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Original article

Challenges in Learning Oral Pathology: A Student-Based Survey at the University of Benghazi

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ABSTRACT

Oral Pathology is an essential component of undergraduate dental education. However, most students experience difficulties with the complexity of the subject, histopathological terminology, microscopic slide identification, and the inability to link theoretical and clinical learning. This study aimed to assess the perceptions of dental students regarding the subject of Oral Pathology in order to improve teaching approaches at the Faculty of Dentistry, University of Benghazi. A cross-sectional, questionnaire-based study was conducted among third-year dental students at the University of Benghazi, Libya. A self-administered questionnaire assessed perceived learning difficulties, practical experiences, learning environment, attitudes towards Oral Pathology, and study strategies. Data were analyzed using frequencies, percentages, descriptive statistics, Spearman's rank order correlation, and binomial logistic regression, with statistical significance set at $p < 0.05$. The response rate was 29.8% (120 of 403 eligible students). Histopathology of the lesions was identified as the most difficult area by 45% of students, followed by odontogenic tumors 16.7% and oral cancer 15.8%. Slide identification was the most frequently reported practical difficulty 30%, followed by correlating theoretical knowledge with microscopic appearance 23.3%. Only 10% of the students reported being able to identify slide features on first viewing. Pre-reading before practical sessions was the only preparation behavior significantly associated with self-reported slide identification ability ($\rho = 0.197$, $p=0.031$). Although 80.8% of students agreed that Oral Pathology was important for future clinical practice, only 22.5% considered the current teaching methods effective. Clinical case analysis in small groups was the most frequently preferred improvement (49.2%), followed by discussion of multiple cases after lectures (25.8%). Multiple-choice questions were the most frequently used study strategy (74.2%), while 52.5% reported frequent use of artificial intelligence tools. In conclusion, third-year dental students at the University of Benghazi perceive marked challenges in learning Oral Pathology, particularly in histopathological interpretation and microscopic slide identification. Although students are aware of the subject's clinical importance, they expressed dissatisfaction with the current teaching methods. The inclination towards small group case analysis and case-based discussion supports the transition towards more active, clinically oriented, student-centered learning.

Introduction

The official start of the field of Oral and Maxillofacial Pathology was in 1946 when the American Academy of Oral Pathology (AAOP) was founded. Thereafter, it was recognized by the American Dental Association in 1950 as a new dental specialty. Then, in 1995, it was officially designated as Oral and Maxillofacial Pathology [1]. Oral and Maxillofacial Pathology plays a significant role in the identification and management of diseases and lesions that affect the oral and maxillofacial regions, identifying the causes, the effects, and the processes of these diseases [2]. Within this field, students are professionally prepared to reach a diagnosis and a treatment plan for these oral diseases, taking into consideration the connections between systemic and oral diseases by bridging the gap between dentistry and medicine, and integrating the skills of histopathological diagnosis with clinical findings and treatment outcomes [3]. Throughout the learning process in the dental curriculum, there will be a gradual input of knowledge through classrooms, seminars, clinics, and interactive sessions. In spite of the substantial advancements in books, lectures, and the internet, there is still a gap between students' comprehension and motivation for the subject [4].

For the purpose of guiding dental students and to facilitate the development of dental professionals, institutions and educators should have a comprehensive understanding of the barriers that are experienced by students studying oral pathology [5]. Dental students studying Oral Pathology face a number of obstacles such as the complexity of the subject, time constraints, the workload, clinical correlation, the development of diagnostic skills, practical training, and teaching methodologies. To overcome these challenges, curriculum changes and clinical and practical integration are all required.

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By addressing these challenges, dental institutions may provide a stimulating learning environment that can lead to the development of capable Oral Pathology dentists [6]. Oral Pathology is frequently identified as one of the most demanding subjects in the undergraduate dental curriculum, and the reasons given by students are consistent across countries. Surveys conducted across different countries highlight four common complaints: The number of lesions to be distinguished, unfamiliar histopathological terminology, difficulty identifying the lesions under the microscope, and the idea that the subject is considered theoretical rather than clinical [6,7,8]. The aim of this study is to analyze the perceptions of undergraduate dental students at the University of Benghazi regarding the subject of Oral Pathology in order to improve teaching and training methods in the future.

