).	Descriptive-Bibliographical	It is important that teachers are trained in the use of virtual tools and applications since they must be in charge of the correct presentation and didactic classes for the students	Technological tools that were used during the COVID-19 pandemic education proved to be of great benefit as the technology offered different types of resources for virtual education.	ICTs
Impact of ICTs: Challenges and Opportunities for Higher Education in the face of COVID-19. Díaz P; Ruiz K; Egúez C. (2021).	Descriptive-Bibliographical	Training on the use of digital tools and devices for teachers should be taken into account so that they can take full advantage of new technologies and improve the quality of classes.	Thanks to ICTs and digital devices it was possible to implement tools that are favorable for the educational field, especially in higher education, obtaining a better level in the correct uses of technologies for education	Digital devices and COVID-19
Technological tools in the teaching-learning process in higher education students. Molinero M, Chávez U. (2019).	Descriptive-Retrospective	The devices most used by students were the computer and cell phones; educational platforms allowed students to interact more effectively in a real time period with the teacher.	The technological tools used in COVID-19 were of great help to the teachers. Thanks to the advances in technology and the emergence of new applications, students have been able to improve their study style by using different tools on a daily basis.	Digital devices and COVID-19
Is inequality of educational opportunities in Primary Education increased by school closure due to coronavirus? Cabrera L; Pérez C y Santana F. (2020).	Descriptive-Bibliographical	The closure of educational institutions due to the coronavirus pandemic increased the inequality of schooling for students, especially at the primary level, since many households did not have a laptop or an Internet network to access virtual classes.	The educational units presented different deficiencies in times of pandemic, which, thanks to the implementation of technological devices, were able to allow teachers to teach their classes virtually; however, a large part of the student body did not have the necessary requirements for online classes, mainly due to socioeconomic factors.	Education problems in COVID-19
The Covid-19 Pandemic. An opportunity to think about how to make our education systems more inclusive? Echeita G. (2020).	Descriptive-Retrospective	Advances have been made for the benefit of students, integrating technology as a new method of study.	There are different inequalities among students in the institutions, however, the commitment of public policies to help improve education is essential to end these types of inequalities and ensure that all students have access to a quality education.	Educational opportunities in coronavirus.
Online assessment in higher education in times of COVID-19. García F. (2020).	Descriptive-Retrospective	Some years ago, distance education was a challenge for educational institutions since there were no solid curricula, however, academic management during the pandemic provided academic support for educational activities.	The coronavirus pandemic has caused several changes in the activities of society, especially in the educational field, since face-to-face classes had to be suspended, adapting technological resources and tools to provide a better online education.	Education in pandemic time.
Use of information and communication technology and learning and knowledge technologies in times of Covid-19 in Higher Education. Guerrero J; Cevallos R; Harry A; Feijoo J. (2020).	Descriptive-Bibliographical	It is evidenced that there are several technological applications and tools that serve as a resource and support for education and the difficulties that arise as a result of the pandemic.	Nowadays, the application of technological devices is indispensable in education since several educational needs arise which can be met through online pedagogical practice.	Technological and Covid-19
Pandemic COVID-19: a device that elicits and amplifies exclusion. A study of a first grade class in a rural municipal school in San Rafael, Chile. Pizarro Y; Chamorro A; González I. (2021).	Descriptive-Retrospective	The coronavirus pandemic transformed the educational system, posing a series of challenges and problems for educational institutions, especially due to the emergence of virtual teaching, since many teachers did not know how to implement the web page tools.	Despite all the difficulties that have arisen in the implementation of virtual classroom systems, the implementation of virtual education has been achieved, allowing students to access classes at a distance and thus avoiding contagion	Online classes and Covid-19.
Availability and technological knowledge of university mathematics teachers in times of covid-19.. Acuña L; Cuevas O; Angulo J. (2022).	Descriptive-Field	Most teachers used cell phones and laptops to teach virtual classes because they are very complete devices that, in addition to being able to quickly access virtual platforms, also allow them to move from one place to another with ease.	The pandemic teaches us the importance of technological updating and the reconfiguration of teaching methods taking into account the different technological resources and tools.	Educational ICTs and Covid-19.

