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Assessment of satisfaction in emergency remote learning from pharmacy students' perspective in a public university in Brazil

Avaliação da satisfação no ensino remoto emergencial na perspectiva de estudantes de farmácia em uma universidade pública no Brasil

Evaluación de la satisfacción en la enseñanza remota emergencial en la perspectiva de los estudiantes de farmacia de una universidad pública en Brasil

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Abstract
The remote teaching-learning process in the Baccalaureate of Pharmacy at UFMG brought many challenges to the students, thus our objective was to assess the satisfaction of the students with the ERL. It was evaluated when the classes were instituted by means of Emergency Remote Learning (ERL), during the coronavirus pandemic (SARS-CoV-2). A questionnaire addressing teaching-learning data, sociodemographic habits and lifestyle was collected through a virtual platform and, data are analyzed by linear regression and by the Classification And Regression Tree (CART) technique. The overall mean students´ satisfaction with ERL was 3.12±1.10 (Likert scale 1-5), presenting an inverse correlation with learning in the professional cycle of the course ($p<0.001$). Only 3.1% indicated 'none or little learned', variable classified as maximum satisfaction. Low satisfaction was registered with the quality of the practical classes (3.06±1.22) revealing the limitation of ERL in the case of a lot of practical content, as for Pharmacy course. A

high level of satisfaction was related to the didactics and methodology of the professors (3.55±0.99), showing their commitment and dedication to the ERL, despite the difficulties of its implementation. The study results point for improvements in content, course organization, or the use of different technologies to enhance student satisfaction with remote learning format.
Keywords: Personal satisfaction; COVID-19 pandemic; Higher education; Students; Pharmacy.

Resumo
O processo de ensino-aprendizagem à distância no curso de Bacharelado em Farmácia da UFMG trouxe muitos desafios aos alunos, por isso nosso objetivo foi avaliar a satisfação dos alunos com o ERL. O estudo foi avaliado quando as aulas foram instituídas por meio do Ensino Remoto Emergencial (ERE), durante a pandemia de coronavírus (SARS-CoV-2). Coletou-se um questionário abordando dados de ensino-aprendizagem, hábitos sociodemográficos e estilo de vida, por meio de plataforma virtual, e os dados foram analisados por regressão linear e pela técnica Árvore de Classificação e Regressão (CART). A satisfação média global (3,12±1,10) com o ERE, relativa à escala Likert 1-5, apresentou correlação inversa com a aprendizagem no ciclo profissional do curso (p<0,001). Apenas 3,1% indicaram 'nenhum ou pouco aprendizado', variável classificada como satisfação máxima. Baixa satisfação foi registrada com a qualidade das aulas práticas (3,06±1,22), revelando limitações do ERE em caso de muito conteúdo prático, como para Farmácia. Alta satisfação foi relacionada à didática e metodologia dos professores (3.55±0.99), mostrando seu engajamento e dedicação, apesar das dificuldades de implantação do ERE. O processo de ensino-aprendizagem à distância no curso de Bacharelado em Farmácia da UFMG trouxe muitos desafios aos alunos, por isso nosso objetivo foi avaliar a satisfação dos alunos com o ERL. Os resultados apontam para melhorias no conteúdo, na organização das disciplinas ou no uso de diferentes tecnologias para aumentar a satisfação dos alunos com o formato de ensino a distância.
Palavras-chave: Satisfação pessoal; Pandemia por COVID-19; Ensino superior; Estudantes; Farmácia.

Resumen
El proceso de enseñanza-aprendizaje a distancia en el Bachillerato de Farmacia de la UFMG supuso muchos retos para los estudiantes, por lo que nuestro objetivo era evaluar la satisfacción de los estudiantes con el ERL. El estudio fue evaluado cuando se instituyeron las clases a través de la Enseñanza a Remota de Emergencia (ERE), durante la pandemia del coronavirus (SARS-CoV-2). Se colectó un cuestionario que abordaba datos de enseñanza-aprendizaje, hábitos sociodemográficos y estilo de vida a través de una plataforma virtual, y los datos fueron analizados por regresión lineal y por la técnica del Árbol de Clasificación y Regresión (CART). La satisfacción global media (3,12±1,10) con la ERE, relativa a la escala Likert 1-5, mostró una correlación inversa con el aprendizaje en el ciclo profesional de la carrera (p<0,001). Solo el 3,1% indicó 'ningún o poco aprendizaje', variable clasificada como máxima satisfacción. Se registró baja satisfacción con la calidad de las clases prácticas (3,06±1,22), revelando limitaciones de la ERE en caso de mucho contenido práctico, como Farmacia. La alta satisfacción se relacionó con la didáctica y la metodología de los profesores (3.55±0.99), mostrando su compromiso y dedicación, a pesar de las dificultades en la implementación de la ERE. Los resultados apuntan a mejoras en los contenidos, en la organización de las asignaturas o en el uso de diferentes tecnologías para aumentar la satisfacción de los alumnos con el formato de enseñanza a distancia.
Palabras clave: Satisfacción personal; Pandemia de COVID-19; Enseñanza superior; Estudiantes; Farmacia.

