v. 5, n. 7, 2025

International Journal of Human Sciences Research

Acceptance date: 07/05/2025
Submission date: 15/04/2025

REMOTE TEACHING: DIFFICULTIES FOR BIOLOGY TEACHERS DURING THE COVID-19 PANDEMIC

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Abstract: The aim of this study was to conduct a literature review, based on publications from Google Scholar, to identify the successes and challenges faced by biology teachers in remote teaching during the COVID-19 pandemic. Remote teaching occurs when classes are produced by the teacher and made available online, being monitored in real time by the teacher responsible for the curricular component, observing adjustable schedules of traditional teaching. This research used Google Scholar to search for the material, as it is easily accessible, free and linked to several other databases, covering a period from November 2019 to December 2024. Descriptors in quotation marks were used for greater precision of the results linked to the theme being worked on, in order to obtain a selection of studies that contemplate the topic under investigation, in addition to inclusion and exclusion criteria, obtaining a sample of 9 scientific texts. After reading the papers in full, there was a lack of studies analyzing the impacts of the COVID-19 pandemic on biology teachers, as well as the adoption of pedagogical practices to contemplate education and its full development. In conclusion, the studies analyzed on biology teaching during remote classes highlighted the use of digital tools, such as teaching platforms and online games, which proved to be important pedagogical resources. However, the articles analyzed did not present any successes for teachers resulting from remote classes and only one of them focused on the performance of teachers, reporting adversities acquired in working due to the new model of classes.
Keyword: Remote classes. Teachers. Sars-Cov-2. Challenges in biology.

INTRODUCTION

Biology teaching plays a fundamental role in educating people, promoting an understanding of the life sciences. With the arrival of the COVID-19 pandemic, educational institutions have been challenged to transition to the remote model, which can significantly impact the teaching-learning process of students. According to Costa and Sá (2025), new teaching strategies have been incorporated into teaching practices, while some have been abandoned or adapted. Thus, remote teaching has brought challenges for both teachers and students, affecting activities in formal and non-formal educational contexts.

Remote teaching occurs when classes are produced by the teacher and made available online, being monitored in real time by the teacher responsible for the curricular component, observing adjustable schedules of traditional teaching. This method was adopted in 2020 by schools due to the new educational scenario during the COVID-19 pandemic period, in which it is necessary for teaching and learning to take place and at the same time maintain distance (Andrade and Martins, 2021).

From this context, there was a need to suspend face-to-face classes and the insertion of the remote modality began. (2021), the changes that the teaching and learning process has been going through in recent years, especially in 2020 and 2021 called the pandemic period, motivated those involved in education to seek new forms of instruction, instigating teachers to innovate their didactics, especially with a technological interface.

In view of this, this research is justified by the importance of understanding the impasses arising from teachers' feelings about the new teaching method, observing both personal and professional adversities, since the migration to this new method was sudden and unexpected, without prior preparation. This work is of great importance for unders-

tanding the process of teachers' occupational well-being, allowing problems to be identified and consequently solutions to be identified.

Therefore, this study reviewed the literature on Google Scholar to analyze the challenges and successes of biology teachers in remote education during the COVID-19 pandemic, highlighting the complexity of methodological adaptation and the importance of understanding these experiences to improve future practices in similar contexts.

MATERIAL AND METHODS

This work adopts a descriptive, bibliographical and qualitative approach, with the aim of exploring, analyzing and interpreting information extracted from previously published materials. The descriptive approach seeks to review and consolidate existing knowledge, clarify concepts, identify gaps and encourage new thinking.

With regard to bibliographical research, Gil (1999) points out that its main advantage lies in the possibility of covering a much wider range of phenomena than those accessible through direct investigation. In addition, the qualitative approach, according to Minayo (2009), is especially appropriate for studies that seek to understand the logic behind the social practices experienced in reality.

The methodology was based on Menezes, Amorim and Oliveira, (2018), which analyzed theses and dissertations from the CAPES database, but for this research Google Scholar was used to search for scientific texts, as it is easily accessible, free and linked to several other databases. Descriptors in quotation marks were used for greater precision of the results linked to the topic under study, in order to obtain a selection of materials that addressed the topic under investigation. The keywords were: "Biology and the pandemic", "Biology and remote teaching in COVID-19" and "Remote biology classes".

The search for papers took place between November 2019 and December 2024, covering the period during the height of the COVID-19 pandemic. As inclusion criteria, only scientific articles, abstracts and book chapters were selected, with a basis in Portuguese. Exclusion criteria were works that were not well--founded, that did not fully meet the research perspective, course completion works (monographs, dissertations and theses), duplicates and in other languages.

