

Evaluating The Effectiveness Of Peer-Assisted Learning In Dental Anatomy: A Student Perspective

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Abstract

Background: Peer-Assisted Learning (PAL) is a widely recognized pedagogical method in health professions education. This study evaluated the effectiveness of a PAL program in a Dental Anatomy course from the students' perspective, assessing its impact on learning experience, outcomes, skill development, and overall satisfaction.

Methods: A cross-sectional survey was administered to a cohort of dental students (N=50) who participated in a PAL program for Dental Anatomy. The questionnaire collected data on demographics and used a 5-point Likert scale to gauge agreement across four domains: Student Experience, Learning Outcomes, Skill Development, and Satisfaction. Open-ended questions captured the most helpful PAL components and perceived challenges.

Results: The response rate was 100%. Overwhelmingly positive responses were observed. A significant majority strongly agreed or agreed that PAL improved their understanding of tooth morphology (84%), enhanced retention (80%), and created a less stressful, more collaborative learning environment (92% agreed/strongly agreed). Furthermore, 88% reported improved communication skills and 90% felt that explaining topics to peers reinforced their own learning. Overall, 86% of respondents were satisfied with the PAL experience and endorsed its continuation. "Peer teaching" and "Hands-on demonstration" were the most valued components. Challenges, reported by a minority, included introversion-related hesitancy and occasional difficulty in clarifying doubts with peers.

Conclusion: Peer-Assisted Learning is a highly effective and well-received strategy for teaching Dental Anatomy. It significantly enhances the learning atmosphere, improves academic outcomes, and fosters essential transferable skills like communication and teamwork. The findings strongly support the integration and expansion of PAL within dental curricula.

Keywords: Peer-Assisted Learning, Dental Education, Dental Anatomy, Student Engagement, Collaborative Learning, Curriculum Development

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I. Introduction

Dental education demands the integration of vast theoretical knowledge with precise practical skills, creating a significant cognitive and psychomotor load for students [1]. Subjects like Dental Anatomy, which form the foundational bedrock of clinical practice, require deep understanding and recall of complex structures. Traditional didactic teaching, while essential, may not always optimally facilitate this deep learning or the collaborative skills necessary for modern dental practice [2].

Peer-Assisted Learning (PAL) is an educational strategy where students learn from and with each other, typically without the direct involvement of a faculty member [3]. In health professions education, PAL has been shown to yield numerous benefits. For the learner (tutee), it can provide a less intimidating environment to ask questions, reinforce learning through alternative explanations, and promote collaborative skills [4]. For the student tutor, the act of teaching solidifies their own knowledge, improves communication skills, and builds confidence [5].

While PAL has been successfully implemented in disciplines like medicine and nursing, its structured application in dental education, particularly in foundational sciences like Dental Anatomy, is less extensively documented [6]. This study aims to fill this gap by evaluating the effectiveness of a PAL program in a Dental Anatomy course from the student participants' perspective. We sought to assess its impact on:

The learning experience and environment.

Perceived learning outcomes and academic performance.

The development of transferable skills.

Overall student satisfaction and recommendations for the future.

II. Methods

Study Design and Participants

A descriptive, cross-sectional study was conducted. The participants were a complete cohort of first-year Bachelor of Dental Surgery (BDS) students (N=50) at [Your Institution Name] who had participated in a structured PAL program as part of their Dental Anatomy curriculum. The PAL program involved regular sessions where students, in small groups, engaged in peer teaching, group discussions, and hands-on practical demonstrations (e.g., wax carving, tooth identification). Ethical approval for the study was obtained from the Institutional Ethics Committee.

Data Collection Tool

A structured, self-administered questionnaire was distributed electronically via Google Forms. The questionnaire comprised five sections:

Section A: Demographic information (Gender, Type of prior school education, Prior knowledge of dental anatomy).

Section B – Student Experience: 4 items on participation, learning atmosphere, comfort in asking doubts, and teamwork.

Section C – Learning Outcomes: 4 items on understanding, retention, practical demonstrations, and exam performance.

Section D – Skill Development: 3 items on communication skills, reinforcement of learning, and independent confidence.

Section E – Satisfaction and Suggestions: 2 closed-ended items on overall satisfaction and desire for PAL continuation, and 2 open-ended questions on the most helpful PAL component and challenges faced.

Responses for Sections B-D were recorded on a 5-point Likert scale (Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree).

Data Analysis

Quantitative data from the Likert-scale questions were downloaded from Google Forms into Microsoft Excel. Descriptive statistics (frequencies and percentages) were calculated for each item. Responses of "Agree" and "Strongly Agree" were combined to indicate positive perception, while "Disagree" and "Strongly Disagree" were combined for negative perception. The "Neutral" responses were reported separately. Qualitative data from open-ended questions were analyzed using thematic analysis to identify common themes and patterns.