1. Introduction

The SARS-CoV-2 pandemic prompted the implementation of Emergency Remote Learning (ERL) worldwide, including in Pharmacy Baccalaureate program at the Federal University of Minas Gerais (UFMG). However, the shift from in-person to remote learning posed challenges for university managers, revealing issues such as inequitable access to technology and disruptions in the academic trajectory (Pérez-López et al., 2020). The ERL was a temporary change in the teaching model that aims to offer access and educational support during a crisis (Appenzeller et al., 2020; Hodges et al., 2020; Moreira et al., 2020).

The Pharmacy Baccalaureate consists of two main cycles: a) basic sciences (at Institute of Exact Sciences - ICEx, and Institute of Biological Sciences - ICB) besides b) professional cycle, which is focused on the pharmaceutical practice at the Faculty of Pharmacy. Disciplines or academic activities consist primarily of theoretical and practical subjects, requiring technical and humanist skills to support students' proficiency (Lorandi, 2006; Foppa et al., 2020).

Student satisfaction is crucial for identifying gaps, proposing teaching improvements, and addressing flaws in professional training, particularly in pharmaceutical education. The low rate of internet connectivity emerged as a challenge

when adapting classroom teaching to Emergency Remote Learning (ERL). In Brazil, internet access was available in only 67% of homes in 2018, below the average of developed countries. Unequal access to better internet connections was observed, with wealthier regions having better quality connections, while poorer network quality was prevalent in other areas of the country (Carneiro et al., 2020). This connectivity issue poses a significant challenge for remote teaching, necessitating equitable institutional coverage, especially for economically disadvantaged students who may not have access to the necessary equipment or services (Appenzeller et al., 2020).

Several socioeconomic, cultural, and demographic factors interfere with teaching-learning. Furthermore, remote learning may be a burden as it demands knowledge about digital tools and requires more significant planning and commitment to learning. Besides, a student leadership centered on organizing time is required for study and carrying out academic activities in a planned manner (Dourado & Oliveira, 2009; Pereira et al., 2019).

Besides students' responsibility, there is an adaptation need to Information and Communication Technology (ICT) and teaching formats used by professors. Considering that attention can be dispersed in the remote model, it is necessary to apply accessible, intuitive, and diversified methodologies to keep the students focused on the class (Chauhan, 2017). In 2018, the applicability of ICT in Brazil was shy, however, with the ERL, all professionals who did not gain knowledge were forced to seek, update, and use the new teaching tools (Oliveira et al., 2021).

Applying ICT to remote teaching raises two crucial factors: i) the professor-student relationship that is vital for implementing the model (Duarte & Maknamara, 2016), and its impact on the student-content relationship and individual development and, ii) the laboratory classes, including the development of manual skills, experimental improvement, and scientific observation. The consolidation of relationships plays a pivotal role in mediating the learning process at various levels (Abrami et al., 2011). Although lab classes supported by logical reasoning (technical demonstrations and content discussions) they do not foster the acquisition of essential professional skills for pharmacists (Patto, 2013; Ray et al., 2022).

Given the challenges of remote teaching-learning process in Pharmacy course, the demands on the students, and other factors the evaluation of teaching activities from a student perspective is crucial. Therefore, our objective was to assess the satisfaction of Pharmacy-UFMG students with the ERL. The study results may point for improvements in content, subject organization, or the use of different technologies to enhance student learning in this teaching format in the future.

2. Methodology

This virtual, cross-sectional study is nested in the project ‘Follow-up of Undergraduate Students, Professors, and Graduates of the Federal University of Minas Gerais (UFMG)’. Briefly, the steps follow as: i) the team of researchers defined the statements to compose the questionnaire for sociodemographic profile of students (Table 1); ii) the adoption of a Likert scale was informed to the students, for a quantitative evaluation; iii) the questionnaire was sent by email to the students; iv) tabulation of results (% satisfaction response) of each individual was performed (Table 2); evaluation of responses was assessed through correlation by univariate analysis (Table 3). Following, a more detailed description is presented.

A questionnaire named ‘Student Evaluation’ (Tables 1-3) was applied to undergraduate students enrolled in Pharmacy-UFMG using Google Forms®, from September 20 to September 28, 2020 (interval correspondent to approximately half of the first scholar semester - 2020/1). Four distinct related categories were addressed: i) the sociodemographic profile and lifestyle habits of students; ii) the satisfaction with the ERL; iii) students’ economic and professional context during the pandemic period; iv) the teaching-learning process in such scenario. This research was disseminated using the students´ emails, Moodle (Modular Object-Oriented Dynamic Learning Environment) free software for learning management systems, and social media (Pereira et al., 2018). Students who answered the variable ‘overall satisfaction’ in the questionnaire were included in the study.