Methods

Study Design and Settings

A cross-sectional, questionnaire-based study was conducted at the Faculty of Dentistry, University of Benghazi, Libya. Oral Pathology is delivered as a compulsory third-year course within the undergraduate dental curriculum, comprising theoretical lectures and practical laboratory sessions. The study was designed to characterize the learning difficulties encountered in this course, the study strategies students employ, and their views on how teaching might be improved.

Study population and eligibility

The eligible population comprised third-year students, defined as those newly progressed from second year within the current academic year. Faculty registrar records for the 2025/2026 academic year identified 403 such students. Students who declined to participate and those who submitted incomplete responses were also excluded. Because all questionnaire fields were configured as mandatory, no partially completed submissions were received.

Sampling

The minimum required sample size was calculated for a 95% confidence level, a 5% margin of error, and a 50% response distribution, with a finite population correction applied to the eligible third-year population of 403, yielding a target of 197 participants. A convenience sampling approach was used: the questionnaire link was distributed to all eligible third-year students through official communication channels, and participation was voluntary.

Questionnaire development and data collection

A self-administered 33-item questionnaire was developed based on a review of the relevant literature, covering demographic and attendance characteristics, perceived difficulty, practical experience and learning environment, attitudes towards the course (six items, five-point Likert scale), and study strategies (ten items, five-point frequency scale). The questionnaire concluded with a single open-ended item inviting suggestions for improving the teaching and learning of Oral Pathology. It was piloted on 20 third-year students for face validity and clarity. The questionnaire was administered electronically using Google Forms and distributed through official student communication channels. Participation was voluntary and anonymous, and no personally identifying information was collected. All items were configured as required fields, so that submitted responses were necessarily complete, and each participant could submit only one response. Data were collected between 3 June and 12 August 2026.

Ethical considerations

Ethical approval for the study was obtained from the Scientific Research Ethics Committee (SREC) at the Faculty of Dentistry/ Benghazi-Libya (Approval NO: 0467). Participation was voluntary, and informed consent was obtained electronically: the first page of the questionnaire explained the purpose of the study, stated that participation was anonymous and voluntary, and confirmed that submission of the questionnaire constituted consent. Participants could withdraw at any point before submission. No incentives were offered, and responses could not be linked to individual students, academic records, or examination performance.

Data analysis

Data were analyzed using jamovi (version 2.7.30; The jamovi project, Sydney, Australia). Categorical variables are presented as frequencies and percentages, and Likert-scale items as median with interquartile range, with mean and standard deviation reported alongside. Associations between preparation behaviours and self-reported slide identification ability were examined using Spearman's rank-order correlation and confirmed using binomial logistic regression, with slide identification ability dichotomised as able versus unable. Statistical significance was set at $p < 0.05$.

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Results

Participant characteristics

Of 403 eligible third-year students, 120 responded, which provides a 29.8% response rate, corresponding to a margin of error of ±7.5% at a 50% response distribution. No responses were missing on any item. Among third-year respondents, 92 (76.7%) were female and 28 (23.3%) males. Attendance patterns differed between teaching formats: 90 students (75%) reported attending practical laboratories regularly, compared with only 30 (25%) who attended lectures regularly, while an equal number (30, 25%) attended lectures rarely (Table 1).

