

Information and communication technologies in biology teaching from the perspective of covid-19 in the light of studies already carried out

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Abstract: Despite the difficult time, the pandemic allowed teachers to work on biology curriculum contents. The aim of this study was to present discussions about the main difficulties faced by teachers and students in relation to remote classes in the teaching of biology in the pandemic scenario. The work is an integrative literature review, carried out through the electronic bases of publications: Google Academic, Scientific Electronic Library Online (SciELO) and the Periodic Portal CAPES. Through the keywords: COVID-19; Biology Teaching; Emergency remote education; Digital technologies. The choice of articles was

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limited to those that met the inclusion criteria, so, after pre-reading, 10 articles were selected and used for discussion. In the end, it was remarkable that the faculty was essential in the period of the pandemic of covid-19, in the instruction of students in the face of a new educational paradigm, also emphasizing a better deepening on the subject researched.

Keywords: COVID-19. Biology Teaching. Emergency remote education. Digital technologies.

1. Introduction

In basic education, Digital Information and Communication Technologies (TDICs) and Information and Communication Technologies, proposes to ensure the right to learning students, promoting the participation and innovation of pedagogies through ICT, encouraging them to understand in the most appropriate way possible according to the creativity of the teacher (ALVES *et al.*, 2020).

Despite the period of pandemic caused by coronavirus allowed teachers to work on curriculum contents of biology. Given the relevance of the subject, discussing biology teachers, creativity, meanings, efficiency and emotional aspects during the pandemic, will emphasize that the teacher needs to be increasingly recognized, because even if they are not prepared professionally and psychologically, they are always seeking to reinvent themselves and instruct students (PRETTO, 2020).

In view of the increase and rapid transmission of the same, distance measures were applied in a worldwide scope, where in education, with the reflection of the pandemic of the new coronavirus (COVID-19) caused the interruption of face-to-face classes, being replaced by remote education by the ordinance of MEC No. 343, of March 17, 2020, in which teachers and students needed to reinvent themselves and adapt, making them increasingly dependent on an education mediated by digital technologies ((MOREIRA *et al.*, 2020; SILVA, 2020).

In this context, during the pandemic period it was necessary to keep students connected with the school, through remote synchronous and asynchronous activities, where technological resources became the easiest way to reach students. Thus, the need to monitor the available technological resources demonstrated that Emergency Remote Education (ERE) challenged teachers, students and even the educational institution itself, becoming a device-mediated model (BENÍCIO; VAZ; PELICIONI, 2021).

With social isolation, everyone's routine suddenly suffered a great impact, where it was necessary to stay indoors, with this closure, education found itself in a challenge, bringing distance education and technology, as a way to mitigate the effects of the pandemic on education. Although it is not yet possible to report the real impacts caused by coping with COVID-19, the difficulties of how to reorganize the work process, in the search to assert a quality similar to that of face-to-face teaching, is already possible to be perceived (MACHADO, 2020).

When it comes to the changing educational landscape, the COVID-19 pandemic anticipated transformations in education, which could possibly occur a few years ahead. Thus, it stimulated a broader debate on the need to care more and

more about teaching methods, as well as the importance of ensuring the permanence of students in schools (MOREIRA *et al.*, 2020).

In view of the above presented, the objective of this research is to present discussions about the main difficulties faced by teachers and students in relation to remote classes in the teaching of biology in this new scenario.

2. Methodology

This is an integrative literature review study, where the collection was composed of scientific articles researched in electronic databases of scientific publications, being identified the following: Google academic, Scientific Electronic Library Online (SciELO) and the CAPES Journal Portal.

The inclusion criteria adopted for this research were: articles available free of charge indexed in full, in Portuguese and published between 2020 and 2021. Exclusion criteria were: theses, dissertations, unavailable articles and publications in a language other than Portuguese.

There was the crossing of the terms, where the search in the database was performed using the following key words: Emergency remote teaching; Digital technologies; Biology Teaching; COVID-19. Then, a reading of the articles was performed and those that adapted to the proposed theme were selected for analysis, so the main information collected from the articles was used for the discussions of this article expanding the knowledge about the theme addressed.

3. Results and Discussion

After research, 67 publications were found (Table 1).

Table 1. Articles found in databases.