The 'overall satisfaction' aligned with the response of students was assessed using a positive scale, which ranged from 1 to 5, with '1' being very dissatisfied and '5' very satisfied, according to the Likert scale (Joshi et al., 2015; Pereira et al., 2018). This was listed as a dependent variable in the statistical analyses The independent variables also had a five-point Likert scale and were divided into three groups addressing: i) the learning context during the pandemic; ii) professional training; and iii) the factors that hindered the learning process (Tables 2, 3). This scale was selected because it represents the evaluator's perception of the analyzed parameter and is one of the most used psychometric tools in the educational context.

A linear regression of the variables was performed to associate the student satisfaction with the ERL. The variables were tested for normality of distribution through the Wilcoxon test. The level of statistical significance considered was 5% (Table 3).

A Classification And Regression Tree (CART analysis) was performed to identify the factors that most discriminated against the dependent variable, the overall satisfaction with the ERL. This analysis is based on a dependent variable and 18 other independent variables (Figure 2).

The main advantage of CART is the result intelligibility revealing association between the data. This technique allows to build trees by dividing groups into subgroups to solve classification and regression problems (Breiman et al., 1998). The Chi-square Automatic Interaction Detection (CHAID) method was used to perform successive divisions of the dataset. It selects the independent variable with the strongest interaction with the dependent variable in each division and group categories that are not significantly different from the dependent variable.

Minimal criteria were established for the development of CART. Nodes were named based on division rules, requiring a minimum of 100 observations per subset. Terminal nodes were required to have at least 50 observations. Subdivisions with a significance probability (p-value) of 0.05 or higher were not considered. The SPSS® (IBM) computational program was used for statistical analyses.

This work was approved by the Research Ethics Committee at UFMG under the Certificate of Ethical Appreciation at Plataforma Brasil (15414619.0.0000.5149). An enclosed Informed Consent Form was automatically forwarded to the respondent students' e-mail addresses.

3. Results and Discussion

Out of the 1,025 students in the Faculty of Pharmacy-UFMG, 401 (39.1%) responded to the questionnaire. Most respondents were female (75.1%), white (52.1%), from public high school (55.6%), or accessed the university through the social-economic accesses (quota) system (57.9%). They were enrolled in the professional cycle (53.2%) and attended classes during the day shift (62.1%). Additionally, 73.3% relied on their parents and family as their primary source of income. Table 1 displays the students´ profile, for which 2.5% had a disability, while 31.4% received assistance from UFMG's digital inclusion program.

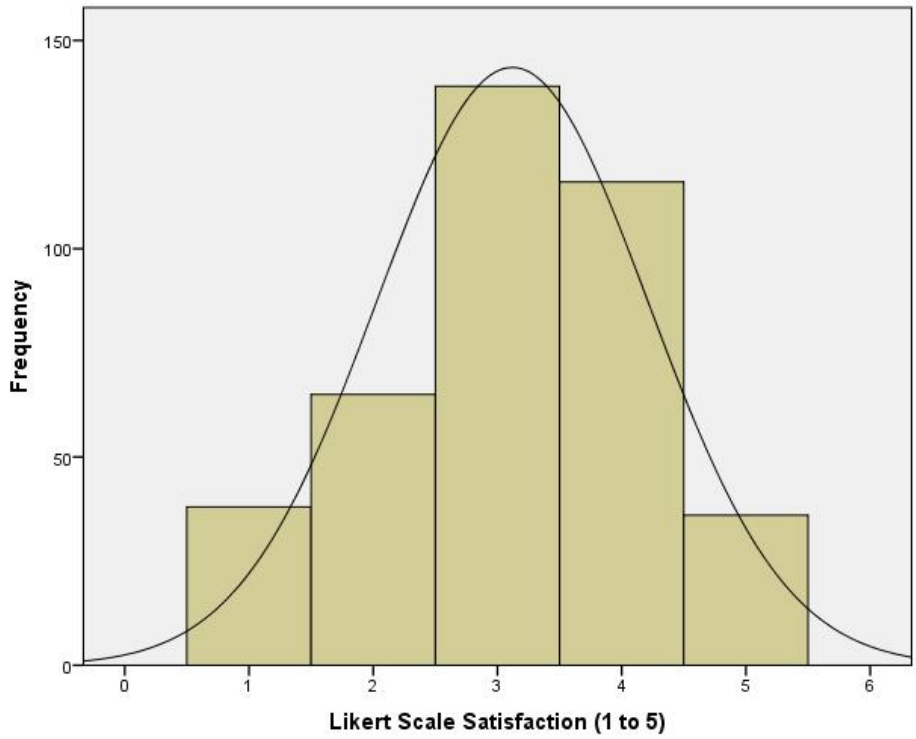
Table 1 – Sociodemographic profile of students attending ERL in Pharmacy-UFMG, September 2020 (n =401).

