





## Pros and cons of remote classes in a Chemistry Degree at Covid-19 pandemic

# Os prós e os contras das aulas remotas em um curso de Licenciatura em Química na pandemia da Covid-19

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## ABSTRACT

In march 2020 an acute respiratory disease caused by the SARS-COV-2 virus was transmitted to a significant number of the world's population. With the global spread, the World Health Organization (WHO) declared a pandemic, and Brazil immediately began to take appropriate measures, such as the establishment of quarantine and social isolation. These measures impacted several areas, including education, which paralyzed face-to-face classes, also affecting education in the State of Alagoas. Some universities decided to continue the academic calendar at an online way, operating through digital platforms, and following this model, classes continued in the undergraduate course in chemistry, at Universidad State of Alagoas (UNEAL), campus I. This article aims to assess the ability to learning in the teaching of chemistry, in the chemistry degree in UNEAL, through digital platforms, during the pandemic. The methodology adopted was a quantitative study with the application of a questionnaire developed on the google forms platform and applied to the students of that course. The survey results show that 45% of students had learning difficulties, 92% of students point out remote teaching as positive, and 90% said that remote learning was the best option at that time. These data indicate that digital platforms are tools that can contribute to the chemistry's teaching, but not replacing face-to-face teaching and student-teacher contact.

## RESUMO

Em março de 2020 uma doença respiratória aguda causada pelo vírus de SARS-COV-2 foi transmitida a um número expressivo da população mundial. Com a disseminação global, a Organização Mundial de Saúde (OMS) decretou estado de pandemia, e o Brasil de imediato começou a tomar as medidas cabíveis, como o estabelecimento de quarentena e isolamento social. Estas medidas impactaram diversas áreas, incluindo a educação, que paralisou as aulas presenciais, afetando também o ensino no Estado de Alagoas. Algumas universidades decidiram dar continuidade ao calendário letivo de forma on-line operando por meio de plataformas digitais, e seguindo este modelo, as aulas continuaram no curso de licenciatura em química, da Universidade Estadual de Alagoas (UNEAL), campus I. Este artigo tem como objetivo avaliar a aprendizagem no ensino de química, no curso de Licenciatura em Química da UNEAL, por meio de plataformas digitais, durante o período pandêmico. A metodologia adotada foi estudo quantitativo com aplicação de questionário desenvolvido na plataforma *google forms* e aplicado aos alunos do referido curso. Os resultados da pesquisa apontam que 45% dos alunos tiveram dificuldades no aprendizado, 92% dos estudantes apontam como positivo o ensino remoto, e 90% disseram que as aulas remotas foi a melhor opção naquele momento. Estes dados indicam que as plataformas digitais são ferramentas que podem contribuir com o ensino de química, porém não substituindo o ensino presencial e o contato aluno-professor.

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## Introduction

On December 31<sup>st</sup>, 2019, the World Health Organization (WHO) was alerted to several cases of pneumonia in the city of Wuhan in China, but it was not until January 7<sup>th</sup>, 2020 that a new type of virus was confirmed, which became known as the new coronavirus. SARS-CoV-2 quickly infected many people in China and the countries surrounding it. On May 20<sup>th</sup>, 2020, considering the significant increase in cases spreading around the world, the WHO characterized a state of global pandemic (Diniz, 2021).

In times of the Covid-19 pandemic, when social isolation was a task for the entire global population, education had to be remodeled to become totally dependent on technology. Since, since education is a “right of all and a duty of the state and of the Family” (Brasil, 1988), it is also a duty of the state to guarantee access to education, providing the necessary means for it to be exercised in the best way, as provided for in the Law of Guidelines and Bases of National Education (LDBEN) art. 205 of the Federal Constitution of 1988, educational institutions sought to adapt to this new reality to continue guaranteeing the right to education.

Throughout the country, classes began to be transmitted to students remotely, which was no different in the State of Alagoas, and for the State University of Alagoas (*Universidade Estadual de Alagoas - UNEAL*), specifically on Campus 1, the Chemistry Degree course also continued classes remotely.

