Revista Ibero-Americana de Humanidades, Ciências e Educação — REASE

doi.org/10.51891/rease.v12i2.24197

INTEGRATION OF ACTIVE LEARNING METHODOLOGIES IN THE TEACHING OF MAXILLOFACIAL PATHOLOGY: EXPERIENCE REPORT AND CRITICAL ANALYSIS

INTEGRAÇÃO DE METODOLOGIAS ATIVAS NO ENSINO DE PATOLOGIA MAXILOFACIAL: RELATO DE EXPERIÊNCIA E ANÁLISE CRÍTICA

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ABSTRACT: This study aims to descriptively and reflectively report the experiences of undergraduate dental students who participated in active learning methodologies in the Maxillofacial Pathology II and III courses. This observational study explored the implementation of case-based, team-based, problem-based, and project-based learning strategies. These methodologies were employed throughout the academic semester and incorporated into the courses' assessment criteria. The integration of active learning methodologies served as a pedagogical strategy to facilitate students' knowledge construction. These approaches made learning more meaningful and enhanced information retention, while also promoting a more engaging, dynamic, and collaborative learning environment by valuing teamwork. However, successful implementation requires faculty training in active methodologies and active student engagement to achieve optimal learning outcomes. In conclusion, active learning methodologies proved to be effective instructional strategies, as they contributed to the development of essential competencies for the students' professional education.

Keywords: Active learning. Dental education. Oral pathology. Dentistry.

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RESUMO: Esse estudo buscou relatar, de forma descritiva e reflexiva, a experiência de graduandos em Odontologia que participaram das metodologias ativas de ensino nas disciplinas de Patologia Maxilofacial II e III. O estudo observacional tratou sobre a vivência da aprendizagem baseada em casos, em equipes, em problemas e em projetos, que são utilizadas ao longo do semestre letivo e estão inseridas nos critérios avaliativos das disciplinas. A inserção de metodologias ativas foi uma estratégia didática para facilitar o processo de construção do conhecimento pelos estudantes. As metodologias ativas tornaram a aprendizagem mais significativa e facilitaram a aquisição das informações pelos alunos, além de tornarem o ambiente de aprendizado mais interessante, dinâmico e colaborativo, em vista da valorização das tarefas em equipe. Entretanto, é necessária a capacitação do docente para utilizar as metodologias ativas e que o estudante esteja envolvido e participe das atividades para que tenha um bom desempenho. As metodologias ativas foram estratégias de ensino efetivas, pois contribuíram para desenvolver competências essenciais para a formação profissional dos estudantes.

Keywords: Aprendizagem ativa. Educação em Odontologia. Patologia Bucal. Odontologia.

INTRODUCTION

The use of active learning methodologies in undergraduate education is a highly relevant strategy for fostering critical and reflective thinking, particularly in developing students' capacity for self-directed learning (Marques et al., 2021). Knowledge construction throughout the academic journey is influenced by student motivation and by the pedagogical approaches employed (Santos & Pita Neto, 2021). In dental education, the incorporation of active learning methodologies has become a valuable resource that transforms learning into a more engaging process and enables students to take ownership of their academic development (Reul et al., 2016).

Team-Based Learning (TBL) has been proven successful in promoting active, collaborative, and practice-oriented learning (Rocha, et al., 2021; Rodrigues et al., 2023; Sakamoto et al., 2023). This methodology encourages prior preparation and teamwork, resulting in greater commitment and in the development of critical thinking skills (Sakamoto et al., 2023). The individual and group preparation phases foster student autonomy and contribute to the acquisition of essential skills for professional practice, even in the face of initial adaptation challenges (Rocha et al., 2021). TBL allows for deeper understanding of key concepts, the development of argumentative competencies, and the practical application of knowledge (Rodrigues et al., 2023).

Another methodology employed is Problem-Based Learning (PBL), which aims to train students to think critically in clinical settings (Gonçalves et al., 2020). Unlike other methods that also involve problematization, PBL introduces the problem at the beginning of the learning

process (Klein & Ahlert, 2019). In this approach, the tutor acts as a facilitator of learning, while students are responsible for managing patient health problems and critically evaluating clinical decisions (Ronn et al., 2019). This model shifts the traditional vertical teaching paradigm toward a collaborative construction of knowledge (Menezes-Rodrigues et al., 2019).

Case-Based Learning (CBL) is another educational strategy that seeks to bridge theory, clinical practice, and real-world application (Ribeiro et al., 2020; Wagner & Martins Filho, 2022). CBL involves the creation of problem scenarios to revisit key concepts discussed in lectures. The goal is to develop students' ability to interpret clinical issues and make decisions based on data obtained through patient history and physical examination (Caldas et al., 2024; Silva et al., 2024).

Within this framework of encouraging students to take an active role in their own learning process, Project-Based Learning (PjBL) stands out. It is grounded in the transfer of knowledge to solve real-world problems through the development of projects with practical impact (Pascon & Peres, 2023). The challenge posed stimulates information-seeking behavior, providing the learning process with a greater sense of purpose and applicability (Carvalho et al., 2022). PjBL unfolds through sequential stages, beginning with the discussion of the challenge and the decision about the final product to be developed as a solution (Pascon & Peres, 2023).