Features		n	%
Gender	Female	301	75.1
	Male	100	24.9
Skin color	Yellow	7	1.8
	White	209	52.1
	Brown/Black	171	42.6
	Prefer not to answer	14	3.5
Public high school	No	178	44.4
	Yes	223	55.6
Supported by student assistance	No	275	68.6
	Yes	126	31.4
Physical disability	No	391	97.5
	Yes	10	2.5
Course semester	1st to 4th	186	46.4
	5th to 13th	212	52.9
	Prefer not to answer	3	0.7
Course shift	Daytime	249	62.1
	Night	152	37.9
Use of quota program for university admission	No	232	57.9
	Yes	169	42.1
Origin of the primary source of income for maintenance as a student	Internship, scientific initiation, extension, or other scholarships	29	7.2
	Student assistance fund	32	8.0
	Work/Retirement	46	11.5
	Parents or family	294	73.3
Use of institutional resources for digital inclusion	No	348	86.8
	Yes	52	13.0
	Prefer not to answer	1	0.2

Source: Authors (2024).

Based on the Likert scale, students' overall satisfaction with the ERL lies in the range 2.5-3.5, as shown in the histogram of Figure 1 (Joshi et al., 2015). Comparisons with existing literature are challenging due to the lack of similar results on the proposed scale (1 to 5). Although the mean is relatively high, there is still room for educational enhancements. However, a more detailed exploration of the ERL limitations can be found in Table 2, analyzing the study variables.

Figure 1 – Histogram for assessment of ranged Likert scale satisfaction among students who attended ERL in Pharmacy-UFMG, September 2020 (n=401).



Source: Authors (2024).

Professors' high demand for updating, programming, and preparation of activities was triggered after much regulation and structuring of the guidelines for the new teaching format, during this short adaptive period (Castaman & Rodrigues, 2020). Thus, the satisfaction data collected reflect the commitment and responsibility of the academic community, as much as the search for the improved teaching through electronic tools. The teaching planning and the concise definition of methodologies are deterministic factors of educational pedagogy (Massengale & Vasquez, 2016), which became even more relevant in the context of the ERL during the pandemic.

Table 2 presents the general satisfaction with didactic-pedagogical aspects. Among the ten satisfaction aspects assessed, eight had a higher mean satisfaction than the overall teaching satisfaction (in bold). These variables include the availability of the teaching plan at the beginning of the semester (3.77), scheduling evaluation activities (3.72), quality of theoretical classes (3.63), teaching material for theoretical classes (3.59), consistency between given and tested contents (3.55), didactics of professors in theoretical classes (3.55), didactics of professors in technical demonstration classes (3.19), and teaching material for technical demonstration classes (3.15). The overall mean students´ satisfaction with ERL yielded a value 3.12±1.10, within the range shown in Figure 1.

Two settings were identified for variables with scores lower than the average general satisfaction: quality of technical demonstration classes (3.06) and access to bibliographic references/study material (2.93). Limited access to bibliographies was caused by an ongoing bidding process for digital collections during the questionnaire administration at the start of the ERL.

Adapting practical classes to the remote format, which involved simulations, face-to-face visits, laboratory techniques, and pharmaceutical practice-related activities posed challenges, and likely affected the quality of technical demonstration classes. Exploring alternatives for practical classes raised discussions on the feasibility of developing necessary skills and attitudes remotely.

When assessing several factors related to student satisfaction with the ERL, a list of favoring or hindering aspects is shown in Table 3. The higher satisfaction with the ERL was proportional to the accumulated knowledge, as seen for students in the professional cycle of Pharmacy. Indeed, this is related to the student's progress along the course, as evidenced in Table 3, by the values of the beta coefficients of the variables evaluated.

The acquisition of knowledge/learning influences satisfaction with teaching since the students' perception is linked to contentment with the educational model, their learning ability, and the correlation of their performance with the effort (Sembiring, 2017). Furthermore, the students' engagement with new learning is essential for exercising their freedom and autonomy for decision-making, which precedes their professional experience (Berbel, 2011).

Table 3 indicates that satisfaction with the ERL correlates with the beta coefficient. The strongest correlation (bold beta value 0.458) was observed when the acquisition of learning in subjects taught in the basic science cycle at ICEx was significant. In the Pharmacy-UFMG program, students spend four semesters in the basic science cycle at both ICEx and ICB, followed by six semesters in the professional cycle at the Faculty of Pharmacy, focusing on pharmaceutical practice and related studies. Previous institutional evaluations noted that students struggled with chemistry subjects taught at ICEx, however, this study's data contradicts those findings, potentially due to the remote offering of these disciplines during the ERL with diverse and flexible assessment activities, contributing to increased satisfaction.