The Covid-19 pandemic leads us to reflect on how important interpersonal relationships are, as the lack of physical contact, in the process of teaching and learning, can be considered an impediment to expressing feelings and assertive communication. However, in a world where technology is the tool we so long for and need to solve problems, whether professional, sentimental and/or family, it has become the only ally. The deprivation of this freedom, in the majority of society, may awaken the need to relate physically to each other or not, but perhaps point to a new world culture (Fiori & Goi, 2020).

Education in times of pandemic, caused by the new coronavirus, is not consolidated in the same way as before this “world crisis”, given that this pandemic has led to the momentary closure of most universities in Brazil (Ladeira, 2020).

Remote classes were adopted to continue the school year amid the restrictions imposed by the Covid-19 pandemic. With the suspension of face-to-face classes, the Ministry of Education, on an exceptional basis, released an ordinance that authorized the resumption of ongoing disciplines and the opening of new classes through online classes and remote activities (Novo, 2020).

Abruptly, teaching was changed and, for teachers, a great challenge arose to be faced: to consider digital technologies as teaching tools and seek to extract the best performance from

students in this moment of crisis. With this situation imposed, teachers were faced with, without any preparation, planning or organization with regard to instrumentalization and teaching practice for the use of tools that would enable the extension of the school routine in the home environment (Ferreira & Barbosa, 2020).

Thus, in view of the above, through this article, we will seek to research and learn about the pros and cons that the Chemistry Degree Course at the State University of Alagoas (*Universidade Estadual de Alagoas - UNEAL*), Campus I, Arapiraca, experienced during the pandemic period caused by Covid-19.

## **Theoretical framework**

The Covid-19 pandemic challenged everyone in their routines and teachers and students were surprised by the new class profile that changed the teaching-learning process in education. It was understood at that time that there was a need to restructure the model of classes, being rethought in order to seek a more meaningful teaching, with less possible damage and promoting quality education, regardless of the context in which the student was inserted (Piffero et al., 2020).

When the WHO declared the seriousness of the Covid-19 pandemic in March 2020, a worrying health situation and the adherence to measures to control the transmission of the disease were established, involving individual and collective hygiene and physical distancing actions. In education, one of the actions involved the need for remote classes so that students would not be deprived of teaching (Couto et al., 2021).

Thus, there was a need to provide technological resources for students who did not have access. In addition, it became essential to promote continuing education courses for teachers, in order to improve their skills in handling the technologies used in educational processes so that there would be a better quality and use of classes, whether face-to-face or virtual (Limeira et al., 2020).

Analyzing this context, we saw a great challenge for teachers to adapt to this new format of teaching classes. In addition, the teachers were aware that a large portion of the students already had constant contact with the digital environment, through their tablets and smartphones, for example, and on the other hand, these teachers were already paying attention to the development of activities through the conjuncture of new technologies. And we are not just talking about the effort to know the use of a new device, or virtual environment, application, etc., but also thinking about how to put this use into practice and so that the teaching and learning process achieves its objectives (Alves, 2018).

It was relevant to use pedagogical practices in a perspective of interaction through digital technologies, as it proposed a transformation in the role of communication and

information, in which the subject ceased to be simply a consumer or receiver, to also be a co-author and producer in the information process (Carvalho & Carvalho, A., 2017).

From this perspective, the inclusion of digital technology was and is a requirement present in contemporary society, increasingly connected in real time, which generated new reflections on the teacher's work in the face of that new teaching reality and the ways used to stimulate the assimilation of knowledge through a virtual environment (Avelino & Mendes, 2020).

Usually, the lack of mastery of these resources used as pedagogical tools or the difficulty in appropriating this type of language can generate resistance to the use of technologies, because “in the classroom, the obstacle insinuates itself as a block in the action of teaching in a situation in which the teacher is unable to conduct the process in a way that contributes to the student's learning” (Schuhmacher et al., 2017, p. 566).