Therefore, the aim of this study is to report the experiences of undergraduate dental students with the integrated application of active learning methodologies in the Maxillofacial Pathology II and III courses.

METHODS

This is a qualitative observational study based on participant observation and reflective journaling, aiming at a critical analysis of the application of active learning methodologies in the teaching of Maxillofacial Pathology within undergraduate dental education. These courses address pathological conditions that affect the stomatognathic system.

Maxillofacial Pathology II focuses on the pathophysiology of diseases presenting as vesiculobullous, ulcerative, white, red-blue, pigmented, and papillomatous-verrucous lesions. Maxillofacial Pathology III addresses oral cancer, salivary gland disorders, osseous tumors, odontogenic and non-odontogenic neoplasms, metabolic and genetic diseases, orofacial pain, and neuromuscular disorders. Given the dense and essential curriculum for dental training,

there was a need to implement active methodologies to make learning more engaging and to increase student involvement.

These are theory-practical courses with a total of 75 hours per semester. Theoretical content is delivered through conceptual presentations and contextualization. Practical sessions include clinical case discussions and histological slide analysis. Active learning methodologies are integrated into both the course schedule and the assessment process. Final grades are composed of scores from TBL, PBL, CBL, PjBL, and two theoretical exams.

RESULTS

CASE-BASED LEARNING

CBL accounts for 10% of the final grade and was implemented following traditional lectures to apply the covered concepts. Students were presented with simulated clinical scenarios related to the topics discussed in class. Case outlines and complementary exams were made available via Google Classroom®. Students were instructed to solve the cases using their acquired knowledge, fostering the reasoning process necessary for reaching a final diagnosis.

During the activity, students were required to present detailed answers to justify their diagnostic reasoning process. This methodology reinforced theoretical knowledge while integrating theory and clinical practice, fostering critical thinking and decision-making skills. Group discussions also facilitated experience sharing and consolidation of knowledge.

Figure 1- CBL in Maxillofacial Pathology II

TEAM-BASED LEARNING

TBL sessions were scheduled at the beginning of the semester with a predefined topic. In Maxillofacial Pathology II, the topics included hematologic diseases and systemic disease

associations with red-blue lesions. In Maxillofacial Pathology III, the focus was on lymphoid lesions. TBL accounted for 20% of the final grade. One week prior to the activity, students received study guides via Google Classroom®, including book chapters, scientific articles, and videos. This preparatory phase was essential for the success of the activity. Subsequent steps were conducted using the TBL Active® online platform during in-class sessions. In the readiness assurance phase, students completed an individual questionnaire on the platform without access to study materials, under a timed condition. Afterward, the teacher randomly divided students in teams for the group test. Once organized, the same quiz was reopened, and students discussed each question to reach a consensus answer—again without consulting any materials and within a time limit.

Figure 2- TBL groups test in Maxillofacial Pathology III

After completing the team test, TBL Active® automatically sent performance reports to each student via email. Students could contest questions by submitting appeals supported with bibliographic references. The instructor later provided feedback. TBL effectively promoted independent knowledge construction while also stimulating collaborative learning and application of learned concepts, through individual preparation and group discussions following the individual assessment.

PROBLEM-BASED LEARNING

PBL accounted for 20% of the final grade. The activity began with the class being divided into groups of five to six students. Each group was assigned a complex problem aligned with course content.

Groups discussed clinical aspects of the case and took notes without consulting external sources. During these PBL sessions, the teacher acted as a tutor—facilitating discussion, maintaining focus, and encouraging clinical reasoning. After classroom discussion, students continued working on the case at home. Based on the guidance received, they researched scientific literature to develop a solution.

To support their decisions, students prepared written reports referencing scientific literature. These were submitted and presented in the following class session, during which each group shared their reasoning process, clinical hypothesis, and diagnostic conclusions. After all presentations, the instructor provided feedback, corrections, and additional commentary.

Figure 3- Final PBL presentation and discussion in Maxillofacial Pathology III

This activity promoted self-directed learning and cooperation through peer discussions and research. PBL also fostered the development of critical problem-solving skills, always under the instructor's guidance to ensure meaningful learning outcomes.

PROJECT-BASED LEARNING

PjBL was carried out over the entire semester and accounted for 30% of the final grade. This methodology involved the development of a final product aimed at solving a relevant problem related to Maxillofacial Pathology.

At the start of the semester, students were asked to form groups of up to eight members. Each group was paired with postgraduate students (from a stricto sensu Dentistry Graduate Program) who mentored and supported the project development. Regular meetings were held

during the semester with mentors and the instructor to discuss ideas and shape the product. An important aspect of PjBL was the encouragement to search for and apply scientific articles throughout the development process. The theoretical framework supported the relevance and justification of the project.

In the final week of classes, students showcased their projects during the "Pathology Exhibition." Final products included books, book chapters, scientific articles, and gamified educational materials in pathology. Therefore, this activity had a great impact on learning by encouraging autonomous research and fostering additional skills such as scientific writing and teamwork.