In observing the professional formation group, the satisfaction with the ERL was more significant when the student reported that this format provided less difficulty in accessing studies; little delay in completing studies; and little reduction in their income ($p<0.05$).

Table 2 – Satisfaction (% response) of students attending ERL and ranked Likert scale (descending order of mean ± standard deviation, SD) in Pharmacy-UFMG, September 2020 (n=401).

Likert Scale / Satisfaction aspect	1 (Very dissatisfied)	2	3	4	5 (Very satisfied)	Could not answer	Mean ± SD
	Response (%)						
Availability of the teaching plan at the beginning of the semester	5.2	12.0	17.7	24.4	35.2	5.5	3.77±1.23
Scheduling evaluation activities with at least one week	5.7	12.5	18.2	23.2	34.2	6.2	3.72±1.25
Quality of theoretical classes	3.7	10.5	25.4	37.9	20.9	1.5	3.63±1.05
Teaching material for theoretical classes	4.5	11.2	27.2	32.7	22.9	1.5	3.59±1.10
Consistency between content given and content charged	6.2	13.7	22.2	27.4	25.4	5.0	3.55±1.21
Didactics of professors in theoretical classes	3.0	11.0	29.2	39.9	16.0	4.0	3.55±0.99
Didactics of professors in technical demonstration classes	11.5	15.0	24.9	28.7	13.7	6.2	3.19±1.23
Teaching material for technical demonstration classes	11.7	17.7	24.7	24.9	15.2	5.7	3.15±1.26
Overall satisfaction	**9.5**	**16.2**	**34.7**	**28.9**	**9.0**	**1.7**	**3.12±1.10**
Quality of technical demonstration classes	12.7	17.2	25.7	27.2	10.2	6.5	3.06±1.22
Access to bibliographic references/study material	17.7	21.4	23.7	17.7	16.0	3.5	2.93±1.34

Source: Authors (2024).

Table 3 – Univariate analysis results (ranked in descending order of beta coefficient) of overall students' satisfaction attending ERL concerning several aspects of learning process in Pharmacy-UFMG, September 2020 (n=401). a: ICEx - Exact Sciences Institute; b: ICB - Institute of Biological Sciences.

Aspect of learning process (Likert scale)	Parameter	Beta coefficient	Standard error (SD)	*t*	*P* (>|*t*|)
Remote learning during the pandemic (1: no learning, to 5: learning enough)					
Basic science at ICEx[a]		**0.458**	0.05	8.245	<0.000
Professional formation at Faculty of Pharmacy		0.425	0.048	8.617	<0.000
Formation in related areas		0.349	0.055	5.049	<0.000
Basic science at ICB[a]		0.308	0.065	5.102	<0.000
Professional formation (1: much contribution, to 5: no contribution)					
Difficult access to the study		0.369	0.035	7.662	<0.000
Delayed formation		0.202	0.037	3.926	<0.000
Caused the reduction in income		0.124	0.036	2.395	0.017
Difficult access to internships		0.096	0.037	1.694	0.091
Difficulties of the learning process (1: much, to 5: none)					
Lack of face-to-face interaction with the professor		0.377	0.037	8.070	<0.000
Time for study		0.315	0.039	6.578	<0.000
Need to reconcile home/family care and study		0.302	0.039	6.265	<0.000
Professor's didactics		0.295	0.04	6.102	<0.000
Mental illness		0.293	0.038	6.059	<0.000
Physical illness		0.275	0.036	5.669	<0.000
Need to combine housework and study		0.239	0.032	4.884	<0.000
Professor-student relationship		0.218	0.041	4.419	<0.000
Access to electronic equipment		0.171	0.037	3.439	0.001
Internet access		0.149	0.037	2.985	0.003

Source: Authors (2024).

An inverse relationship was identified between household income affected by the pandemic and student satisfaction with the ERL. Income is directly related to access to education, given that higher education has yet to be universalized. Only about one-fourth of young people aged 18 to 24 are in higher education institutions, and most of these students come from families with a household income greater than three minimum wages (BRL$1,212 equivalent to US$217.18 minimum wage monthly, starting on January 1, 2022) (Carvalho & Waltenberg, 2015; Assis, 2021).

We should emphasize that the access policy with quota was implemented at UFMG around ten years ago. However, its corrective social-economic principle cannot be fulfilled, when associating the factors 'income' and 'skin color', which requires other policies to be strengthened or created to favor equal access to and permanence of students (Caregnato et al.,

2020).