The internet is a means of communication and information that enables interaction between people, through contacts, virtual friendships, and constant exchanges with other colleagues can facilitate the learning of some students with others. Currently, most students have a cell phone with a camera, which makes it possible to film, photograph, connect to the internet, record videos, have TV and games, etc. Thus, the teacher needs to be connected with everything that happens around him and use, in the school environment, the potential available in these media, for the construction and reconstruction of significant knowledge for the student (Barreto & Rocha, 2020).

Thus, digital technology has its use as an alternative to fill the gaps left by the impossibility of holding face-to-face classes, that is, education can be mediated by multimode resources and remote teaching constitutes a possibility to teach and learn (Médici et al., 2020).

Remote teaching was an alternative to mitigate the effects of the pandemic on education, caused by the new coronavirus and its variants. Certainly, the consequences to learning were and are felt, however, teaching in the hybrid modality (remote and face-to-face) is something preeminent in contemporary times (Blikstein, 2020).

However, teachers and students need to be aware that technology alone does not work miracles to acquire knowledge, and it is necessary that there is an interaction between the machine and man, so that the information provided through digital technologies is consolidated in the production of content that appropriates knowledge that is already certified. aiming at the expansion of these and the discussion around new information that generates new perspectives for the efficient cognitive process.

## **Methodological procedure**

For this study, the survey method was used to obtain quantitative information about remote classes in the Chemistry Degree Course at the State University of Alagoas (*Universidade Estadual de Alagoas - UNEAL*) Campus I. This is probabilistic convenience sampling, using semi-structured questionnaires through Google Forms and made available via social network (WhatsApp). The application of the questionnaire took place in the second semester of 2021, for students of the Chemistry Degree Course at the aforementioned university.

The accomplishment of this work was divided into two stages, namely:

Stage 1: Contemplated the performance of qualitative research in articles published in databases such as Google Scholar and SciELO for theoretical foundation and corroboration in the analysis and discussion of the results.

Stage 2: Sought to carry out an exploratory research with the application of a virtual questionnaire, containing 13 objective questions with multiple choice answers and descriptive questions. The questionnaire sought to analyze the pros and cons of remote classes in the Chemistry Degree Course at the State University of Alagoas (*Universidade Estadual de Alagoas - UNEAL*), Campus I.

## **Results and discussion**

The results to be discussed are the result of the 58 students interviewed from the Chemistry Degree Course at the State University of Alagoas (*Universidade Estadual de Alagoas - UNEAL*), Campus I.

According to the first question, we seek to know: Do you have access to the internet? And for this questioning, we verified that all the interviewees have access to the internet, which contributed to the monitoring of the classes without prejudice to the information/knowledge transmitted to the students. According to data obtained by the Brazilian Institute of Geography and Statistics (IBGE), one in four people in Brazil does not have access to the internet. In total numbers, this represents about 46 million Brazilians who do not access the network (IBGE, 2018).

In the view of Flauzino et al. (2021), the advancement of digital technology in Brazil has given rise to new dynamics for the learning process, which have intensified in the pandemic, and through the internet has offered the necessary support for the development of remote classes, using tools such as email, interactive exchange of messages in real time, file transfer, and multimedia navigation for learning.

On the other hand, the pandemic has exposed the structural problem regarding internet access by Brazilian students, especially by students in the public school system, which according to Alves (2020), is an expression of social inequality in Brazil, which led part of the students not to have adequate education, harming learning.

This structural problem is also evidenced by Miranda et al. (2020, p.4), when they denounce that “the suggestion of remote education in the public network as a whole can be perceived as a great mistake, as it makes access to knowledge unfeasible for the less favored social class, as they do not have access to digital technologies [...]”.

In the second question, which was asked: Do you agree with Decree No. 40,539 of March 19<sup>th</sup>, 2020, regarding the measure to have remote classes? For this question, it was noted that 90% of respondents answered that they agreed with the new teaching method in the midst of the pandemic caused by Covid-19, while 10% did not agree with the remote class model. These data are in line with the work of Fiori and Goi (2021) who found similar results, showing that 92% of respondents agreed that remote classes contributed to learning in the midst of the pandemic.