III. Results

Demographic Characteristics

All 50 students participated (response rate: 100%). The cohort's demographic characteristics are presented in Figure 1. The cohort consisted of 68% (n=34) females and 32% (n=16) males. The majority (64%, n=32) hailed from the CBSE board, followed by State Board (30%, n=15), ICSE (2%, n=1), and MP Board (2%, n=1). Regarding prior knowledge of dental anatomy, 42% (n=21) had no prior knowledge, 38% (n=19) had prior knowledge, and 20% (n=10) were uncertain ("Maybe").

Student Experience with PAL

The PAL program was received exceptionally well, as detailed in Figure 2. Over 90% of students actively participated and found that PAL encouraged teamwork and collaboration. A significant majority (92%) reported that PAL made the learning atmosphere less stressful and more friendly. While 78% felt more comfortable asking doubts to peers compared to faculty, 16% were neutral on this point.

Learning Outcomes

PAL was perceived as highly effective in enhancing learning, with results shown in Figure 3. Eighty-four percent (84%) of students reported that PAL improved their understanding of tooth morphology and nomenclature. Similarly, 80% felt it enhanced their retention and recall for assessments. The practical demonstrations (wax carving/tooth identification) were found helpful by 88% of respondents. A strong majority (78%) believed PAL helped them perform better in theory and practical examinations.

Skill Development

The development of transferable skills was a notable outcome, visualized in Figure 4. Eighty-eight percent (88%) of students agreed that PAL improved their communication and presentation skills. The most significant finding was that 90% felt that explaining topics to peers helped reinforce their own learning—a key

benefit for student tutors. Furthermore, 82% reported developing greater confidence in approaching academic tasks independently.

Overall Satisfaction and Qualitative Feedback

Overall student satisfaction with the PAL program was exceptionally high, as illustrated in Figure 5. Eighty-six percent (86%) of students were satisfied with the PAL experience, and 88% wanted it to continue in future academic topics. Only 8% were neutral or dissatisfied, and 6% were unsure about its continuation.

Qualitative Themes:

Most Helpful Component: Thematic analysis of responses revealed three primary themes (Figure 6):

Peer Teaching (mentioned by ~46% of respondents): Students valued the clarity and relatability of explanations from peers.

Hands-on Demonstration (~36%): Practical sessions like wax carving and tooth identification were highly appreciated for bridging theory and practice.

Group Discussion (~16%): The collaborative exchange of ideas was highlighted as a key benefit.

Challenges Faced: The majority reported "no challenges" or left the field blank. Among the few challenges mentioned, two themes emerged:

Hesitancy in Interaction: A few introverted students expressed initial discomfort in asking questions to peers (e.g., "I am an introvert so I was little bit less confident").

Doubt Resolution: Isolated comments indicated minor difficulties in getting doubts fully clarified by peers (e.g., "challenge in taking my doubts from my fellow ones").

IV. Discussion

This study demonstrates that a structured PAL program in Dental Anatomy is a highly effective and positively perceived educational intervention. The results strongly align with existing literature on PAL in health education, confirming its multifaceted benefits [3, 5, 7].

Our findings indicate that PAL successfully creates a supportive and less stressful learning environment, a crucial factor in the high-pressure context of dental school. The fact that 92% of students found the atmosphere more friendly and 78% felt more comfortable asking questions from peers than faculty underscores PAL's role in reducing the "fear factor" often associated with faculty interactions [4]. This safe space likely promotes deeper engagement and open dialogue.

The positive impact on learning outcomes is clear. Students reported significant improvements in understanding complex morphological concepts, retention, and appreciation for practical applications. The high valuation of hands-on demonstrations suggests that PAL is particularly effective in bridging the gap between theoretical knowledge and practical skill acquisition, a core challenge in dental education.

Perhaps one of the most powerful findings is the perceived benefit for the student tutors, with 90% acknowledging that teaching their peers reinforced their own learning. This "protégé effect" is a well-documented cognitive benefit where teaching material to others leads to deeper understanding and better recall for the teacher [8]. Furthermore, the development of communication, teamwork, and independent confidence are critical graduate attributes that prepare students for future clinical teamwork and patient interactions.

The overwhelming desire (88%) for PAL to continue in other subjects is a strong endorsement from the student body. The qualitative feedback provides actionable insights for curriculum planners: the emphasis on "peer teaching" and "hands-on demonstration" suggests these should form the core of any future PAL initiative.

V. Limitations And Future Research

This study has limitations. It is a single-institution study, which may limit generalizability. The data are based on self-reported perceptions rather than objective measures of academic performance. A future controlled study comparing exam scores and practical grades between a PAL group and a control group would provide stronger quantitative evidence of efficacy. Furthermore, exploring the long-term retention of knowledge and skills gained through PAL would be a valuable research direction.