Moreover, among the responding students, 73% reported that the primary source of income derived from parents. While this dependence is characteristic of the age group of college students, it is possible to relate to anxiety and depression when students do not have a good relationship with their parents. Furthermore, family disorder factors preceding the admission of students to undergraduation generate anxiety and depression with academic impairment. Thus, it may cause harm to mental health and correlate to a lower satisfaction (Alves et al., 2021).

Access to higher education is associated to qualified people, who typically, have higher salaries and are less exposed to unemployment. Furthermore, it implies great benefits for society, such as a drop in crime rates, increased life expectancy, and greater political awareness. Nevertheless, only about one-fifth of the Brazilian population owns an undergraduate degree. This bottleneck owes to the low-income families' greater difficulty of accessing universities. Moreover, low income hinders university permanence, which is a factor strongly related to the trend of dropping out of higher education courses in public institutions, since higher-income students are more willing to dedicate full-time themselves (Carvalho & Waltenberg, 2015; Gomes et al., 2021).

Interestingly, even during the pandemic, there were no significant difficulties in accessing internships, and this variable had no statistically significant relationship with satisfaction. Pharmacists remained within the essential professions needed for services in the health area during the pandemic.

In hospital activities, undergraduate pharmacy students and other health professionals needed quickly to adapt to the new sanitary situation, as care and health support activities were essential to reduce the morbidity and mortality of the coronavirus disease (Covid-19). With limited initial knowledge about the evolution of the disease and due to the high speed of scientific discoveries, there was a need for developing and updating pharmacotherapeutical plans, reorganization and distribution of drugs, the anticipation of health risks, and constant clinical updating, generating, in part, an overload on professionals due to the high return of patients to hospitals (Farinha & Rijo, 2020).

Although internships at UFMG were partially suspended, the supervisor professors continued to follow up on students from professional cycle, in person or remotely as demanded in their internship locations.

Experience in community pharmacies´ internships provides knowledge and practical expertise for students, especially during a pandemic. Due to the large regional distribution of community pharmacies, several students could witness the first contact with the population and provide information about preventive measures and treatment for Covid-19. They practiced by identifying suspected cases and raising population awareness about the need of physical distance and adequate treatment, based on scientific evidence to combat fake news circulating in the national territory (Jordan et al., 2021).

Through internships in pharmaceutical industries, students contributed to the research, development, and production of drugs and immunizing agents against the disease, bringing hope to society. They also worked on the production and quality control of essential medicines for fighting secondary infections and addressing other population needs.

Pharmacists played crucial roles in diagnosis, technological development, combating the spread of the virus, implementing monitoring measures, providing emotional support, and managing chronic diseases (Tritany & Tritany, 2020; Jordan et al., 2021).

As shown in Table 3, when the variables involved the learning process group were evaluated concerning satisfaction, they all had a p-value <0.05 in the logistic regression analysis. The result of the beta coefficient with the most significant impact was related to the variable 'lack of face-to-face interaction with the professor'. Therefore, this factor did not hinder the learning process, and the level of satisfaction was higher. The variable 'professor-student relationship' had the same relationship profile with student satisfaction and a high beta coefficient, reinforcing the importance of practical knowledge exchange between students and professors, even in the virtual environment.

While the student spearheads the learning setting, the social relationship established and human interactions during class time generate a positive return on learning (Camp, 2011).

The variable 'professor's didactic' was also positively related to student satisfaction ($p<0.000$). Didactic methodologies and methodological innovations in teaching are relevant in this virtual context, because the centralization does not lie in the educational agents, but in the historically produced knowledge and the complex human understanding (Alves & Teo, 2020). Incorporating active methodologies in classes enhances student participation, integration, and knowledge acquisition. It promotes multi-layered learning, including individual learning, peer discussions, and activities, all guided by the professors' perspective (Fini, 2018). As a result, it is possible to minimize the lags and losses of the conventional educational process in the ERL.

When the students signaled that the demand to carry out different daily activities ('having to reconcile home/family care and study' or 'having to reconcile housework and study') did not harm the learning process, they were also more satisfied with the ERL. There were family issues, especially for students with children, who demand attention and primary education, however, their schools were also closed due to the coronavirus pandemic (Laguna et al., 2021). A previous study developed at Faculty of Pharmacy-UFMG revealed a lower level of health among women with a professional relationship than unemployed men (Ruas & Pereira, 2021). Dissatisfaction with the ERL may be related to the overburden, generally imposed on women who are the majority in this study (75.1%).

A good health condition makes learning possible and modulates the student's commitment to the course, reducing dropouts (Hale & Viner, 2018). The pandemic context has greatly affected the mental health of the population, including students. It has brought significant changes in daily life, causing insecurity, anxiety, and worsening of mental illnesses like anxiety, depression, post-traumatic stress, and increased suicidal ideation among students (Cobo-Rendón et al., 2020). In this sense, when students reported that the variables 'mental illness' and 'physical illness' did not hinder the learning process, their satisfaction with the ERL was also more significant.