Since the World Health Organization (WHO) declared the seriousness of the infection caused by the new coronavirus, a worrying health situation and the adherence to measures to control the transmission of the disease have been installed, involving individual and collective actions of hygiene and physical distancing. One of the actions involved the need for remote classes so that students would not be deprived of education (Couto et al., 2021).

In that period, it was relevant to use pedagogical practices in a perspective of interaction through Digital Information and Communication Technology (DICT), proposing a transformation in the role of communication and information, in which the subject is no longer simply a consumer or receiver, but also a co-author and producer in the information process (Carvalho & Carvalho, A., 2017).

From this perspective, the inclusion of DICT was included, which is a requirement present in contemporary society, increasingly connected in real time, which generates new reflections on the teacher's work in the face of this new teaching reality and the ways used to stimulate the assimilation of knowledge through a virtual environment (Avelino & Mendes, 2020).

Thus, “[...] This is a time to reflect on learning about the different platforms, and about making their use recurrent. [...]” to “rethink new ways of teaching and learning and break down barriers and paradigms related to this deep-rooted modality” (Vercelli, 2020, p. 56).

Vercelli (2020, p. 50) explains that remote classes differ from classes in the Distance Learning (DE) format by clarifying that in this “[...] The content is, most of the time, asynchronous, that is, without a predetermined schedule, self-instructional, and conducted by tutors”, unlike remote classes, which take place in real time.

In this sense, Rothen et al. (2020) ratify that the use of DICT in the classroom expands the possibilities of communication between teachers and students. Souza (2020) defends the digital inclusion of students by arguing that education needs to treat technology as an ally in the learning process, not that technologies are the only solution for the teaching and learning

process, but their use allows a wide range of possibilities for acquiring knowledge with dynamism and virtuality, characteristics that attract the student's attention.

Usually, the lack of mastery of these pedagogical resources or the difficulty in appropriating this type of language can generate resistance to the use of DICT, because, “in the classroom, the obstacle insinuates itself as a block in the action of teaching in a situation in which the teacher is unable to conduct the process in a way that contributes to the student's learning” (Schuhmacher et al., 2017, p. 566).

In the third question, which sought to know if the university had made any video or tutorial to guide the implementation of remote classes. Thus, we noticed that the vast majority of respondents, that is, 90%, said that guidance was made available through the course coordination and that teachers also clarified the operation of remote classes, under the argument that it would be the best way to maintain social isolation and continue with the academic calendar up to date.

We note that these data dialogue with the data obtained in question 2, when students agreed to have remote classes so as not to have delays in the academic calendar, a thought that corroborates that of Rondini et al. (2020) when they stated that in pandemic times, the use of DICT became the means used by schools to maintain classes in the face of the social distancing protocols defined by the WHO to avoid Covid-19 infection; and also with that of Médici et al. (2020), who saw the use of DICT as one of the most debated solutions in the context of the pandemic, due to the need for social isolation and for the maintenance of the school year.

The fourth question asked the interviewees: Was any technical support provided by the institution on how to use the technologies for remote classes? For this question, we find that:

**Table 1.**  
Technical support provided by the institution.

Alternative	Percentage (%)
Yes	55
No	45

*Note: Survey data (2023).*

It is observed that 45% of the interviewees reported that they were not given any type of support from the institution, on how to handle the technologies to be used to monitor remote classes, and 55% of the interviewees stated that they had some type of guidance or tutorial on how to use the technology for remote classes.

The use of TDICs in the classroom expands the possibilities of communication between teachers and students. The digital inclusion of students and also of some teachers is necessary, since they also had difficulties in using these tools. Education needs to treat technology as an ally in the learning process, not that technologies are the only solution for the teaching and learning process, but their use allows a wide range of possibilities for acquiring knowledge with dynamism and virtuality, characteristics that attract the student's attention.

