

Experience report on Clinical Pharmacy education: application of active methodologies during and after the covid-19 pandemic

Relato de experiência no ensino de Farmácia Clínica: aplicação de metodologias ativas durante e pós pandemia de covid-19

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ABSTRACT | INTRODUCTION: The education of pharmacists is essential for health systems, and the National Curriculum Guidelines (DCNs) emphasize the need to integrate theory and practice. Active methodologies, such as PBL, TBL, simulations, and gamification, foster the development of clinical reasoning and practical skills. **METHODOLOGY:** This is a qualitative descriptive study reporting the experience of graduate students from the Teaching Improvement Program (PAE) in applying active methodologies in Clinical Pharmacy during remote teaching (pandemic) and face-to-face teaching (post-pandemic). Data was collected through student observations and analyses. **RESULTS:** Remote teaching presented challenges in student interaction, assessment of practical skills, and use of technology. Active methodologies promoted engagement and pedagogical development. In the post-pandemic period, in-person activities enabled practical simulations, clinical method exercises, and the use of innovative tools such as short videos, improving student performance and integrating theory with practice. **CONCLUSION:** The pandemic accelerated the adoption of active methodologies, highlighting the importance of combining digital tools with practical training.

KEYWORDS: Pharmacy Education. Active Learning Methodologies. Covid-19 Pandemic.

RESUMO | INTRODUÇÃO: A formação de farmacêuticos é essencial para os sistemas de saúde, e as Diretrizes Curriculares Nacionais (DCNs) destacam a necessidade de integrar teoria e prática. Metodologias ativas, como PBL, TBL, simulações e gamificação, favorecem o desenvolvimento do raciocínio clínico e das habilidades práticas. **METODOLOGIA:** Trata-se de um estudo descritivo qualitativo que relata a experiência de estudantes de pós-graduação do Programa de Aperfeiçoamento de Ensino (PAE) na aplicação de metodologias ativas em Farmácia Clínica, durante o ensino remoto (pandemia) e presencial (pós-pandemia). Os dados foram coletados por observações e análises dos estudantes. **RESULTADOS:** O ensino remoto apresentou desafios na interação entre alunos, avaliação de habilidades práticas e uso de tecnologia. Metodologias ativas promoveram engajamento e desenvolvimento pedagógico. No período pós-pandemia, atividades presenciais permitiram simulações práticas, exercícios do método clínico e uso de ferramentas inovadoras, como vídeos curtos, melhorando o desempenho dos alunos e integrando teoria e prática. **CONCLUSÃO:** A pandemia acelerou a adoção de metodologias ativas, evidenciando a importância de combinar ferramentas digitais com o treinamento prático.

PALAVRAS-CHAVE: Educação em Farmácia. Metodologias Ativas de Ensino. Pandemia de Covid-19.

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1. Introduction

The training of pharmacists is strategic for strengthening health systems worldwide, especially given the increasing appreciation of the role of this profession in health care¹. Thus, the National Curricular Guidelines (DCN) of the Pharmacy course have changed over the years, focusing on training professionals capable of working in the most varied areas, with the central purpose of defining the desired profile of the graduate, in addition to exploring the skills and content that students must acquire during graduation².

The 2017 DCNs for Pharmacy undergraduate education makes it clear the need for comprehensive pharmacist training to practice the profession in various settings, highlighting its crucial role in meeting society's health demands. One of the highlights of the document is the presentation and definition of the axes that must sustain the student's curriculum, which include: Health Care (50%), Health Technology and Innovation (40%), and Health Management (10%). In addition, it reinforces the integration of teaching, research, and extension, prioritizing a more humanistic and critical approach³.

In this context, work and teaching require that trained or in-training pharmacists develop skills such as creativity, autonomy in the pursuit of knowledge, leadership, conflict resolution, teamwork, and adaptation to technological and social transformations⁴. Thus, in Clinical Pharmacy education, the application of Pharmaceutical Care was one of the innovations established by the 2017 DCNs.

However, to properly teach Pharmaceutical Care, it is essential to combine theory with practice, such as the use of the clinical method, which is a fundamental aspect of this subject. Therefore, new learning approaches become relevant. The most prominent approach is the active methodology, one of the most important teaching tools in the health field. It allows students to immerse themselves in real situations that can occur in daily life, such as in primary health units and even in hospital settings⁵. This approach facilitates the development of clinical reasoning skills

and student interaction, providing an experience different from traditional teaching methods^{5,6}. Thus, the application of active methodologies contributes to the improvement of the clinical method.

