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# Students' Perspective of Remote Synchronous Activities Developed in the Morphofunctional and Integrated Practices Laboratories During the COVID-19 Pandemic

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## ABSTRACT

The objective of this study was to evaluate students' perception of online activities during the COVID-19 pandemic. A self-administered online questionnaire was sent to first- to fourth-year medical students. A total of 398 medical students answered the questionnaire. About 90% of the students perceived the overview of the activities as positive (satisfactory/very satisfactory), while 88.66% considered their adaptation satisfactory. The same pattern was observed in the other items, except for the motivation for classes. Self-assessment and faculty members/lecturers' performance along with the methodology adopted were also perceived positive (satisfactory/very satisfactory) by more than 70% and 75% of the students, respectively. In this study, synchronous distance learning classes were developed through Blackboard® using different pedagogical resources and a multiple-choice test was also applied at the end of every class. It was observed that most of the content was contemplated and validated with the online activities and audiovisual materials provided throughout the semester, and it was considered that the transition in the teaching-learning process required a joint effort by both faculties and students. Undergraduate students had a very positive perception regarding synchronous online activities developed in the morphofunctional and integrated practices laboratories during the COVID-19 pandemic.

**Keywords:** *Online learning, Laboratories, COVID-19, Medical education*

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## INTRODUCTION

The COVID-19 pandemic brought many changes in people's daily lives, and most considered that the greatest impact was the interruption of all collective activities, including academic ones (1), due to social distancing. Thus, medical schools were

forced to abruptly interrupt their face-to-face activities, with no time for strategic planning on how to continue teaching in this new scenario (2– 3).

In order to minimise academic impacts and, consequently, the loss of the entire school year, several pedagogical strategies

for online learning have emerged, with many universities adopting synchronous class modality as a technology-mediated teaching methodology (4). In this modality, lecturers started to use digital platforms for live transmission (in real-time) to teach students theoretical and/or theoretical-practical content, continuing the curriculum programme that has already started (5).

On the other hand, students also had to adapt to this new reality and be resilient, given the difficulties inherent in the whole teaching-learning process, without the physical presence of colleagues and lecturers, as well as specific challenges regarding the use of new technological tools (1, 6).

The synchronous activities were implemented without ample time for planning and adjustments. All of them were developed over weeks, continuously, with lecturers' and student's teaching-learning curve being exercised throughout this process (7).

There were many concerns, uncertainties and feelings of insecurity, on both sides, regarding the applied content's quantity and quality, and how this content would be evaluated, which could harm not only the learning process but the validity of the content and developed activities (3, 8).

According to this new educational scenario (3), full of uncertainties, associated with the rapid use of digital resources in a true "educational therapeutic test," the student's vision and assessment regarding the activities developed becomes extremely relevant. Through this vision, it will be possible to correct deviations and improve the teaching-learning process, since the continuity of academic activities, in its standardised form, will certainly not follow the same patterns of the pre-pandemic period (3, 9).

## OBJECTIVE

This study aims to evaluate students' perception of remote synchronous activities developed in the morphofunctional and integrated practices laboratories during the COVID-19 pandemic.

## METHODS

This is a cross-sectional, analytical and quantitative study with undergraduate medical students from a private university, which was conducted in accordance with international ethical guidelines and approved by the university's ethics committee.

The inclusion criteria were first- to fourth-year students, aged 18 years old or older, in the first semester of 2020, who signed an informed consent form, guaranteeing anonymity. It excluded all students aged under 18 years old, those who did not sign the consent form, or those who requested their exclusion along the study.

An online self-administered questionnaire, developed on Google Forms® (Google LLC, Mountain View, CA, USA), was sent through the institutional online platform and students' personal e-mail at the end of the first semester. It was built according to the needs detected by lecturers, dimensions of the digital learning environment (10), and psychology in medical education (11). It was focused on medical students and built-in four main domains, which were subdivided into nine multiple-choice questions, to find out the students' perception of the developed remote activities. These domains included general perception of the developed activities, personal aspects along the process, faculty performance throughout the process, and the final evaluation of the process. All questions were based on a numeric scale that varies from 1 to 4, in which 1 = unsatisfactory and 4 = very satisfactory (Figure 1).