In addition to the active learning methodologies, two written exams were administered to assess knowledge acquisition. These were taken in trios to reinforce the collaborative nature of learning and contributed a combined total of 20% to the final grade.

Despite the benefits observed, several challenges emerged during the implementation of active methodologies. Among them was the need for adequate technological resources and stable internet access, both for completing activities and for individual preparation. The demanding weekly schedule of the dental program also posed a barrier, as active methodologies require greater preparation time.

Some students initially expressed insecurity and difficulty adapting to the new pedagogical approach. However, continuous support and guidance from the instructor helped mitigate these obstacles and facilitated student adjustment throughout the activities.

DISCUSSION

Among the most commonly used active learning methodologies, CBL and PBL stand out due to their similarities, as both are structured around clinical case scenarios (Caldas et al., 2024; Silva et al., 2024; Wagner & Martins Filho, 2022). The main distinction lies in the timing and context in which students access information. In PBL, some information may be uncovered during the course of the activity itself—often before the topic has been formally addressed in lectures—whereas in CBL, prior knowledge of the subject matter is required (Wagner & Martins Filho, 2024).

The construction of problem-scenarios based on previously addressed content, a hallmark of CBL, plays a critical role in linking theoretical knowledge to real-world clinical practice by stimulating clinical reasoning (Caldas et al., 2024; Silva et al., 2024; Ribeiro et al.,

2020; Wagner & Martins Filho, 2022). Collaborative activities have demonstrated better educational outcomes; therefore, it is recommended that students be organized into groups for case discussions (Silva et al., 2024). In this way, CBL represents a significant enhancement of the teaching process by promoting student prominence and encouraging cooperative learning (Caldas et al., 2024; Carvalho et al., 2022; Pascon & Peres, 2023; Sistermans, 2020).

Within this student-centered approach, PBL emerges as a strategy to foster group discussions focused on problem-solving, as well as to develop the skills necessary for meaningful knowledge assimilation (Gonçalves et al., 2020). The PBL process begins with reading the problem, clarifying unfamiliar terms, formulating hypotheses, and identifying learning objectives. After individual study, a group discussion follows. By starting with the presentation of the problem itself, this method breaks away from rote memorization and fosters critical thinking and communication skills (Ronn et al., 2019).

In the context of team-based learning, TBL has proven to be an effective strategy for making education more active, collaborative, and meaningful (Nichele, 2023). TBL promotes autonomous preparation, clinical reasoning, and teamwork, thereby enhancing engagement and practical learning (Sakamoto et al., 2023). It also encourages individual accountability and cooperative learning, although both students and instructors may face initial adaptation challenges (Rocha et al., 2021). Thus, effective implementation of TBL requires curricular redesign and faculty development (Nichele, 2023).

Another active methodology is PjBL, which involves the development of a product to address real-world challenges through sustained project work. Students are encouraged to identify real-life problems, formulate hypotheses, and develop viable solutions (Carvalho et al., 2022). This approach fosters student learning autonomy, as they engage in decision-making, problem-solving, and self-managed research. In addition to academic gains, PjBL contributes to the development of argumentative skills, critical thinking, collaboration, and both cognitive and socio-emotional competencies (Pascon & Peres, 2023).

Despite the increasing adoption of active learning methodologies by educators, several challenges persist. Among them are student resistance to pedagogical change and the time-intensive process of preparing instructional materials. Overcoming these barriers requires careful planning and instructor training prior to implementing active strategies (Ferreira & Morosini, 2019).

In this context, modern professional education demands active pursuit of knowledge, considering the evolving nature of scientific understanding and the complexity of real-world clinical situations (Santos et al., 2019). The experience with active learning methodologies in Maxillofacial Pathology courses demonstrated significant benefits for student learning, both in formative and summative evaluation assessments. These methodologies transform the educational environment by shifting the student's role from passive recipient to active participant in knowledge construction—supported by the instructor, who assumes the role of guide, supervisor, and facilitator (Carvalho et al., 2022). However, these strategies may also lead to negative experiences when students exhibit low engagement, particularly in assessment activities, as participation and collaboration directly influence performance (Santos & Pita Neto, 2021).

CONCLUSION

The experience with active learning methodologies proved to be essential for the professional development of dental students. Given the complexity and density of the course content, the implementation of these methodologies made learning more meaningful and effective.

The emphasis on critical reasoning and the positioning of students as active agents in the construction of knowledge, with the support of faculty, contributed to the development of core competencies required for professional practice. However, it is crucial that students remain actively engaged in the activities to achieve good performance, and that faculty members are properly trained to implement these strategies effectively.

For future research, it is recommended to investigate the perceptions of both students and instructors who have participated in active learning methodologies. Comparative studies involving cohorts exposed to traditional teaching methods may also be conducted. Such analyses could provide valuable insights for improving dental education strategies.

In conclusion, the adoption of active learning methodologies in the teaching of Maxillofacial Pathology proved to be an effective approach to addressing and complementing the curricular content. Their application enhances student autonomy and accountability, better preparing them to manage real-life situations in clinical practice.

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