VI. Conclusion

The implementation of Peer-Assisted Learning in the Dental Anatomy curriculum was met with resounding success. It is an effective pedagogical tool that enhances the student learning experience, improves perceived academic outcomes, and fosters essential professional skills. By creating a collaborative and low-anxiety environment, PAL empowers students to become active participants in their education. Dental schools should strongly consider the formal integration of PAL into their curricula, not just for Dental Anatomy, but for other foundational and clinical subjects, to cultivate a more engaging, effective, and supportive learning culture.

References

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Figure Captions

Figure 1. Demographic Characteristics of Study Participants.

(A) Gender distribution of respondents; (B) Type of school education prior to dental program; (C) Self-reported prior knowledge of dental anatomy.

Figure 2. Student Perceptions of the Peer-Assisted Learning (PAL) Experience.

Responses to statements regarding the learning environment, participation, and collaborative aspects of the PAL program (Section B of the questionnaire).

Figure 3. Student Perceptions of Learning Outcomes Attributed to PAL.

Responses to statements assessing the impact of PAL on knowledge acquisition, retention, practical skills, and examination performance (Section C of the questionnaire).

Figure 4. Student Perceptions of Skill Development Attributed to PAL.

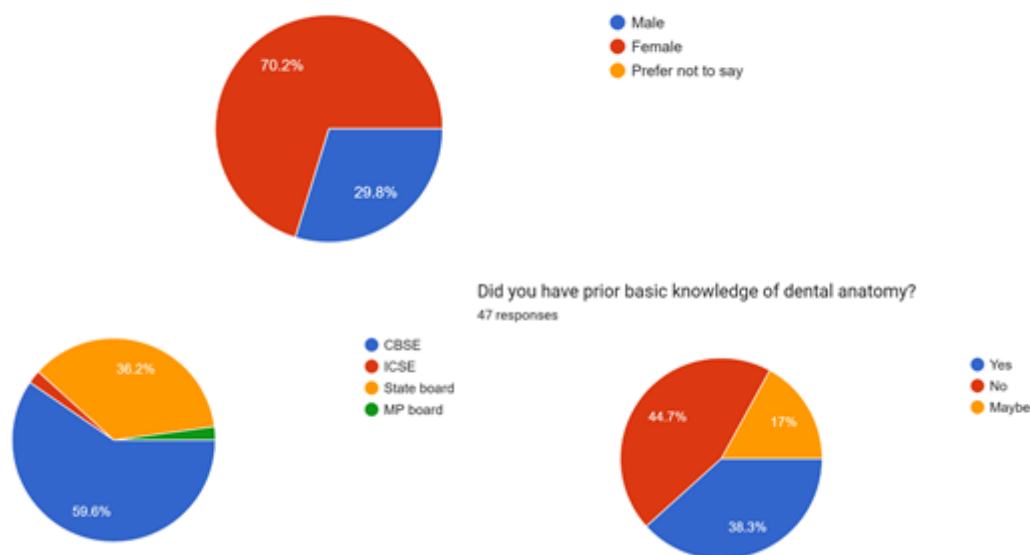
Responses to statements evaluating the development of communication, self-learning, and independent confidence through the PAL program (Section D of the questionnaire).

Figure 5. Overall Student Satisfaction and Future Intent for PAL.

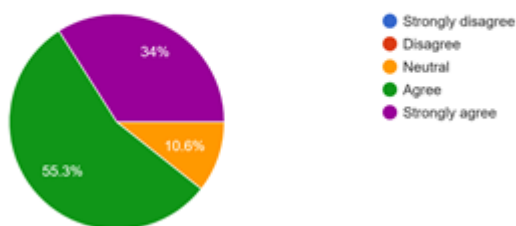
(A) Overall satisfaction with the PAL experience in Dental Anatomy; (B) Student desire for the continuation of PAL in future academic topics.

Figure 6. Most Valued Components of the Peer-Assisted Learning Program.

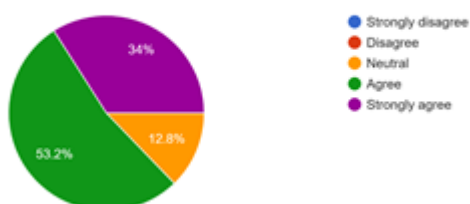
Student responses to the open-ended question identifying the most helpful aspect of the PAL sessions.