Active methodology models have proven effective, such as the problematization methodology, which is efficient in establishing the "clinical problem" as well as the "step-by-step" of its resolution, through meaningful learning, autonomy, and learning to learn, in addition to developing skills that include the cognitive dimensions of abilities and attitudes⁷. Other applications of active methodologies in Clinical Pharmacy involve techniques that place the student at the center of learning, promoting practical and collaborative experiences, such as:

- Problem-Based Learning (PBL): Solving real clinical scenarios.
- Clinical Simulation: Experiencing practical situations with simulated patients.
- Case Studies: Applying concepts to real-life problems.
- Team-Based Learning (TBL): Collaborative group work.
- Role-playing: Simulating interactions between pharmacists and patients.
- Gamification: Using games to reinforce learning.
- Concept Maps: Organizing and integrating knowledge.

Finally, for the discussion and understanding of each clinical case, it is essential that future professionals develop skills such as communication, management, leadership, creativity, and initiative in decision-making. These skills are fundamental for conducting discussions focused on clinical reasoning, standardizing conduct (based on protocols or anamnesis), interpreting data, and problem-solving, considering the local reality and patient needs. Pedagogical strategies should enable students to articulate theory and practice, overcome knowledge gaps, assume responsibilities, and commit to service and patient care. All of this helps prepare pharmacists with knowledge directed to clinical practice⁸.

Therefore, the objective of this study is to report the experience of graduate students in incorporating active methodologies into Clinical Pharmacy education, comparing the periods during and after the covid-19 pandemic.

2. Methodology

This is a descriptive and qualitative experience report, focused on the application of active methodologies in the Clinical Pharmacy discipline of a Pharmacy undergraduate course. The experience was conducted by graduate students linked to the Programa de Aperfeiçoamento de Ensino - PAE (teaching improvement program from Universidade de São Paulo) and covers two distinct periods: emergency remote teaching during the covid-19 pandemic, and in person teaching in the post-pandemic period.

Information was collected through participant observation and documentary analysis of the activities carried out. The parameters of "engagement," "anxiety," and "isolation" were qualitatively evaluated: engagement was measured by the frequency and quality of student participation in synchronous activities, forum discussions, and task delivery, while perceptions of anxiety and isolation were inferred from spontaneous student reports and observation of non-participation behaviors.

The evaluation of graduate students' performance in the PAE during the pandemic had a formative and process-oriented focus, aiming at the development of pedagogical skills. Thus, this approach allowed continuous and adaptive evaluation of teaching practice in a crisis scenario.

3. Results

3.1 During the pandemic

During the covid-19 pandemic, Clinical Pharmacy education was challenged to adapt to the remote format, requiring significant changes in pedagogical approaches. The transition to the online environment imposed the need for new teaching strategies,

incorporating active methodologies such as gamification, online TBL, and role-plays. These methodologies aimed to stimulate active participation and student involvement, despite the inherent limitations of remote teaching.

Activities requiring greater student participation, such as clinical case discussions and simulated consultations, presented additional difficulties. The lack of direct contact possibly compromised the fluidity of interactions, impacting on the quality of discussions and engagement during online sessions. Technical factors, such as connection instability and barriers to accessing technologies, were also challenges that may have affected teaching quality. These limitations revealed the need for greater technological preparedness to support remote teaching in emergency situations.

In practical activities, adaptation was particularly challenging. Clinical Pharmacy depends on direct interaction with patients and a realistic environment for developing clinical skills. With the impossibility of conducting in-person activities, alternatives such as online simulations and role-plays were implemented, but could not fully replace the in-person experience. Although they provided a viable solution, these remote activities did not offer the immersion necessary for developing skills such as interpersonal communication and quick decision-making in clinical scenarios.

Similarly, in telepharmacy, the lack of physical contact with the patient and distance communication can generate similar challenges, making it difficult to develop important skills such as evaluating physical signs, for example. Despite this, telepharmacy can be an interesting alternative, provided pharmacists are trained to ensure quality patient care⁹.

Another significant challenge was assessing the development of students' competencies. Although theoretical knowledge could be measured through quizzes and online tests, the evaluation of practical skills, essential in Clinical Pharmacy, was limited by the lack of in-person interactions. Clinical practice requires direct observation to assess students' ability to handle complex situations, which was not fully possible in the remote format. Thus, the evaluation of practical skills fell short of expectations.