The selection followed four stages: in the first, the platform's filters were applied considering the year, language and descriptors, resulting in a total of 15 selected papers. In the second, screening continued based on the inclusion and exclusion criteria, followed by reading the titles and, where relevant, the abstracts to confirm relevance. After this first survey, the texts were read in full, and six more papers were excluded due to one being a duplicate article, another a dissertation and four papers that did not meet the research objectives, leaving only nine scientific texts. In the third stage, a portfolio was organized containing the title, authors, year and objective, making it easier to consult. Finally, in the fourth stage, the detailed analysis and writing of the article was carried out.

RESULTS AND DISCUSSION

After selecting the nine papers, a portfolio was put together containing the titles, authors, year of publication and objectives of each paper, as shown in Table 1.

The study by Nascimento *et al.* (2021) mentions the use of some digital platforms during the supervised internship in biology, and does not present any problems related to difficulties in the teaching process during the pandemic, nor success on the part of the teacher. Therefore, the importance of the teacher in improving the contribution to the students' civic education is emphasized in a summarized way, without highlighting the difficulties

TITLE	AUTHORS	YEAR	OBJECTIVES
The supervised internship in biology teaching and its contribution to teacher training during the pandemic.	Nascimento *et al.*	2021	Present, describe and analyze the experiences acquired during the supervised internship in Biology teaching during the pandemic period.
Mind map and crossword puzzle: Facilitating tools in the teaching-learning process in Biology.	Coelho *et al.*	2021	To present an account of the experience of the residents of the 1st Module of the Pedagogical Residency Project in force at IFSULDEMINAS - *Campus* Machado.
Teachers' and students' perceptions of digital games for learning Biology in the context of the pandemic.	Amorim and Costa	2021	To investigate the perceptions of biology teachers and students who play online digital games about the challenges of learning.
Practical Biology Lessons in Remote Education: Challenges and Perspectives.	Sá and Lemos	2020	Understanding the biology teaching practices developed in a state school in the municipality of Campos Sales - EC during the social isolation caused by the pandemic.
Mind and concept maps: a strategy for meaningful learning in biology teaching.	Yano *et al.*	2021	The aim was to create mental and conceptual maps in different subjects for students on the Biological Sciences degree course.
The use of gamified platforms in education as strategies to enhance learning and student interactivity in classes.	Silva *et al.*	2021	Demonstrate the use of digital tools *Mentimeter* and *Kahoot* as a strategy for promoting student interactivity and improving the concepts of Biology content.
Challenges encountered by teachers in teaching Science and Biology in the midst of the pandemic in the city of Cedro-CE.	Menezes and Viana.	2023	To analyze the perception of science and biology teachers in the municipality of Cedro-CE about the pedagogical practice developed during this historical period.
ICTs as Allies in Biology Teaching During the Covid-19 Pandemic.	Miranda, Cedro and Silva.	2024	To reflect on the rise and impact of ICT as a tool for learning to teach biology during the COVID-19 pandemic.
Perception of teachers from different schools about the teaching-learning process of science and biology in the context of COVID-19 in Abaetetuba, Pará, Brazil.	Rego *et al.*	2024	To investigate the perception of Science and Biology teachers from different schools about the teaching-learning process of these subjects in Abaetetuba-Pará during the pandemic scenario, as well as the challenges they faced.

Table 1. Portfolio of selected articles.
Source: Research data, 2024.

faced by teachers in the face of the methodologies adopted during the pandemic period. The authors report that:

> Faced with the rapid inclusion of Information and Communication Technologies in the educational sphere, brought on by the *Sars-CoV-2* pandemic, carrying out the Supervised Internship remotely highlighted the essential need for contemporary teachers to be constantly learning in order to improve an education that not only trains students who know the contents of the curriculum, but also citizens who are imbued with criticality in a society of staggering social inequalities (Nascimento *et al*., 2021).

The work also highlights that the supervised internship emphasizes the entire process during the pandemic, mentioning the use of digital platforms such as Google Meet, WhatsApp, Google Forms and *Kahoot*.

Coelho *et al.,* (2021) and Yano *et al.,* (2021) discuss the use of mind maps and crossword puzzles on digital platforms, highlighting their relevance in remote teaching. The tools not only stimulate the students' cognitive process, but also facilitate feedback for teachers, allowing for a better assessment of the knowledge acquired.

The authors did not discuss the obstacles encountered by teachers, nor the successes achieved with the new teaching method. They both worked on the insertion of conceptual and mental maps for students during the pandemic period, a phase that required new teaching strategies so as not to leave students without classes.

Authors Amorim and Costa (2021) discuss the use of digital games in biology classes, emphasizing that they should be used according to the theme discussed, so that they don't

become just entertainment, thus offering engagement and promoting learning through experimenting with games in the classroom, allowing the teacher to be the mediator in the teaching and learning process.

The authors point out that "The path to experimenting with digital games in school contexts therefore requires teachers and school management to overcome their prejudices (Amorim and Costa, p. 108, 2021)". It should be emphasized that the games should be arranged according to the approach to the content in the classroom, since this didactic alone is insufficient for learning. Finally, the authors did not present any advantages for teachers, nor any problems with remote classes.