On this aspect, it is evaluated that the knowledge of technological tools, previously considered only as computerized resources, started to have a didactic function for cognitive, social and human development, since such tools promote an inclusive and broad education in the search for knowledge and in the use of technology for the apprehension of knowledge (Limeira et al., 2020).

In the fifth question, the interviewees were asked: How would you rate the content and type of material made available by teachers for their studies in remote classes? It was found that 85% considered the study material provided by the teachers “good”, 10% considered the material “excellent”, showing that the didactic material was favorable to the teaching and learning of the students, and 5% gave an opinion as “regular”.

This result is in line with the research by Rothen et al. (2020, p. 102) who list methodological proposals applicable to teachers for the development of remote classes, including: “[...] select content, organize learning itineraries, define stages of activities, define evaluation criteria, monitor the pace of learning and adapt methods and practices according to the development of students”.

Menezes et al. (2021) add that changes in educational paradigms are not only related to curricular content and proposals, as provided for by Law No. 9,394/1996 - Law of Guidelines and Bases of National Education (LDB) and through the National Education Plan (PNE). Such changes are also related to technological didactic resources that can be used in the classroom and in other educational environments to enhance learning, however, they need to be didactically significant and developed with attractions (offered by DICT) that contribute to assimilate the content and to keep the student's focus on the learning process.

The sixth and seventh questions are correlated and asked, respectively, if the course coordinator has been accompanying the class in adapting to remote classes and if the faculty of the Chemistry Degree course at (UNEAL) has provided some kind of schedule for class follow-ups. Thus, we found that 75% of the students affirmed the commitment of the coordination to accompany the students in that period of adaptation to remote classes, and that 25% indicated little commitment of the coordination to meet requests about doubts in accessing remote classes.

For the answers to the seventh question, we note that 100% of the students stated that they had received from the coordination a calendar with the definitions of days and times of remote classes. Santos (2021, p. 4) reinforces that the pedagogical coordinator, as a professional who, among his attributions, works in the continuing education of teachers, needed to create “[...] together with the other segments of the course, possibilities for the challenges of remote teaching to be gradually overcome, even bearing in mind that the difficulties would go beyond their willpower [...]”, which required a “[...] articulated action with a view to the common good, a fact that ended up being silenced due to the lack of support from



the educational community in the face of the real problems of the institutions” (SOARES, 2020, p. 3).

The eighth and ninth questions also complemented each other, as we sought to know about the quality of the audios and videos that the students had access to in class. Thus, we noticed in the eighth question that 90% of the students said they had access to good audio in remote classes, and that 10% had difficulty due to the poor quality of their own devices to follow the classes. For the ninth question, where the quality of the videos/images of the remote classes was asked, we found that 10% of the interviewees stated that the videos/images received had excellent quality and the majority, that is, 90%, stated that they had good quality, but that they could be more attractives.

The results pointed out in these two questions add up and report the quality related to the audiovisual transmission of the didactic material, usually done by a virtual teaching platform. Paludo (2020) explains that the platforms are used in different processes that foster learning, ranging from the development of activities to video calls and assessments, which requires the teacher to have mastery over the use of DICT, as this way they will know how to use technological resources with the necessary quality of sound and image.

The tenth question asked whether access to virtual books and periodicals was made available to support remote classes. For this question, we noticed that 100% of the interviewees affirmed positively, informing that they received virtual material for remote classes. According to Hodges et al. (2020, p. 6) “[...] It's not about recreating a robust education system, but about providing temporary access to educational supports and content in a fast, easy-to-set up, and reliable way, during an emergency or crisis”.

In relation to the eleventh question, the commitment of the undergraduate students of the chemistry degree course at UNEAL campus 1 with remote classes was questioned. We noticed that 85% of the interviewees answered that they were committed to remote classes, while 15% said they were unfocused during classes for various reasons, such as relatives and family at home, street noise, among others. In this sense, Vercelli (2020) argues that teachers and students need to be aware that technology is only a technical support to enable the development of syllabus to acquire knowledge, and it is necessary for students to seek environments that help them focus on remote classes.