The experience in the PAE during the pandemic brought significant development in pedagogical skills. The need for rapid adaptation revealed the importance of exploring new methodologies and technological tools, expanding the teaching repertoire. Furthermore, the application of active methodologies in remote teaching allowed real-time observation of the benefits and limitations of these practices in the context of Clinical Pharmacy education.

The immersion in this emergency context was also an opportunity to reflect on the development of future professors. It highlighted the importance of being flexible and creative in crisis scenarios, as well as adapting teaching practices to meet both academic and emotional needs of students. Remote teaching, despite its limitations, proved to be a powerful tool when well conducted, and could continue to be explored even after the return to in-person teaching.

Thus, the PAE internship during the pandemic not only provided technical pedagogical learning but also broadened the vision of the challenges and opportunities in faculty training. The experience of adapting teaching in a crisis context demonstrated the resilience required to overcome adversity and highlighted the potential of Information and Communication Technologies (ICTs) in education to transform teaching, even in disciplines with a strong practical component, such as Clinical Pharmacy.

3.2 Post-pandemic

In the first semester after covid-19, Clinical Pharmacy education underwent an important transition with the return of in-person classes and the possibility of applying active methodologies such as TBL, simulated consultations, and clinical case studies.

A highlight was an activity focused on the development of the clinical method and on solving Drug-Related Problems (DRPs), carried out in two stages: the first, conducted without guidance, and the second, after teaching the clinical method and conducting practical simulations.

In the evaluation, the first activity had an average of 5.8 (SD = 2.0; 95% CI: 5.3–6.3), while the second reached an average of 7.9 (SD = 1.2; 95% CI: 7.6– 8.2). This significant difference indicates that prior guidance from the teacher on the clinical method improved

students' learning, allowing greater understanding in the second activity¹⁰.

This experience demonstrates the importance of teaching the clinical method combined with active methodology in the Pharmacy undergraduate course, enabling students to understand and meet the essential requirements for the development of Pharmaceutical Care. In addition, it highlights the benefit of adopting the DCNs in the training of future pharmacists³.

In this context of innovative methodologies, a differentiated activity carried out in the discipline, inspired by the pandemic period, was the use of short videos, widely disseminated on the TikTok platform as a form of entertainment and social connection during lockdowns^{11,12}. This platform, widely used by young people to share daily life, has also been explored as a virtual learning tool¹¹.

Based on this, the activity objective was for students, in pairs, to record a video of up to 2 minutes to explain what they had learned in the discipline, which generated great engagement in the class. One of the reasons for this enthusiasm may have been the fact that students were already accustomed to the new trend of short videos on social media, facilitating the formulation of ideas¹³. In addition, the competitive environment created, with creativity and content evaluation, provided extra motivation, since the three best grades received a bonus of 0.5 points in the final exam.

The use of this platform for educational purposes is also discussed in other studies, which indicate that the creation of short videos helps consolidate acquired knowledge and allows creativity to flourish during the process¹³. Thus, this activity provided a quick and dynamic review of the discipline from the students' perspective, who often used humor to convey what they assimilated during the classes, with a high level of assertiveness in the content in many videos.

The post-pandemic period consolidated many of the strategies tested during remote teaching, especially regarding the use of active methodologies, as well as enabling the incorporation of new tools, such as the TikTok platform. This flexibility expanded possibilities for developing practical and theoretical skills, improving students' preparation for real clinical scenarios.

Finally, during the pandemic, tools such as gamification, online TBL, and role-plays were essential to maintain student engagement. With the return to in person classes, these same methodologies could be refined and applied more effectively, thanks to the resumption of direct interactions and more immersive clinical simulations.

4. Discussion

The covid-19 pandemic had a profound impact on education, accelerating the adoption of active methodologies and highlighting the need for new paradigms for the future. Several studies explore the different dimensions of this transformation, revealing both challenges and opportunities in distance and online education^{11,14}. During the pandemic, remote teaching was adopted almost entirely, with rare exceptions, and educational institutions around the world resorted to virtual platforms to ensure educational continuity. However, structural challenges arose, such as digital exclusion, especially in low- and middle-income countries, where internet access and adequate devices are limited. In this report, digital exclusion was not identified, possibly due to the satisfactory infrastructure of the region; however, connection instabilities were observed, compromising the development of synchronous and asynchronous activities, an impact even more pronounced in economically disadvantaged regions^{14,15}.