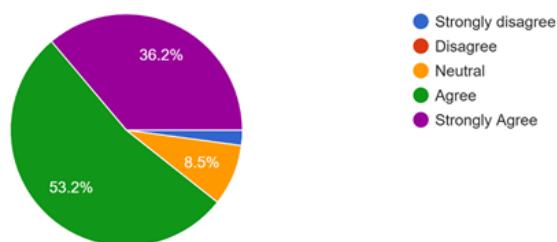
Section B – Student Experience with Peer-Assisted Learning I actively participated in peer-assisted learning sessions.
47 responses



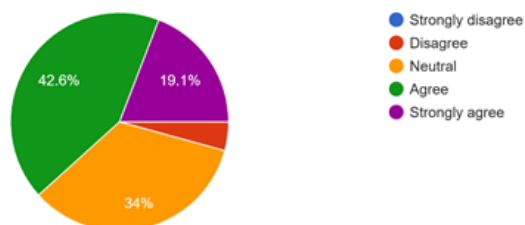
PAL made the learning atmosphere less stressful and more friendly.
47 responses



PAL encouraged teamwork and collaboration among students.
47 responses

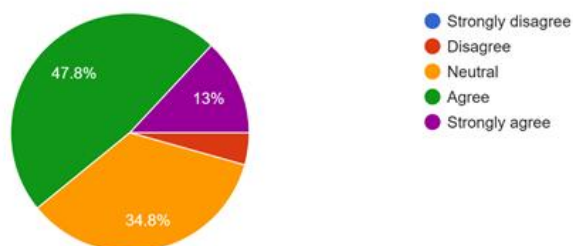


Section C – Learning Outcomes PAL improved my understanding of tooth morphology and nomenclature.
47 responses



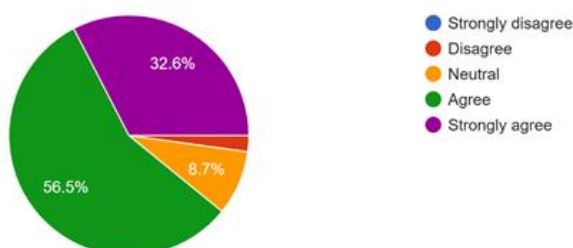
PAL enhanced my retention and recall during assessments.

46 responses



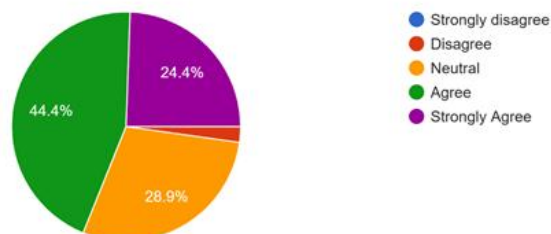
The practical demonstrations by peers (wax carving / tooth identification / features) were helpful.

46 responses



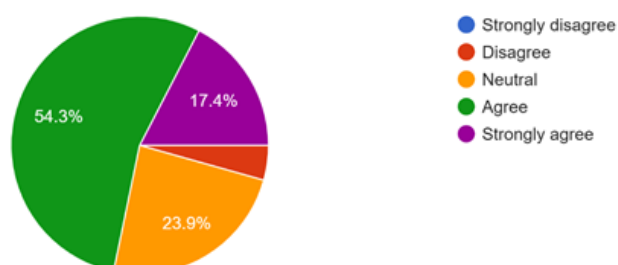
Explaining topics to peers helped reinforce my own learning.

45 responses



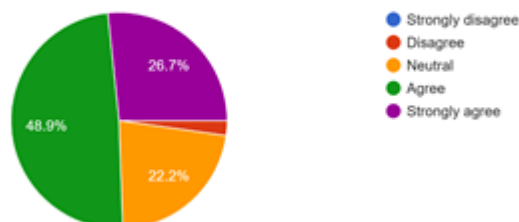
Section D – Skill Development PAL improved my communication and presentation skills.

46 responses



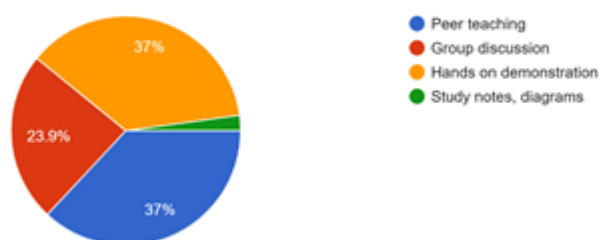
PAL developed confidence in approaching academic tasks independently.

45 responses



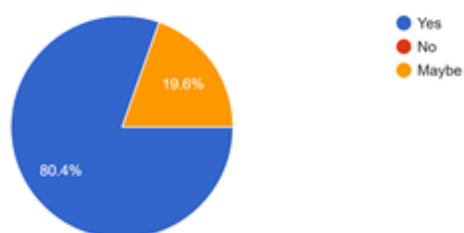
Which PAL component did you find most helpful?

46 responses



I would like PAL to continue in future academic topics.

46 responses



Section E – Satisfaction and Suggestions Overall, I am satisfied with the peer-assisted learning experience in Dental Anatomy.

46 responses

