

How Brazil teaches science during the pandemic?

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It is now well known that the COVID-19 pandemic has had a drastic effect across the globe. Since 2020 we have faced the challenging reality of combating an invisible enemy that threatens many lives, and we had to adapt to many changes in routine, which, although difficult, proved necessary. Social isolation is now something that is part of our daily lives, and with the need to stay at home, using the internet to perform many tasks has become the new norm, resulting in many companies and institutions having to quickly adapt to the home office, and it was no different for educational institutions.

Distance education was already a reality in some Brazilian institutions before the pandemic, but when all face-to-face activities were suddenly suspended, it was not easy to adapt schools and universities to this model. Public universities in Brazil adopted the online model provisionally as they did not have the dimension of what to expect in the future, however, it soon became clear that efforts would be needed to maintain the quality of education even at a distance, which is especially important for science education, since it is greatly hampered by the impossibility of laboratory classes.

Since the beginning of the pandemic, the São Carlos Institute of Chemistry (IQSC) has adopted the guidelines of the University of São Paulo to maintain activities remotely, both in educational activities and in cultural, extension and research projects. After a period of adaptation, teachers and students needed to learn to use online platforms, and together develop the best ways to teach classes and assess the knowledge acquired.



At first, there was immense concern on the part of the students, as the vast majority had to leave the University City and return to their families' city for an indefinite period, with an initial predicted interval of only 15 days! Many lived hundreds of miles away from the university, and had to spend many months without most of their clothes and belongings. Furthermore, one of the biggest challenges of distance education was the lack of internet connection or adequate equipment to carry out distance activities, as many students depended exclusively on the internet or computers available in campus libraries.

Other difficulties pointed out by students also include the lack of a suitable study environment in their families' homes, lack of space, lack of infrastructure, difficulty to access a silent environment, difficulty in accessing study materials since most also depended on the libraries for this, in addition to the many students affected by the economic instability of their families as the country undergoes a peak in unemployment rates. In addition to this, we must also consider the psychological effects that social isolation and the pandemic have brought to everyone, from anxiety caused by the fear of the disease, to the symptoms of fatigue and stress caused by the lack of social interaction in general.



Fortunately, the university has taken several steps to try to alleviate these adverse effects caused by the pandemic, providing internet kits for students with lack of internet connection. The chemistry institute provided a cell phone chip with internet connection and also a USB adaptor, with 60 gigabytes of data which are already paid for by the university monthly, which is enough to watch about 100 hours of video classes

every month. The cost of such an internet plan in Brazil varies between 100 and 120 reais (about 23 dollars) but fortunately, students that can't pay for it can get it for free (shipping included). There are other institutes within the university that also provided temporary laptops for students in need, as well as a few computers for the student accommodations, where most of the less fortunate students live.

The university also partnered with platforms that provide online collections with many titles in the areas of mathematics, physics, chemistry, pharmacy, health among others. After the first year of distance education, several debates were also held about different ways of adapting teaching to the online model, and

discussions began on the implementation of online practical classes. The institute then decided to make available, mainly to students closer to the end of the course, online laboratory classes, where the professor transmits the experiments and the students carry out the class reports, as well as some adapted experiments and seminars.

The University of São Paulo also encouraged several events and courses for the improvement of teachers in the use of online platforms, in addition to guiding them on different methods to teach the subjects, however, giving each teacher the freedom to decide how they will teach the content and evaluate the students. The institution also offers psychological assistance programs to students, which is extremely important, especially in these challenging times.

In addition, students are also encouraged to participate in various online extension events, such as lectures and mini-courses, online conversations, solidarity events, “the professions fair”, the “scientist for a day” event, music and dance workshops, cultural chats, academic weeks, freshman reception events and even more casual events like game nights and online get-togethers. Many students still participate in activities in extension groups, for example, recording experiments at home and sharing them on social media, as a way to encourage and disseminate science to the community.

Isadora Grassi Bizinotto, a student at the São Carlos Institute of Chemistry who joined in 2019 and is a resident of the student accommodation, reports her greatest difficulties with distance learning: “When you're alone, it's much easier to disperse, to be distracted... this issue of concentration and maintaining discipline is very difficult for me” she reports that the amount of activities that teachers charged during this period has increased considerably, and that she feels she doesn't have time to study as before: “I believe it would be good if some teachers started doing activities a little differently, and classes at a pace that was easier to follow and concentrate... some of them also do not provide study materials, which makes it very difficult”.

But Isadora also mentions that some teachers and monitors adopted methods that helped her: “Some subjects used different platforms that facilitate online learning and help to record information more easily, such as the use of flashcards and memorization tools”. Fortunately, the student also reports that she had a lot of support from her family: “My mother and my sisters understand and respect my study schedules and my routine a lot, they know I have to study”. About the

psychological difficulties during this period, she says that she had frequent anxiety attacks, and felt very discouraged over the months, but that the teachers were very understanding about it and willing to talk about it.

André Molina Gregório, who is also a student at the chemistry institute, joined in 2019 and is a resident of the student accommodations, reports: “There was no coordination between the teachers on how to carry out the activities, each one used a different platform, a different way, much uncoordinated deadlines and conflicting methodologies”. Despite the need for practical classes to be held at a distance, André reports that the experience was insufficient and he feels that he would like to do these classes in a real laboratory: “As much as my teacher has given us experiments that can be performed at home, clearly they are not enough for my training as a chemist, we cannot carry out complex organic syntheses in the kitchen of our homes.”

Interestingly, in contrast to some other students, the student reports that in his parents' house he has a study environment better than student housing on campus “Whether I like it or not, being able to stay in a more comfortable place for me, where I have more space and stable internet and I can stay with my dog. It was an advantage”.



For Priscila Zem Camargo, also a student at the IQSC since 2019 and a resident of the student accommodation, the biggest difficulty was the study environment: “My parents' house is very small and my family is large... It is very difficult to study there. I have to alternate places to study, I spent a few months living with my grandmother, I returned to São Carlos for a few months to undertake my scientific initiation project, and now that I have returned to live with my parents I have to spend many days at my boyfriend's house, where I have better study conditions”.

However, during distance learning, she says that she learned to organize herself better “After a long time struggling to learn to study during this period, I feel that I have improved my study methods a lot, and the recorded classes allow a much better use of my time, where I can speed up classes, pause, rewind, and watch at my own pace.”

She also says that she is very grateful to her teachers, since many of them made a great effort to teach the subjects in the best way possible: “My biochemistry teacher planned very well and her classes are very complete. She is always available to answer questions, and used evaluation methods that helped a lot to understand the content, such as group exercises, as well as seminars with very interesting topics that go beyond the subject. My water chemistry teacher was also excellent. I could see that he was very concerned about our learning experience, having a lot of patience to explain the content to us, and making an effort to learn to use digital platforms. He even bought a drawing tablet!”



Now in Brazil the pandemic scenario is becoming more optimistic, and the vaccination campaign has already reached almost half of the population. Thus, public elementary and secondary schools are already returning to their activities, and

universities have already returned to their research activities, and are starting to plan a gradual return to the classroom.

As much as this period was very difficult for everyone, distance learning has some advantages, and the use of technological tools and online resources in classrooms brings many possibilities for innovation in teaching, and that is why the University São Paulo is starting to look at ways to incorporate some modality of hybrid teaching into its courses in the future. And as much as we are all looking forward to this period coming to an end, we can certainly extract a lot of new knowledge from the experiences we had with it.