Table 1. Characteristics of the third-year students (n = 120)

Characteristic	n	%
Gender		
Female	92	76.7
Male	28	23.3
Lecture attendance		
Regularly	30	25.0
Sometimes	60	50.0
Rarely	30	25.0
Practical laboratory attendance		
Regularly	90	75.0
Sometimes	26	21.7
Rarely	4	3.3

Difficulties encountered in learning Oral Pathology

When asked to identify the single most difficult area of Oral Pathology, students most frequently selected histopathology of lesions (54/120, 45%), followed by odontogenic tumours (20/120, 16.7%), oral cancer (19/120, 15.8%) and cysts (12/120, 10%). No third-year student selected bone pathology (Figure 1a). A parallel pattern emerged for practical difficulties. Slide identification was the most commonly reported challenge (36/120, 30%), followed by correlating theory with microscopic appearance (28/120, 23.3%) and poorly stained or non-typical slides (26/120, 21.7%). Difficulties attributable to equipment or instrument operation were less common: faulty or limited microscopes were cited by 11/120 students (9.2%) and inability to operate the microscope by 7/120 (5.8%) (Figure 1b).

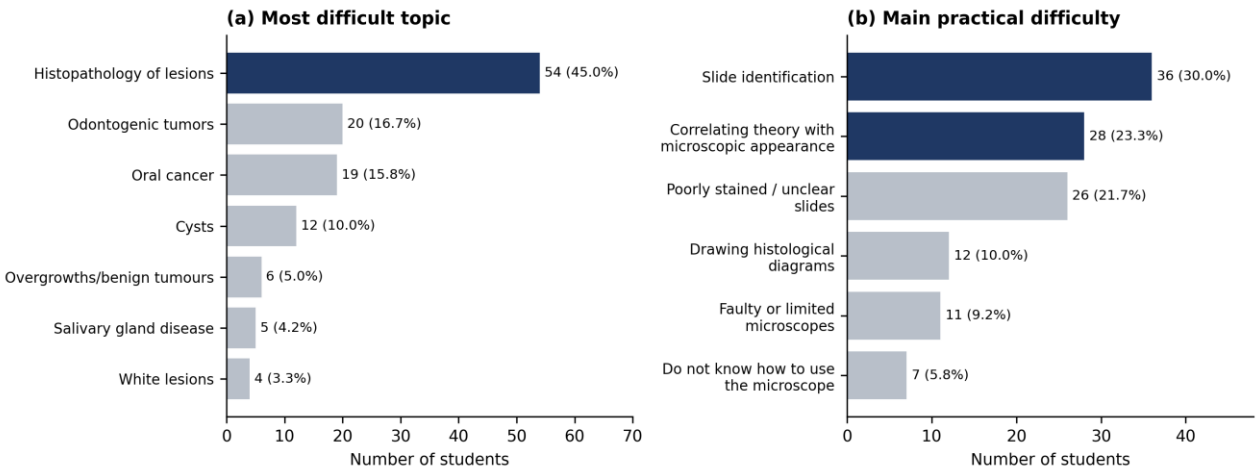

Figure 1. Perceived difficulties among third-year students (n = 120). (a) Most difficult Oral Pathology topic; (b) main practical difficulty encountered

Perceptions of the practical learning environment are presented in (Table 2). Twenty-four students (24/120, 20%) considered the light microscope inadequate for studying slides, and 67/120 (55.8%) considered it adequate only sometimes. Fifty-eight students (58/120, 48.3%) reported that the large number of students in lectures and laboratories negatively affected their learning, and 55/120 (45.8%) judged the current frequency of practical laboratories insufficient for learning microscopic identification.

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Table 2. Perceptions of the practical learning environment, third-year students (n = 120)

Item	Yes n (%)	Sometimes n (%)	No n (%)
Light microscope adequate for studying slides	29 (24.2)	67 (55.8)	24 (20.0)
Class size negatively affects learning	58 (48.3)	34 (28.3)	28 (23.3)
Practical laboratory frequency is sufficient	65 (54.2)	—	55 (45.8)

Preparation for practical sessions and slide identification ability

Preparation specific to the practical sessions was inconsistent, and self-assessed ability to identify slide features was low (Table 3). Twenty-eight students (23.3%) read the topic before attending the practical session, and 30 (25%) never did; 26 students (21.7%) reviewed the Oral Pathology Atlas consistently, and 64 (53.3%) never did. 64 students (53.3%) endorsed the pre-laboratory theoretical explanation of slides as helpful. Only 12 students (10%) reported being able to identify the features of a slide on first viewing, while 66 (55%) could do so sometimes, and 42 (35%) could not. Of the preparation behaviours examined, only pre-reading was significantly associated with self-reported slide identification ability ($\rho = 0.197$, $p = 0.031$). Neither lecture attendance ($\rho = 0.154$) nor practical laboratory attendance ($\rho = -0.017$) was associated with reported ability. A multivariable logistic regression identified no significant predictor.