DESCRIPTORS	DATABASE		
	Google Academic	SCIELO	CAPIES
Emergency remote education	5	6	4
Digital technologies	6	4	8
Biology Teaching	5	8	6
COVID-19	6	5	4
TOTAL	22	23	22

Source: Prepared by the researcher with data collected.

The choice of articles was limited to those that really

addressed information and communication technologies in biology teaching and that met the inclusion criteria, thus, after complete reading, 10 articles were selected to write analysis and categorization proposed in this study.

From this evaluation of the publications, the articles described in Table 1 were obtained, which were used for discussion.

Table 1. Articles selected to make up the study.

N	Origin	Article title	Authors	Year	Considerations/ thematic
01	Latin American Journal of Scientific Studies.	Information and Communication Technologies (TICs): an approach in the remote teaching of Chemistry and Nanotechnology in schools in times of social distancing.	SANTOS, D.S.	2021	ICT, although present in many schools and even in many homes, were not as included within the methodologies of traditional classroom teaching as the main didactic resource. The COVID-19 pandemic accelerated the process of including ICTs in teaching and new learning strategies were rethought.
02	Ibero-American Journal of Humanities, Sciences and Education - REASE.	Teaching biology in times of pandemic: creativity, efficiency, emotional aspects and meanings.	SOARES, M. D.; SANTOS, A. N.B.; FARIAS, F. R.; LIMA, F.G.C. L.	2021	The results showed that the virtual environment became the possible learning space for the training process, there was a difficulty in separating home and professional activities.
03	CONEDU.	Remote classes in pandemic time: challenges and perceptions of teachers and students.	MIRANDA, K. K.C. O.; LIMA, A. S.; OLIVEIRA, V.C.M.; TELLES, C.B.S.	2020	It is necessary a greater performance of the family and the educational networks, as well as investment in technological resources, among others, so that the consequences of this type of teaching, adopted in an emergency way, generate fewer negative consequences in the school learning process.

04	Teaching of Science and Biology in Non-School Spaces and Scientific Dissemination.	What, how and why teach in times of pandemic? An analysis of the teacher's perception about the use of the Social Network Instagram in the Remote Teaching of a High School Class.	FREITAS, T.C. R.C.	2021	This report presents the proof that the use of Technologies stimulated and involved students in the virtual world in a responsible and scientific way, increasing the students' learning as well as the formation of learning communities through the interaction between the class and its followers.
05	Research, Society and Development.	Teaching technologies used in education in the COVID-19 pandemic: an integrative review.	NETO, J. S.; PINE, F.V.A.; MATOS, H.L.; LOPES, A. R. O.; CERQUEIRA, G.S.; SOUZA, E. P.	2021	The data report that the inclusion of technologies, especially digital technologies incorporated through platforms to remote teaching, enable a better qualification in teaching, in addition to facilitating the learning of the developed contents.
06	Ifes Science Magazine.	Education and covid-19: the art of reinventing the school mediating learning "primarily" by the tdc.	CANI, J.B.; SANDRINI, E. G.C.; SOARES, G.M.; SCALZER, K.	2020	Constata it is that the digital environment, with a strategic integration of teaching-learning process and technologies, offers numerous effective remote mediation resources for educational use.
07	Professor's look.	Educational actions in times of pandemic: reflections on biology in high school.	LIMA, W. R.; PEIXOTO, J.; ECHALAR, A.D.L.F.	2020	Actions that aim to preserve the link of students with the school. To this end, it presents possibilities for organizing pedagogical work in Biology in high school, considering the responsibility of the school in the process of socialization of knowledge, as well as the importance of education for human