Domain 1 - General perception of the developed activities	1	2	3	4
<b>Part 1 - Overview of the activities – give a score</b>				
a) Previous Theoretical Material				
b) Discussion of activities before and during the course				
c) Organization of virtual rooms				
d) Script content				
<b>Part 2 - Activity scripts – give a score</b>				
a) Prior availability				
b) Learning objectives				
c) Alignment with tutoring content				
d) Quality of the scripts				
<b>Part 3 - Evaluation strategy used, after each SCRIPT / CLASS – give a score</b>				
a) Evaluation form				
b) Number of questions per evaluation				
c) Division between the themes of the scripts				
d) Total assessment time				
e) Execution of the evaluation after each activity				
Domain 2 – Personal aspects along the process	1	2	3	4
<b>Part 1 – Personal performance – give a score</b>				
a) Adaptation				
b) Internet signal / availability				
c) Technology domain				
d) Investment in study time				
e) Motivation for classes				
f) Professor / student relationship				
g) Quality / detailing of the guidelines received				
<b>Part 2 - Self-evaluation – give a score</b>				
a) Personal dedication				
b) Relationship with colleagues				
c) Relationship with the faculties				
d) Previous study				
Domain 3 – Faculty aspects throughout the process	1	2	3	4
<b>Part 1 - Faculty performance</b>				
a) Punctuality				
b) Clarity of the explanations				
c) Level of knowledge				
d) Availability to solve problems/doubts				
e) Use of different pedagogical resources along the classes				
f) Interaction with students				
g) Interaction between faculties				
<b>Part 2 - Methodology – give a score</b>				
a) Quality of the didactic material presented				
b) Relationship between the presentation and the entire content				
c) Material availability				
d) Variety of methods				
e) Presentation of the content				
f) Support materials provided to complement the activities				
Domain 4 – Final evaluation of the remote teaching-learning process	1	2	3	4
<b>Part 1 - Morphofunctional and integrated practices laboratories - give a score</b>				
a) Impact of these activities on your training				
b) Adaptability of the faculties				
c) Commitment of the professors to warrant a good experience				
<b>Part 2 - Level of learning throughout the thematic modules – give a score</b>				
a) Skill / knowledge level at the beginning of the MODULE				
b) Skill / knowledge level at the end of the MODULE				
c) MODULE's contribution to skill / knowledge				

Figure 1: Online questionnaire with four domains.

According to the same numeric scale, students were also requested to answer the final validation question: “Considering all online developed activities, do you believe that most of the content was contemplated and validated with the discussions and audiovisual materials provided by the lecturers?”

Descriptive analysis and Chi-square test were performed through the online programme (available at [www.socscistatistics.com](http://www.socscistatistics.com)) to compare the answers of first- to fourth-year students, considering

5% ( $p < 0.05$ ) as the level of statistical significance.

## RESULTS

Nine were excluded from the 407 undergraduate students. Two of them did not sign the informed consent and seven were under 18 years old; all of them were in their first year. Thus, the total sample was 398 students, and the mean age was 21.26 years old where 106 were male and 292 were female.

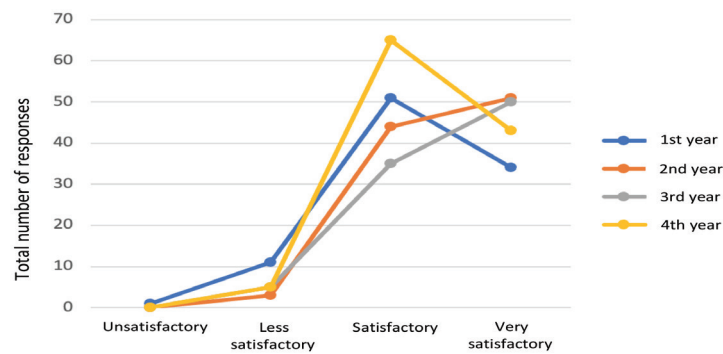
Considering the total sample of the study, a large participation of students from the first- to the fourth-year was observed. The coefficient of variation of the sample was 8.42% which made the groups comparable to each other.

**Domain 1: General Perception of the Developed Activities**

When the students were asked to evaluate the activities’ overview (Part 1) regarding the theoretical material (item “a”), 95.8% (*n* = 93) of the first-year students, 94.8% (*n* = 93) of the second-year, 95.5% (*n* = 86) of the third-year, and 92.0% (*n* = 104) of the fourth-year considered

it satisfactory or very satisfactory, while comparisons between the years did not show significant differences. There was also no significant difference between the groups regarding the discussion of activities before and during the course (item “b”), organisation of virtual rooms (item “c”) and script content (item “d”).