Table 3. Practical preparation and self-assessed slide identification, third-year students (n = 120)

Item	Yes n (%)	Sometimes n (%)	No n (%)	ρ with slide identification
Reads the topic before the practical session	28 (23.3)	62 (51.7)	30 (25.0)	0.197*
Reviews the Oral Pathology Atlas	26 (21.7)	30 (25.0)	64 (53.3)	0.160
Pre-laboratory explanation aids identification	64 (53.3)	39 (32.5)	17 (14.2)	0.046
Can identify slide features on first viewing	12 (10.0)	66 (55.0)	42 (35.0)	—

*ρ, Spearman's rank-order correlation with self-reported slide identification ability. *p <0.05.*

Perceptions of teaching and preferred improvements

The highest-rated statement was that Oral Pathology is important for future clinical practice (median 4, IQR 4–5; mean 4.11, SD 1.01), with which 97/120 students (80.8%) agreed or strongly agreed. The lowest-rated statement was that current teaching methods are effective (median 3, IQR 2–3; mean 2.66, SD 1.16), endorsed by only 27/120 students (22.5%) while 50/120 (41.7%) disagreed or strongly disagreed. Substantial proportions also agreed that the number of topics is large (80/120, 66.7%) and that histopathological terminology is difficult to understand (77/120, 64.2%) (Table 4).

Table 4. Attitudes towards Oral Pathology, third-year students (n = 120)

Statement	Median	IQR	Mean	SD	Agree / strongly agree n (%)
Oral Pathology is important for future clinical practice	4	4–5	4.11	1.01	97 (80.8)
The number of Oral Pathology topics is large	4	3–5	3.87	1.34	80 (66.7)
Histopathological terminology is difficult to understand	4	3–4	3.72	1.06	77 (64.2)
Practical sessions help improve my understanding	4	3–4	3.48	1.04	72 (60.0)
Oral Pathology is a non-clinical theoretical subject lacking motivation	3	2–4	3.10	1.22	43 (35.8)
The current teaching methods are effective	3	2–3	2.66	1.16	27 (22.5)

Response scale: 1 = strongly disagree to 5 = strongly agree. IQR, interquartile range.

When asked which single measure would most improve Oral Pathology learning, students most often selected clinical case analysis sessions for small groups (59/120, 49.2%), followed by discussion of multiple cases immediately after theoretical lectures (31/120, 25.8%). Digitalized slides and virtual microscopy attracted the fewest endorsements, selected by 15/120 students (12.5%), the same number as individual quizzes followed by group discussion (Figure 2).

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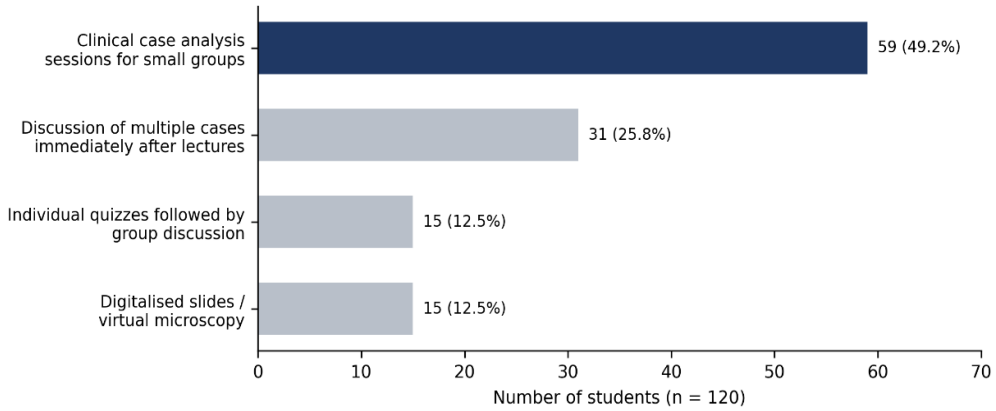