The variables 'access to electronic equipment' and 'access to the internet' positively influenced student satisfaction, but the beta coefficients were lower than 0.200 in the logistic regression. The reduced impact on ERL satisfaction may be due to the university's efforts to improve access to electronic equipment and the internet for students with specific needs. Despite limited resources for student support, providing electronic devices and internet access through financial donations was crucial for students who rely on assistance programs.

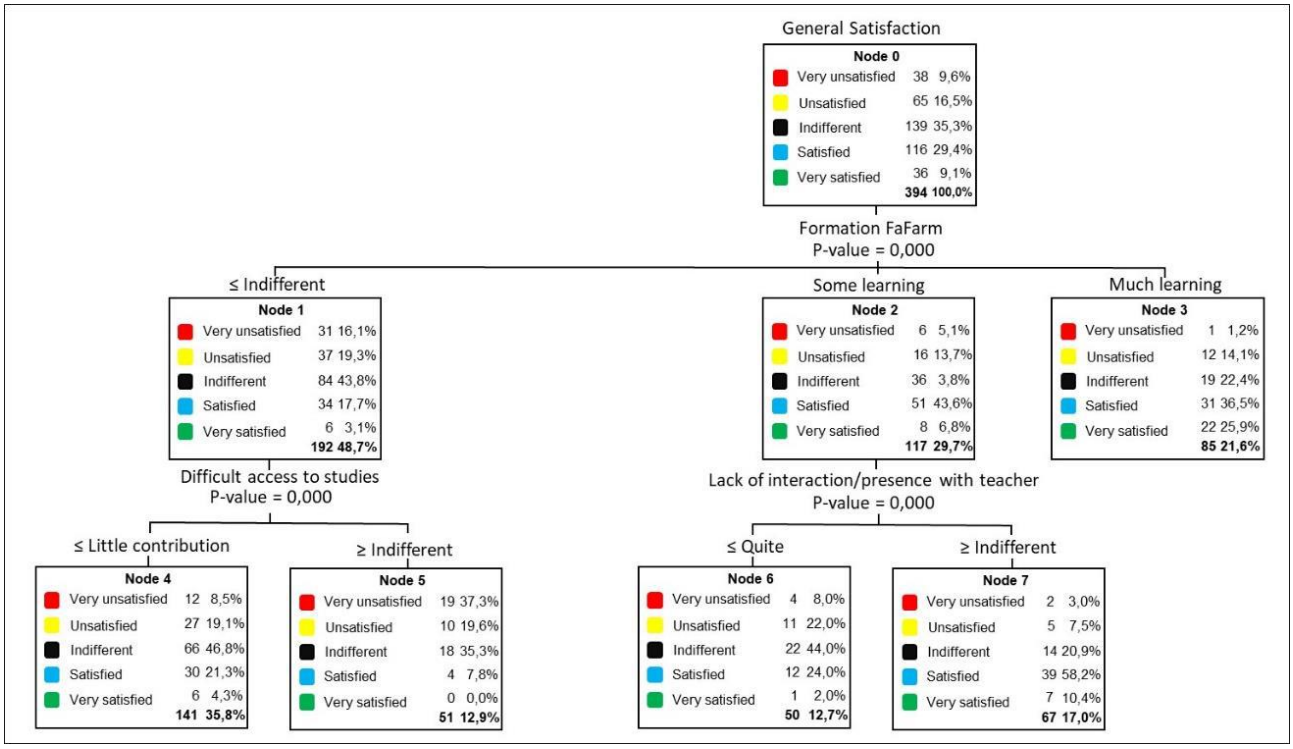
However, the unexpected change of adapting teaching to the remote model using new tools overcomes the problems of having or not having the equipment. Since this format was a novelty, it required great effort from students and professors. Furthermore, the new term ´coronateaching´ has been used to point out a deficit in the students' adaptation. This concept portrays psycho-affective implications caused by the overload of information through several virtual platforms, which can bring frustration in the face of insufficient knowledge in the use of ICT by both students and professors.

Different external factors can influence student satisfaction over time of exposure to the ERL, suggesting the need for more studies, such as the present one, carried out at different periods.

3.1 Cart Analysis

CART analysis was performed to rank the factors that most influenced student satisfaction with the ERL. The root node, named node 0, refers to the model's response variable, student satisfaction. The other nodes indicate the subgroups formed based on the successive divisions of the root node, as illustrated in Figure 2.

Figure 2 – Graphic representation of CART analysis, in nodes 0 to 7, according to educational parameters and level of student satisfaction with ERL in Pharmacy-UFMG, September 2020 (n=401). Source: authors (2024).



Source: Authors (2024).