Part 2 accessed the general perception of the activity scripts regarding prior availability (item “a”), learning objectives (item “b”), alignment with tutoring content (item “c”) and script quality (item “d”), which were considered by most students to be satisfactory or very satisfactory, with no significant difference between the studied years (Figure 2).



Note: No statistical difference, Chi-square test

**Figure 2:** General perception of the activity scripts (prior availability, learning objectives, alignment with tutoring content and quality of the scripts in the different periods).

Regarding Part 3 of Domain 1, after classes, students were asked about the assessment strategy. In all studied years, “satisfactory” was the predominant answer in relation to all items analysed; however, the greatest variability occurred in relation to the time available for assessment (item “d”). But when the responses between the different years were compared, there were no significant differences.

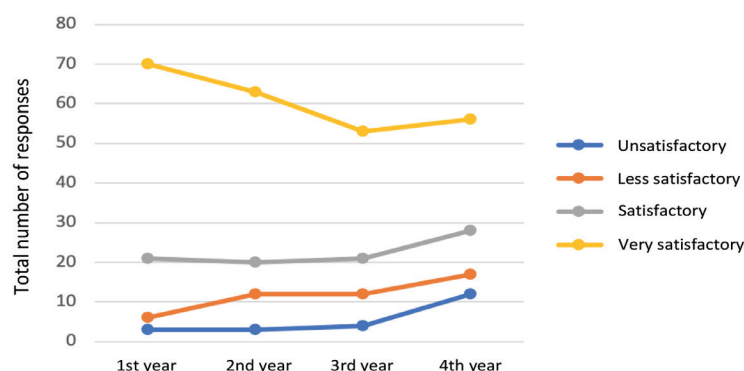
**Domain 2: Personal Aspects Along the Process**

Domain 2 was divided into two parts and assessed personal aspects of the entire

remote process: personal performance (Part 1) and self-evaluation (Part 2).

A mean of 88.66% of all students considered the adaptation of the remote process (Part 1, item “a”) all other aspects considered in Part 1 satisfactory or very satisfactory. Item “e,” i.e., motivation for classes, showed the greatest response variability. However, most responses were satisfactory or very satisfactory, with no significant difference between the groups (Figure 3).

Students of the different years showed a positive self-evaluation (Part 2) in all items, with no significant differences between the groups.



Note: No statistical difference, Chi-square test

**Figure 3:** Part 1, item “e” – motivation for classes in the different periods (no statistical difference, Chi-square test).

### Domain 3: Faculty Aspects Throughout the Process

Part 1 assessed seven items regarding the faculty’s performance along the remote teaching-learning process, in which there were a positive perception with a great predominance of very satisfactory response

in all of them with no significant differences between the groups (Table 1).

Students were asked to evaluate six items regarding the methodology applied by the faculties along the remote process. In all items, students considered the methodology very satisfactory, with no significant differences between the years (Table 2).

**Table 1:** Students’ perception of the faculty performance, with a predominance of very satisfactory responses in the different years (Domain 3, Part 1)

Domain 3: Faculty aspects throughout the remote process							
Part 1: Faculty performance							
Year	Punctuality (%)	Clarity of the explanations (%)	Level of knowledge (%)	Availability to solve doubts (%)	Use of different resources (%)	Interaction with students (%)	Interaction between faculties (%)
1st (n = 97)	100.0	86.6	97.9	89.6	66.0	91.7	91.7
2nd (n = 98)	92.8	90.8	95.9	97.9	86.7	94.8	94.8
3rd (n = 90)	92.2	93.3	94.4	82.6	87.7	92.2	87.7
4th (n = 113)	94.6	88.4	91.1	92.9	87.6	92.9	87.6