Despite these obstacles, the pandemic also brought significant opportunities. Asynchronous learning, combined with the use of collaborative synchronous tools, which in this study included gamification, role-plays, and online TBLs, proved effective by providing students with greater flexibility, allowing them to manage time more efficiently. The adoption of active methodologies in remote teaching was also reported in other studies, and although many professors had no prior training, some adapted quickly to new digital pedagogical approaches, an aspect that should be considered in future faculty training^{14,16}.

Regarding acceptance of remote classes, many students reported positive perceptions. The systematic review by Naciri et al.¹⁴ and the meta-synthesis by Camargo et al.¹⁵ indicate that during the covid-19 period, students recognized the

fundamental role of these classes for educational continuity, as well as their potential to enhance the learning process through flexibility and accessibility. Thus, remote teaching offers a flexible environment for students to learn at their own pace and revisit recorded classes, if necessary, which can improve understanding and retention of content^{15,16}.

However, it is important to recognize that these benefits do not always manifest uniformly among students. National and international studies, such as those conducted by the Oswaldo Cruz Foundation (Fiocruz) in Brazil¹³ and by Bao¹⁷ in China, reinforce that the absence of face-to-face contact affected student motivation and learning quality, especially in courses requiring practical activities or greater in-class interaction, such as Pharmacy.

Similar to what was observed in this report, the role-plays used for clinical case discussions presented greater difficulties in remote teaching due to the reduction in student interaction, compromising the development of these activities. In contrast, the application of the clinical method in the in-person format resulted in good student participation, good academic performance, and favored the adoption of the DCNs, focusing on learning Pharmaceutical Care. In addition, studies also show that acceptance of remote teaching strongly depends on engagement strategies and continuous institutional support, with better results when there are structured faculty training and adequate technological resources¹⁸.

The pandemic accelerated experimentation with these methods, and many remain in use even after the end of the health crisis. Hybrid methods, combining the best of in-person and online teaching, have been identified as a promising solution for the future. Studies indicate that many teachers prefer the hybrid model, which offers the flexibility of online teaching without losing the value of face-to-face interactions^{13,16}. In this report, the hybrid model was not applied to Clinical Pharmacy teaching; however, in the post-pandemic period, tools highlighted during remote teaching were incorporated to enhance active methodologies employed in the classroom. Such practice, as evidenced by Radin et al.¹², favors interaction and demonstrates that innovative methodologies can significantly contribute to the teaching-learning process.

Finally, some improvement perspectives point to the need for better training for both students and professors, aiming to optimize the quality of remote teaching. This may include conducting professional development workshops, providing technical support, and developing innovative teaching techniques. Educational institutions are encouraged to evolve in the pedagogical design of distance learning courses, in addition to ensuring a stable internet connection and the use of secure educational platforms^{15,16}.

This report presents limitations, such as the absence of a more robust quantitative analysis. A qualitative descriptive design was chosen, which made it possible to integrate the experiences of different graduate students involved in Clinical Pharmacy teaching in the same undergraduate course. This approach allowed a qualitative comparative analysis of the use of active methodologies between the periods during and after the pandemic, highlighting and favoring the adaptation of these methodologies both to remote and in-person teaching. Future studies should expand the sample, use quantitative and qualitative methods, and include longitudinal comparisons in order to generate evidence on the effectiveness and acceptance of remote and hybrid teaching.

5. Conclusion

The experience gained during the pandemic allowed not only to adapt teaching to emergency conditions but also to combine a teaching repertoire that enriched post-pandemic practices. The transition of the discipline to the return of in-person activities brought a new dynamic, allowing students to more fully experience the learning process, especially the essential practical competencies of Clinical Pharmacy.

Thus, the integration of these approaches proved fundamental to strengthening learning, combining technological flexibility with practice, resulting in more complete and effective training for students. Finally, the forced transition to remote teaching paved the way for a deeper reflection on the future of education, where digitalization is no longer an option but a necessity.

Authors' contributions

The authors stated that they made substantial contributions to the work in terms of research design or design; data acquisition, analysis or interpretation for the work; and writing or critical review of relevant intellectual content. All authors approved the final version to be published and agreed to take public responsibility for all aspects of the study.

Competing interests

No financial, legal, or political conflict involving third parties (government, companies, private foundations, etc.) was declared for any aspect of the submitted work (including, but not limited to, grants and funding, advisory board participation, study design, manuscript preparation, statistical analysis, etc.).

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