The variable most strongly associated with satisfaction was the 'professional cycle at the Faculty of Pharmacy (FaFarm)'. Students who were in an internship or vocational training reported higher levels of satisfaction and perceived 'sufficient learning' (Likert scores 4 and 5) compared to students in earlier stages of the Pharmacy course, whose scores ranged from 1 to 4, indicating little to some learning. The academic training during the professional cycle plays a crucial role in consolidating knowledge and shaping ethical, affective, political, and social dimensions of academic-professional and personal behavior. This transformation may directly impact the social reality surrounding the trainees (Gusso et al., 2020). Thus, at the upper stage of their education, students can see more clearly the usefulness of the acquired knowledge in their professional life, which leads to a positive relationship with their satisfaction, even in the context of the ERL.

Regarding the students who evaluated to have had ‘some learning’ (score 4), the variable most associated with student satisfaction was ‘lack of face-to-face interaction with the professor’, which highlights the importance of relational contact between students and professors for the development of learning, which is more effective in face-to-face circumstances.

The simple incorporation of traditional teaching resources into digital format does not supplant the benefits of face-to-face interaction, which has the advantage of developing different dynamics between students and professor, and improving professional attitudes (Gusso et al., 2020).

Furthermore, multiple and specific practical contents can only be effectively consolidated in a Pharmacy course offer through face-to-face student-professor interaction. The unfeasibility of a Pharmacy course in a non-face-to-face format should be reinforced, except for extreme situations, such as the pandemic situation experienced. In this sense, additional didactic and pedagogical support may be necessary at the time of in-person return to classes to consolidate learning (Carneiro et al., 2020).

Finally, among students who indicated ‘no learning at all’ to ‘indifferent learning’ (Likert scores 1 to 3), the variable ‘difficulty in accessing studies’ most influenced student satisfaction with the ERL. However, due to the breadth of the proposed variable, there are limitations in analyzing this factor associated with student satisfaction. Thus, it emphasizes the

need to investigate specific circumstances of these students to design student programs or adopt educational strategies that facilitate educational use in the new teaching model.

Few studies related to quantifying student satisfaction are found in the literature. The main limitation of this work was the data collection period since it occurred at the onset of the implementation of the ERL (2020/1), when the pandemic was somewhat stable, in Brazil. Nagy et al. (2021) used a mind map to track pharmacy students' responses to the impact of Covid-19 on their learning. From 53 respondents, the association between ERL and mental health, assessed qualitatively, was prevalent.

There is an inverse relationship between ERL satisfaction and the difficulty of accessing studies. The reasons behind this encompass socio-educational issues that require further exploitation through qualitative assessments. The lack of face-to-face interaction between professors and students significantly impacts ERL satisfaction (beta value 0.377). Students believe that classroom intercommunication is crucial for their professional development. These perceptions are also associated with challenges in adapting practical teaching to the distance model, as it requires essential professional skills in patient care and technology-related areas, an issue also discussed by Nagy and colleagues (2021).

Thus, the results indicate that dissatisfaction relates to the non-face-to-face performance of activities, especially practical ones, pointing to the inherent limitation of the ERL format in the students' perception. It is necessary to incorporate tools, such as active teaching methodologies, which strengthen the professor-student relationship and help improve technical demonstrations and the development of professional skills to minimize the gaps and losses of the educational process in this context.

The CART analysis focus on the most relevant issues on the response satisfaction of students and alert for the priority to be given for actions to improve teaching in undergraduate subsequent offers, provided for in this format. It is an adequate tool to deepen insights in the cause-effect search and seek forward to consolidate solutions.

Noteworthy, this is the first study that quantitatively relates multiple factors to student satisfaction with the ERL in an undergraduate Pharmacy course training in a Brazilian public higher education institution. Given the genuine pandemic moment, the long-term effects of adopting the remote teaching model are unpredictable. However, a lesson learned in this health emergency is that universities must have an educational plan for the crisis and be prepared before it occurs. All the acquired knowledge and skills to work online classes must be used for upcoming post-pandemic teaching strategies (Oliveira et al., 2021). Today, students can benefit from the ICT skills developed during the pandemic for distance learning in their in-person interactions with peers and professors.

4. Conclusion

The mean satisfaction of students reflects the dedication and responsibility of teaching professionals in implementing the new teaching format. CART analysis reveals that this satisfaction is primarily influenced by the phase of the professional cycle in the Pharmacy course. However, adapting the course to remote learning presents challenges, particularly in laboratory classes, leading to low satisfaction levels.

Despite the considerable efforts of professors in implementing the ERL a significant burden was to adapt Pharmacy lab classes to remote format. This study highlights the ongoing importance of developing technological skills for both students and teachers in order to enhance the quality of remote teaching in adverse situations. Further studies addressing virtual teaching technologies should be considered to advance in the field of higher education.

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