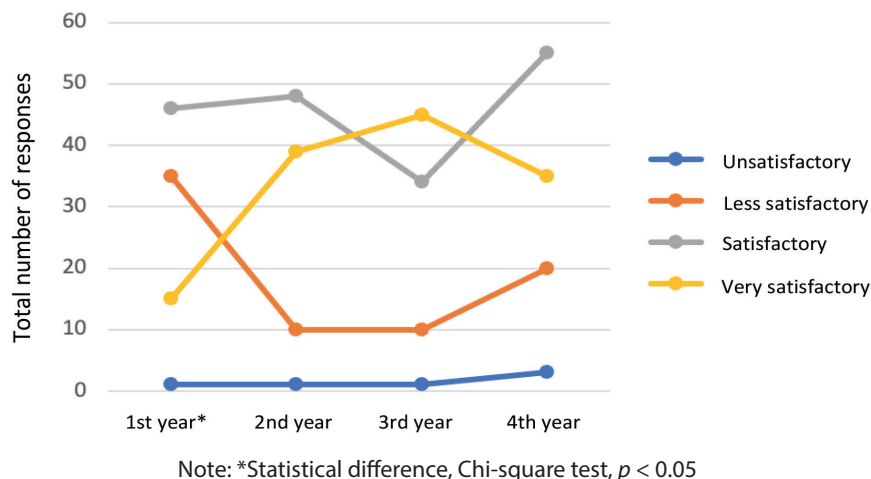
**Table 2:** Students’ perception of the faculty performance, with a predominance of very satisfactory responses in the different years (Domain 3, Part 2)

Domain 3: Faculty aspects throughout the remote process						
Part 2: Methodology						
Year	Quality of the didactic material presented (%)	Relationship between the presentation and the content (%)	Material availability (%)	Variety of methods (%)	Presentation of the content (%)	Support materials provided to complement the activities (%)
1st (n = 97)	94.8	90.7	82.4	88.6	88.6	71.7
2nd (n = 98)	97.9	92.8	75.5	85.7	94.8	80.6
3rd (n = 90)	86.6	86.6	77.7	71.4	81.6	74.4
4th (n = 113)	85.8	80.5	75.2	73.4	84.0	75.2

**Domain 4: Final Evaluation of the Remote Teaching-Learning Process**

The final evaluation of the remote process, which addressed two main aspects, i.e., the role of the laboratories in the teaching-learning process (Part 1) and the level of learning throughout the thematic modules (Part 2), was that the laboratories presented a positive impact on the teaching-learning process during the remote period.

The question regarding content validation during the remote process showed that students considered the content to be contemplated and validated with the discussions and audiovisual materials provided by the lecturers. However, a significant difference was observed when the first year was compared with the others ( $p < 0.05$ ) (Figure 4).



**Figure 4:** Validation of the content during the remote process, in the different periods (statistical difference, Chi-square test,  $p < 0.05$ ).



## DISCUSSION

The year 2020 was marked as the year of modified educational model for all levels (2). In the face of the COVID-19 pandemic, the need for social isolation arose due to the lack of information, treatments and vaccines against the disease (1, 9). Faced with this new reality, medical schools, lecturers and students had to adapt with the least possible damage in the teaching-learning process, including practical activities (5, 7, 12), which our group called “changing the tire with the car moving.” In this adaptation process, remote classes had to be developed to be exciting and efficient, to encourage students to build their knowledge even in a moment when they are insecure and confused, especially those who were in the first year (1, 13).

In our institution, the course's pedagogical model is the problem-based learning. In this model, undergraduate students receive all the laboratories' activity scripts at the beginning of the thematic module and must prepare themselves for practical classes, to improve, complement and solve questions/doubts. However, despite the model being adopted in different medical schools, all of them had to adapt their activities to remote classes (5, 7, 9).

The use of digital platforms such as Zoom Meeting® (Zoom Video Communications, Inc., San Jose, CA, USA), Microsoft Teams and other similar platforms was the only way to continue academic activities (13–15). In this study, synchronous distance learning classes were developed through Blackboard® (Blackboard Inc., Washington, DC, USA) using different pedagogical resources such as PowerPoint or Prezi (available at: [www.prezi.com](http://www.prezi.com)) presentations, anatomical models, videos, flipped classroom and quizzes. Generally, the activities were developed once a week as follows: based on the day's activity script content, it starts with a 20-minute theoretical explanation (in PowerPoint or Prezi) through a flipped classroom. After this period, the discussion

of the content is carried out through activities that include videos, quizzes, or anatomical models. Then, a multiple-choice test is also applied at the end of every class.