Figure 2. Preferred measure for improving Oral Pathology learning among third-year students (n = 120). Students selected a single option

Study strategies

Reported use of study strategies is presented in (Table 5). Solving multiple-choice questions was the most frequently used strategy (median 4, IQR 3–5; mean 4.10, SD 0.96), reported as often or always by 89/120 students (74.2%). Attendance at private tutoring centers ranked second (mean 3.64, SD 1.34; 68/120, 56.7%), followed by the use of artificial intelligence tools such as ChatGPT (mean 3.58, SD 1.26; 63/120, 52.5%), which exceeded the reported use of textbooks in addition to lectures (mean 2.88, SD 1.43). The two least-used strategies were asking instructors for clarification (mean 2.69, SD 1.05), reported as often or always by only 23/120 students (19.2%), and group study (median 2, IQR 1–3; mean 2.15, SD 1.16), reported by 16/120 (13.3%).

Table 5. Reported frequency of use of study strategies, third-year students (n = 120)

Study strategy	Median	IQR	Mean	SD	Often / always n (%)
Solving MCQs	4	3–5	4.10	0.96	89 (74.2)
Attending private tutoring centers	4	3–5	3.64	1.34	68 (56.7)
Using AI tools (e.g., ChatGPT)	4	3–5	3.58	1.26	63 (52.5)
Re-reading lecture notes and sheets	3	3–4	3.53	1.11	59 (49.2)
Memorisation/repetition techniques	3	3–5	3.53	1.17	59 (49.2)
Watching educational videos	3	2–4	3.08	1.18	43 (35.8)
Drawing diagrams/mind maps	3	2–4	3.04	1.25	39 (32.5)
Using textbooks in addition to lectures	3	2–4	2.88	1.43	43 (35.8)
Asking instructors for clarification	3	2–3	2.69	1.05	23 (19.2)
Group study	2	1–3	2.15	1.16	16 (13.3)

Discussion

It is essential to understand the demographics and behavioral trends of dental undergraduates in order to design successful and effective curricula that would improve student engagement in basic dental sciences. This study was conducted to resolve the problems faced by third-year dental students in Oral Pathology theory as well as practical classes, and to improve future teaching and training methods. In this cohort, 120 out of 403 eligible third-year students responded, representing a 29.8% response rate with a margin of error of ±7.5% at a 50% response distribution. This response rate is considered relatively low compared to similar educational surveys. Studies that distributed questionnaires directly in scheduled classes or laboratories consistently reported significantly higher participation, achieving a 90.4% response rate [9], and other studies reported a 100% response rate [2,6,10]. These high response rates may partly reflect the implementation of census-based or mandatory enrollment approaches.

An interesting behavioral trend was noticed in the results, as 75% of students attended practical laboratories regularly, whereas only 25% regularly attended lectures. Another study conducted in 2026 also documented that 70.1% of dental students did not consider attending oral pathology lectures important [11]. This substantial 3:1 ratio in favor of practical lab attendance underscores serious student perceptions regarding the value of different teaching styles. Students prefer practical lab sessions because they are considered active, hands-on, and directly relevant to their practical examinations. For instance, the use of light microscopes and viewing glass slides in traditional dental labs requires students to attend lab sessions, as these slides cannot be easily accessed outside of the lab [12]. On the other hand, students often skip lectures because they can be replaced with textbooks, handouts, private tutoring, or online resources [10]. This attendance gap

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highlights the importance of curricular review. This study shows that histopathology of lesions was found to be the single most difficult area of Oral Pathology (45%), outranking other disease categories such as odontogenic tumors (16.7%), oral cancer (15.8%), and cysts (10%), while bone pathology was not selected by any student (0%). This finding is consistent with the reported literature, which described oral pathology and histology as abstract and dense subjects [13]. The complexity of basic dental sciences is well established in the literature; for example, Gupta et al. (2019) reported that 59.8% of dental students had problems in understanding and remembering oral histology, which forms the foundational basics for oral pathology [14]. This significant difficulty in histopathology of lesions reflects a diagnostic skill rather than a disease category and draws attention to a common educational barrier.