4 *Farias, D.B.; Lima, A.F.P.S.; Silva, E.T.B.; Silva, E.B.; Lima, J.B.A.S.; Silva, M.T.B.; Silva, W.C.; Silva, V.D.B.; Silva, G.E.R.; Souza, J.M.; Albuquerque, V.H.; Aguiar, A.C.; Silva, R.M.S.; Lima, C.G.O.; Bruce, J.C.S.; Costa L.L.L.; Silva, E.V.; Barbosa, V.C.; Gomes, V.S.; Alvares, E.B.S.O.; Morais, R.C.S. Information and communication technologies in biology teaching from the perspective of covid-19 in the light of studies already carried out...*

					formation.
08	Biology: Challenges, Skills and Competencies in Biology Teaching.	The COVID-19 pandemic and the teaching process - learning.	GOMES, I.C.; SOUZA, E. S.	2021	Given the teaching-learning process, it occurs to the need of the school to adapt the teachings to the reality that lives and the changes that the new generations of students are connected, make use of resources and didactics that minimize learning difficulties, ensuring the formation of students for the exercise of citizenship
09	Magazine <i>Interactions</i> .	The use of digital technologies in the teaching process during the covid-19 pandemic.	ROCHA, F. S.M.; LOSS, T.; ALMEIDA, B. L.C.; MOTTA, M. S.; KALINKE, M.A.	2021	Some teachers indicated that the use of TD in teaching will not replace the role of the teacher in face-to-face classes, especially in Basic Education, but the adoption of remote education, in the period of pandemic, will directly impact pedagogical practices in the return of face-to-face activities.
10	Revista de Educación en Biología.	Biology and pandemic teaching: contextualizing Covid-19.	LIPORINI, T. Q.; QUARRY, A. J.	2020	As a result, and action of said UoI, it is expected that schools will appropriate the activities offered in it.

Source: Prepared by the researcher with data collected.

Given the educational context caused by the pandemic, knowing the experiences of biology teachers will contribute to the discussion of the theme in question, thus showing the difficulties and overcoming experienced by the educator, due to remote teaching. Among the various adaptations, conventional education was replaced by new digital platforms. Thus, requiring skills and skills that until then was not worked with graduates. In addition, the method of evaluating the student has become more complex, leaving in evidence that the practice of evaluation by single means,

such as the test, is an outdated method (SANTOS, 2021; FREITAS, 2021).

On teaching and evaluation methodologies, Soares *et al.* (2021), elucidates that the most used tools were Google Meet (online class), Zoom (recording of classes and "slides") Google classroom (activities made by students), the latter was the main way to check if students are experiencing and performing the exercises, because they send activities answered, the teacher gave a return through corrections and explanations of the proposed questions.

Thus, evaluating the student goes far beyond a simple and mere test, this post, Neto *et al.* (2021), argues that teacher training is needed from these new Digital Information and Communication Technologies, so that the skills needed for the teaching and learning process are successfully developed. Among many challenges in the educational context in the pandemic period, the use of digital technologies is one of the major factors pointed out, since a large majority did not have continued training and ended up being limited to conventional education. However, the lack of preparation of teachers regarding the use of digital technologies can generate a deficit in communication and learning of students. However, it is necessary that institutions need to be encouraged to continue teacher training (ROCHA *et al.*, 2021; MIRANDA *et al.*, 2020).

Most teachers saw the use of ITDCs as a challenge, while others were an opportunity to reinvent themselves, as well as to improve their teaching methods. Thus, the relevance of biological knowledge is perceived, where it was essential in coping with the pandemic, that is, biology teachers had an even greater role in this period, being challenging, especially in the transfer of coherent information to students (CANI *et al.*, 2020; GOMES, GOHETS SOUZA, 2021).

The teacher-student relationship is indispensable in advancing meaningful learning, and it is evident that the Brazilian educational system needs to be rebuilt, where the teacher needs to get out of the comfort zone, and go in search of professional training, always keeping on top of ICTs and innovations (LIPORINI & PEDREIRA, 2020; Lima, LIMA; PEIXOTO; ECHALAR, 2020).

4. Conclusions

Given the relevance of the subject, it is remarkable that the faculty was essential in the period of the pandemic of covid-19, in the instruction of students in the face of a new educational paradigm. With this, the closure of schools and educational institutions due to the pandemic situation caused by covid-19, implied a new look and reflection of traditional education.

Thus, the need to monitor the available technological resources demonstrated that Emergency Remote Education (ERE), a model mediated by devices, ICT and internet, challenging teachers, students and even the educational institution itself, to an education ensured by digital means.

At the end of the present study, it is suggested that teachers and researchers in the area of science and technology teaching, a deepening of the researched subject, with perspectives on the negative and positive impacts of remote classes in the post-pandemic period and technological advances.

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