Specific questionnaires are widely used according to the type of study. However, there is no previously validated questionnaire to assess the pandemic's impact on academic activities. Thoma et al. (10) analysed the literature regarding digital technology use and identified three domains in physician education: digital communication, digital learning resources and digital assessment. They also highlighted that the digital space is a critical area for innovation in medical education, and efforts to fully integrate it into current clinical and educational practice may benefit from the application of the current paradigms of innovation. Cate and Durning (11) studied peer teaching in medical education and highlighted that the psychological aspects involved in pedagogical resources can only be analysed by different theories to explain and predict hypothetical positive and negative effects. Rajab et al. (13) developed a questionnaire to analyse the COVID-19 pandemic's impact on online education which combines closed and open-ended questions, focused on general aspects and applied to faculties and medical students. Based on these studies, the presented questionnaire was developed to find out the students' perception of the remote activities developed by our group during the COVID-19 pandemic. These domains assessed their general perception (Domain 1), personal aspects along the process (Domain 2), faculty aspects throughout the process (Domain 3) and a final evaluation of the remote teaching-learning process (Domain 4).

More than 90% of students chose satisfactory or very satisfactory answers regarding the overview of activities (Part 1) and activity scripts (Part 2) in the general perception of remote classes (Domain 1). However, despite the positive view regarding

the evaluation strategy after classes (Part 3), the time available for assessment presented the greatest variation. The same was observed by Rajab et al. (13) and Binks et al. (16), who mentioned that of the many challenges, workload and evaluation time management appeared as one of the most important aspects to be analysed and frequently improved.

Students' perceptions regarding the remote classes were quite variable. Although students appreciate the platform, almost 50% of students still believed that the physical classroom was better than e-classroom, according to Singh et al. (7). However, it is important to note that during the pandemic, both lecturers and students had to choose either to try remote learning or to stop activities altogether.

Domain 2 evaluated personal aspects along the remote process. In this domain, students had to answer about their personal performance (Part 1) and self-evaluation (Part 2). Majority of the students (88.66%) considered their adaptation of the remote process (Part 1, item "a") to be satisfactory or very satisfactory. The same was observed in the other items, except for the motivation for classes (item "e"), which, despite being also positive, showed the greatest variability in responses. It probably occurred because of social distancing and isolation during a period of great socialisation (1, 12). Self-assessment (Part 2) was also positive with up to 70% of satisfactory or very satisfactory responses for all items. This can be explained by the students' efforts to stay connected and active during the quarantine period whose end was unpredictable (9, 13). It can also be explained as a recognition of the lecturers' effort to adapt to this new scenario, continuing the teaching-learning process (7). Positive responses from more than 75% of students in the different years were also observed when evaluating Domain 3 (teaching aspects throughout the process), regarding the performance of professors (Part 1) and the methodology they adopted (Part 2).

The last evaluated domain (Domain 4) addressed two main aspects: the role of the laboratories in the teaching-learning process (Part 1), and the level of learning throughout the thematic modules (Part 2). According to the students, the developed activities with different synchronous online strategies showed to be effective and presented a positive impact on their teaching-learning process. This aspect could be explained by the greater contact of students with lecturers, not only during the period of synchronous activities but also in solving questions/doubts and problems at different periods of the day (including nights and weekends) (7, 9, 12).

Students considered that most of the content was contemplated and validated with the online activities and audiovisual materials provided throughout the semester. However, despite the predominance of positive responses (satisfactory and very satisfactory), a greater number of first-year students responded that it was less satisfactory when compared to the other years. This can be explained by this specific group of students' inexperience and the frustrated expectations about entering the university this pandemic brought (13).

The main limitation of the present study is that it revealed only the activities' evaluation developed from the students' point of view, and not of the lecturers' point of view. However, it was observed that the pandemic imposed a transition in the teaching-learning process that required a joint effort by both lecturers and students. This effort proved to be quite positive, as observed in other studies that suggested the inclusion of medical education-related technologies in the post-pandemic period (5, 7–8, 10–14).

We also think that in the post-pandemic period, faculties will incorporate these practices mainly in theoretical aspects regarding essentially practical disciplines such as anatomy, physiology and histology. Likewise, the development of these digital resources will enable the realisation of classes and activities with foreign professors



that would otherwise be impossible. This possibility will improve the network of students and professors, promoting the exchange of knowledge and, certainly, a more global view of medical education.

## CONCLUSION

The activities developed in the morphofunctional laboratories and integrated practices during the COVID-19 pandemic were perceived positive (satisfactory/very satisfactory) by undergraduate students, who considered that most of the proposed content was covered by the activities.

## ETHICAL APPROVAL

This project was approved by the Institutional Ethics Committee under reference number 36070320.3.0000.5495

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