Oral pathology is a preclinical phase lacking patient interaction, which diminishes students' interest and restricts their capabilities for diagnostic reasoning. Therefore, students face challenges with the progression from repetitive learning of clinical facts to the diagnostic analysis of microscopic lesions [15]. In this investigation, the difficulty rate for slide identification reached 30%, which aligns with Saawarn et al. (2016), who reported that 35.4% of final-year dental students faced difficulties with slide identification and was considered the main practical bottleneck [2], and another institution reported a higher difficulty rate of 69% [6]. The difficulty in the correlation between theory and microscopic appearance (23.3%) is a commonly encountered challenge. Shrestha et al. (2021) suggest that viewing fixed fields of glass slides under the microscope in traditional lab sessions can create a cognitive disconnection that makes students unable to link the histopathological features with the clinical presentation [16]. The obstacle of poorly stained or non-typical slides (21.7%) is considered a physical barrier of glass slides, which fade over time and degrade naturally. This concern is highly reported in other studies; for instance, Jain et al. (2024) reported that 60.9% of dental students described the glass slides in their lab as faded or poorly stained, restricting their diagnostic capabilities.

In contrast, this survey showed that microscope operation challenges are relatively rare (faulty microscopes 9.2%, inability to operate 5.8%). This comfort is reflected in another survey, which revealed that while students had problems remembering slide features and associating them with diagrams, they were very comfortable operating the microscope [9]. In this survey, 20% of the students considered light microscopes inadequate for studying, while 55.8% found them adequate only sometimes. Traditional light microscopy has been widely questioned in the literature for the lack of accessibility outside lab hours, the high cost of maintenance, and the discomfort while using such as eye strain. It was shown that a blended learning curriculum (Light Microscope + Virtual Microscope) significantly reduced laboratory exam failure rates to 3.23% compared to 13.48% in traditional microscopy-only groups [17]. Fonseca et al. (2015) pointed out that shifting to virtual microscopy (VM) eliminates these challenges, as they showed that over 90% of students prefer digital slides due to the easy accessibility to high-resolution slides anywhere and anytime [18]. A key finding in the results is that pre-reading was the only preparation behavior significantly associated with self-reported slide identification ability ($\rho = 0.197$, $p = 0.031$). Notably, neither lecture attendance ($\rho = 0.154$) nor practical laboratory attendance ($\rho = -0.017$) showed any significant association with reported diagnostic ability, and multivariable logistic regression identified no significant predictor. This statistical outcome points to important implications for educational practice and is well supported by modern educational research.

Conventional, passive attendance of lectures and labs does not necessarily lead to diagnostic competence. Studies have shown that traditional didactic teaching makes students sleepy and decreases their attention span [13]. In this sample, 75% of students attended practical laboratories regularly, yet attendance showed no association with self-reported slide identification ability ($\rho = -0.017$). Moreover, passive observation under the microscope without any mental stimulation may constrict students' cognitive processing [19]. The significant association of pre-reading with slide identification capability is consistent with the fundamental principles of Self-Directed Learning (SDL) and the "Flipped Classroom" model [19]. Previous studies compared traditional learning with a web-based blended model where students were required to review digital pathology images before class; they found that the blended group scored significantly higher on final practical examinations (mean 4.3 vs. 3.6, $p = 0.015$). By reading and familiarizing themselves with diagnostic criteria in advance, students can use practical sessions for active clinical-pathological correlation rather than basic landmark searching [16, 20]. The low first-viewing diagnostic accuracy (10%) and the lack of correlation between passive attendance and performance highlight the urgent need to transition from teacher-centered to student-centered methodologies.