The study by Silva *et al.* (2021) presents a proposal for the use of platforms as a strategy for interactive development in remote biology classes, while highlighting the importance of technologies to enhance teaching, focusing on students, without emphasizing teaching performance.

The paper verifies the use of the digital tools "Kahoot" and "Mentimeter" as an alternative for offering interactive classes to students. In this way, the importance of the platforms for dynamism and interactivity in the teaching-learning process is highlighted. The activities on the platforms were carried out through *links* and the use of PINs to solve questions (Silva *et al.,* 2021).

According to Sá and Lemos (2020), the numerous challenges that remote teaching poses to teachers are noticeable, due to the difficulties encountered due to the lack of training to carry out classes in this modality, as well as the use of interactive methods that engage students. The need for classes to take place entirely online makes the student-teacher relationship difficult, so learning is hampered due to the distance between those involved, favoring the physical and mental exhaustion of students and teachers.

Sá and Lemos (2020), in addition to addressing teaching in biology, emphasize difficulties encountered by educators during isolation with virtual teaching, such as: stress, excessive workload, adequate internet accessibility and mastery of digital tools. From this same perspective, Lima and Mota Neto (2021) state that teaching and learning are affected due to the psychological trauma suffered by teachers during quarantine. This corroborates Brizola *et al.* (2021), who point out that the emergency change in education has not adequately prepared teachers, making it challenging to maintain the same quality of teaching.

For Menezes and Viana (2023), the success that has emerged in Emergency Remote Education (ERE), reported by many teachers, is due to the diversity of teaching resources available for teaching practice. The use of digital technologies such as WhatsApp, Google Meet and video platforms has enabled more frequent communication and greater interaction with students, which would otherwise have been limited or non-existent. This variety has allowed for a more dynamic pedagogical approach, providing a space for the use of active methodologies that favor students' autonomy and protagonism in the learning process.

However, Menezes and Viana (2023) point out that, despite the successes, the challenges faced by teachers were substantial. The authors reveal that the lack of internet access was the main obstacle. Around 85.7% of teachers mentioned that the lack of adequate connectivity between students hindered participation and engagement in the activities, leading to a significant lack of feedback on the proposed tasks. This disconnection not only limited student learning, but also made teachers feel frustrated and powerless, since their pedagogical efforts were not being effectively used by the students.

Miranda, Cedro and Silva (2024) highlight the rapid adaptation of many teachers to the use of Information and Communication Technologies (ICTs), which have become essential for maintaining the school calendar and the continuity of learning. The use of platforms such as Google Meet, Zoom and Google Classroom has facilitated interaction between students and teachers, enabling synchronous and asynchronous activities which, in some cases, have increased student participation due to their more dynamic and interactive format.

In terms of challenges, the authors point out that the lack of adequate training was one of the main obstacles, with many teachers reporting difficulties in integrating ICTs effectively into their teaching practices. In addition, the limited infrastructure, such as the lack of quality internet access and the absence of appropriate equipment, impacted both teachers and students, creating an unequal environment for learning. Another critical aspect was the complexity of some biological content, which is challenging to teach remotely, especially without practical activities, which are essential for effective understanding of the subject.

Corroborating this perspective on the successes of ERE, Rego *et al.*, (2024) portray the adaptation of teachers to new technologies and digital methodologies. The use of distance learning platforms, interactive materials and online engagement strategies allowed learning to continue, despite the limitations imposed by social distancing.

However, according to Rego *et al.* (2024), many teachers faced difficulties related to technological infrastructure, such as a lack of suitable equipment and an unstable internet connection. In addition, the pedagogical adaptation to a virtual environment required a great deal of effort, both in terms of planning and in reconfiguring teaching strategies to ensure active student participation. The lack of face-to-face interaction also affected learning dynamics, making it more complex to assess student progress.

FINAL CONSIDERATIONS

After reviewing the literature, there was a lack of studies analyzing the impact of the COVID-19 pandemic on biology teachers and the adoption of pedagogical practices aimed at promoting education. There were also gaps in the literature regarding the difficulties faced by educators, who were neither prepared nor had the necessary equipment to ensure the implementation of remote teaching. However, it is believed that the scarcity of studies with this approach is due to the fact that many studies are still in progress and new studies will be published.

It was observed that the studies analyzed on teaching biology in the remote context highlight the use of digital tools, such as online platforms and games, as the main didactic approach. However, there is no evidence of success for teachers in this format, and only one study focused on teaching performance, reporting on the adversities faced with the new teaching model.

In view of this, this study highlights the need for research into the role of teachers in remote teaching, in order to better understand the challenges experienced. Therefore, considering the possibility of new situations similar to those of recent years, it is essential to invest in quality, interactive remote teaching, anticipating challenges and seeking solutions.

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