In the twelfth question, students were asked about their attendance at online classes. For this questioning, we found that 25% of the interviewees reported that they could not participate frequently in online classes, demonstrating that the method of remote classes was not as appropriate as the modality of face-to-face classes. For the other 75% of respondents, they indicated that they were able to follow remote classes regularly. On this aspect, Alves (2020) reflects that face-to-face or remote, the use of DICT is situated as a new educational conception in promoting knowledge in different ways and different from something merely reproductive such as technicist teaching, contributing to the criticality that must exist in the

teaching and learning process, in which teacher and student share the leading role in conceiving new knowledge based on previous socially acquired knowledge, culturally and in the educational environment.

The thirteenth question asked students about the biggest difficulties encountered in remote classes. For this question, we allowed students to report their difficulties. In view of this, three most relevant situations were highlighted, namely:

**Chart 1.**

Three students' reports about their biggest difficulties in remote classes.	
Student	Testimony
A	Difficulty accessing the internet, poor connection or power outage, considering that most of the undergraduates live in areas far from urban centers.
B	Clarification or doubts about subjects applied in the remote classes modality proved to be complicated, as the student/teacher relationship is difficult because they are recorded classes without the possibility of interaction, that is, they are classes in the distance learning modality.
C	Lack of personal contact between the teacher and the student. It is more difficult to exchange ideas, discuss certain topics, and in addition, the lack of a suitable person to attend classes. Online classes were not as attractive as face-to-face classes.

*Note: Testimonials collected (2023).*

Based on the information in Chart 1, we can infer that remote teaching revealed the confrontation of limitations in access to the internet and in the use of DICTs, evidencing difficulties in accessing and remaining in virtual environments, due to the lack of internet or deficient internet and even the lack of appropriate tools for this purpose. The striking point of these reports shows that the teacher-student interpersonal relationship, which remained distant during the pandemic, was a primary factor in negatively affecting learning. Such reports lead to a reflection on the educational processes and the search for improvement for the pedagogical practice that maintains the personal contact between teacher and student.

The results pointed out with the application of the questionnaire showed that for the students there was a failure in conducting remote classes in 2020, the initial period of the pandemic, even though most of the interviewees stated that they had access to guidance on the use of the teaching platform and didactic material. Therein lies the question about the use of DICT as tools for pedagogical use and about Connectivism, a recent theory and fruit of the information age applied in education, which deals with the learning skills for students to learn in the digital age (Flauzino et al., 2021).

## Conclusion

The present research dealt with the theme of how the process of remote classes of the degree course in Chemistry at Campus I, of the State University of Alagoas (*Universidade Estadual de Alagoas - UNEAL*) took place under the eyes of the students of the referred course. The difficulty of accessing the internet was the main problem reported by the students, as they were not always able to have quality internet. Another point reported was the occasional power outages that prevented connectivity during classes, hindering learning.

These difficulties in accessing the internet and power outages were not only problems faced by the undergraduates, but also by the teachers. Teachers did not have guidance or instruction to handle electronic tools in remote classes, and this interfered with the quality of teaching and, consequently, learning, falling short of the face-to-face class.

In times of the Covid-19 pandemic, when social isolation was a task for the entire global population, education had to be remodeled and became totally dependent on technology. Thus, there was a need for the students of the Chemistry Degree Course to adapt to remote teaching, which evidenced difficulties such as: Handling DICT; feedback from the coordination and teachers about doubts raised by students regarding the handling of DICT and past contents; and the monitoring of remote classes due to lack of concentration and/or access to ineffective technological resources to download videos or listen to audios, for example, in addition to the finding that learning was impaired with the absence of face-to-face teaching.

It is correct to say that in the eyes of the students of the degree course in Chemistry at the State University of Alagoas (*Universidade Estadual de Alagoas - UNEAL*), the pandemic caused by Covid-19 interfered negatively in the progress of the course, but the institution, even with the lack of training for teachers, managed to adapt good material with good audio and video quality, committed to the teaching modality by providing technical assistance to students and took full advantage of the difficulty imposed by the Covid-19 pandemic.

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