The current results show a substantial gap between students' recognition of subject value and their satisfaction with current instruction: 80.8% of students agree that Oral Pathology is crucial for future clinical practice, yet only 22.5% consider current teaching methods effective. This clinical-academic inconsistency is well documented. Imtiaz et al. (2026) found that while 60.9% of dental students agreed that oral pathology is the foundation of all clinical subjects, the non-clinical nature and lecture-heavy teaching methods discouraged them from exploring the field or choosing it as a career specialty [11]. Similarly, Satish et al. (2022) reported that although 85.1% of dental undergraduates acknowledged that oral pathology serves as the base of all clinical subjects, students frequently criticized traditional teaching methods that limited their diagnostic skills [21]. When asked how to improve learning, students favored clinical case analysis sessions for small groups (49.2%) and discussion of multiple cases immediately after lectures (25.8%). This preference is strongly supported by Shrestha et al. (2021), who demonstrated that transitioning from traditional teaching methods to Case-Based Learning

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(CBL) helped students bridge the gap between the theoretical and histopathological parts under the microscope; it was also found that introducing clinical cases before the histopathology evaluation showed significant improvement in post-test scores and student motivation [16].

Small group clinical discussions also promote interactive, collaborative, and self-directed problem-solving skills [22]. Active collaborative methods, such as the modified "snowballing" technique evaluated by Boaro et al. (2026), have shown improvement in 61.6% of students' abilities by encouraging peer-to-peer knowledge sharing and collective diagnostic decision-making [23]. Implementing structured active learning approaches, such as Problem-Based Learning combined with de Bono's "Six Thinking Hats" (PBL-STH), showed an increase in diagnostic accuracy from 40% in traditional slide-based classes to 86.6% in active classrooms [24]. In contrast, digitalized slides and virtual microscopy (VM) attracted only 12.5% of student approval. This finding stands in marked contrast to the more comprehensive medical and dental literature, which consistently demonstrates student preference for VM over traditional light microscopy (LM) [18,25,26]. This study shows a prominent change in how dental students study: solving MCQs was found to be the most used strategy (74.2%), meanwhile artificial intelligence tools like ChatGPT were used by 52.5% of students, outranking textbooks (35.8%). This high dependence on MCQs agrees with other studies which reported that students recommend MCQs as an effective tool for testing and reinforcing cognitive retention [27], as well as interactive e-learning quizzes (such as Kahoot) which stimulate diagnostic confidence and prepare 90% of students for exams [28]. However, the idea of ChatGPT being more helpful than textbooks represents a notable departure from the traditional baselines of dental education, although textbooks have been considered the absolute "gold standard" for pathology throughout history [10, 29]. This may reflect a shift away from static reference reading towards more interactive digital resources.

It is crucial to point out that the least used study strategies were group study (13.3%) and asking instructors for clarification (19.2%). It is considered highly problematic given the reported advantages of structured peer discussion such as the "snowballing" method, where students are required to collaborate and discuss clinical cases in small groups, which proved deep content comprehension [23]. The low use of group study in this report suggests that students are unable to form collaborative habits on their own effectively. This emphasizes the need to move away from teacher-centered didactic lectures to collaborative learning spaces.

This study has several limitations. The 29.8% response rate and voluntary online administration introduce the possibility of self-selection bias, whereby students experiencing greater difficulty may have been more likely to respond. Slide identification ability was self-reported rather than objectively assessed, and may diverge from performance on a formal practical assessment. The study was conducted at a single institution, so the findings may not be generalizable to other universities. Finally, the cross-sectional design does not permit conclusions about the direction of the associations observed — whether pre-reading improves slide identification, or whether students who identify features more readily are more inclined to prepare, cannot be determined from these data. In conclusion, third -year dental students at the University of Benghazi reported marked challenges in learning Oral Pathology, specifically in microscopic slide identification and histopathological interpretation. Although students are aware of the subject's clinical importance, they expressed dissatisfaction with the current teaching methods. The inclination towards small-group case analysis and case-based discussion supports the transition towards more active, clinically oriented, student-centered learning.

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