Source: prepared by authors (2023)

## RESULTS AND DISCUSSION

The teaching process through electronic devices was a great challenge for students and even for teachers, despite the fact that many educational institutions had already implemented certain digital platforms such as Zoom or Moodle and

electronic devices such as laptops or desktop PCs, which were used for the development online classes. However, the age of both students and teachers was a fundamental factor for the facilitation of teaching and learning. (Cabrera et al, 2020)

On the other hand, it is observed that the inclusion of platforms and virtual tools such as Zoom, WhatsApp, Moodle, among others, had as a condition the interaction with digital devices such as cell phones, tablets, computers and laptops, since through them the student can access sources of information and interact in real time with the teacher on a frequent basis. That is why it was considered that the technological environment and digital devices became important tools, being essential to have at least one electronic device to access classes virtually. (Echeita, 2020)

One of the limitations of virtual education in times of pandemic were the external factors, mainly the economic deficiencies of some students who could not afford to purchase an electronic device that would allow them to access their classes, on the other hand, despite the use of digital devices for learning, the limited internet access or the low coverage of a good internet signal caused some inconveniences for students and teachers, making it difficult for them to access classes in real time. (Garcia, 2020)

Digital devices had a huge role and a great influence on education, especially cell phones and computers as they opened a greater possibility for students to develop their knowledge by accessing the wide variety of digital tools available to be used at any time of day. That is why it is considered that they have come to completely transform the way in which education was carried out, leaving aside the resources available in person such as books that were in physical libraries. (Jirón et al, 2020)

The use of cell phones, computers and other data handling, storage and transfer equipment provided a solution to educational problems in times of pandemic, understanding that educational technology was based on the manipulation of technological instruments, since educational institutions put into practice the opportunity to plan classes, tasks and share knowledge through the use of computers, digital blackboards, tablets, cell phones and any device that allows access to web pages, thus generating an important space for the use and implementation of blogs and digital platforms. (Lobos et al, 2021)

The use of digital devices and the Internet marked a great impact on education since they caused the construction of a new model of educational work due to the different proposals of transmission, design and storage that have the different digital platforms for the presentation of educational classes that are interactive mainly seeking to prevent the student from losing interest in learning and thus to enhance the teaching and learning function by applying the logic and creativity of both the teacher and the student. (Michel et al, 2022)

Digital devices in times of pandemic managed to provide students with resources through which they can interact and learn from access to countless platforms that in turn promote student participation during the development of the class, in addition to having the ability to learn outside class hours. They also help to provide teachers with better teaching methods since they are able to use different types of tools that facilitate organization, planning and time.

## CONCLUSIONS

The COVID-19 pandemic brought with it great difficulties for human beings, especially at the educational level since no institution was fully prepared to face such a situation due to the fact that education was mostly carried out in person with the use of physical books, however, technological progress has had a great contribution to society, the use of technological devices has favored the possibility of studying virtually, allowing students and teachers to have access to education, preventing them from delaying their years of study.

Computers and cell phones have been of vital importance for accessing information and databases in an easier and more agile way, since nowadays any person can access web pages from any digital device. Technological devices have made education to start despite the isolation of people, fulfilling a very important role for the needs of students and teachers themselves because through them you can use various educational software that even represent a saving in the economy of society since through them you can access information for free without the need to purchase physical books.

New technologies and the use of technological devices have favored student learning, providing a better interaction in real time and allowing the teacher to give more prominence to the student for the development of their learning. The use of technological devices brings with it that the student can obtain a more personalized learning, improving his style of work and his way of acquiring knowledge, in such a way that it has been possible to increase the quality of education.

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