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### Interactive teaching in oral medicine and periodontology: Lessons learned from students' experience

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#### Abstract

**Objectives:** Interactive educational strategies are aimed to promote critical thinking of students to become lifelong learners. This study was conducted to assess students' perceptions about implementing these strategies in the course content and in teaching and assessment methods.

**Materials and Methods:** Case-based learning, role playing, and group assignments together with formative self-assessment rubrics and simulated cases were implemented in Oral Medicine and Periodontology courses in a public dental school. Problem solving questions and case based multiple choice questions were also used for assessment. A cross-sectional questionnaire-based analysis was used to assess students' perceptions these modifications.

**Results:** A total of 274 students completed the questionnaire giving a response rate of (36.53%). Highest percentage of students preferred interactive sessions (66.1%), followed by tutorial session and group activities (60.9%), pre-reading activities (54%) and online classrooms (46.4%). Majority of the students (63.9%) agreed that problem-based learning improved their critical thinking, while (30.7%) agreed that teaching methods were interesting and (25.9%) were self-motivated to study.

**Conclusions:** The results provided positive feedback of students about the active learning methods. All instructors in dental education should be motivated and trained to implement interactive strategies in their clinical courses and to encourage students to participate in learning activities.

**Keywords:** Ain Shams University, cross-sectional, dental education, interactive learning, questionnaire.

**Running title:** Students' perception to interactive course

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## Introduction:

Developing future dental practitioners is the most relevant mission of dental education (1). However, there is a continuous challenge to improve the learning environment, promote the satisfaction of students with the curriculum, and meet their educational and professional needs (2).

In a dental education context, the course of Oral Diagnosis, Oral Medicine and Periodontology focuses on developing knowledge and skills for diagnosis and management of medical conditions that affect the oral and maxillofacial region (3), as well as prevention, diagnosis and treatment of diseases affecting the periodontium (4). Due to the scope and clinical relevance of such discipline, the World Health Organization had recommended the problem-based, and community-oriented teaching methods for dental education (5).

Many teaching approaches have emerged through the years. However, the lectures were considered the predominant mode of instruction in medical education (6,7). The greatest advantage of lectures is the ability to share basic curriculum information with a large number of students which accommodate the economic constraints on institutions, staff facilities, and students (8,9). However, lack of active interaction by students is the major disadvantage of this approach (10).

Innovative approaches to lecturing as well as alternatives are needed to adapt to a changing educational environment (11). Educators should also consider accommodating different teaching modalities within a curriculum to achieve effective teaching and understanding (12), and to accommodate to the unique learning style for every student (13). Effective assessment strategy should also be introduced to promote reflection, critical thinking and continued learning as self-/peer-assessment and portfolios (14).

Educators, addressed the role of active and self-learning in which the student acquire and integrate new information without the constant supervision of an instructor in the success of all health care professions (15,16).

Active learning techniques that have been utilized in medical education included the interactive lectures, whole class and group discussions, peer teaching, collaborative group and activity-based learning, debates, role-playing or simulations, interactive problem-based learning, case studies, computer-based learning, reading assignments as well as formative self-assessment (17,18).

Different studies have researched students' views on the learning environment (19), curriculum changes (20), teaching approaches effectiveness in classrooms and clinics (21). However, the value and student perceptions of active learning remains unclear (22–24).

Interactive educational strategies were introduced into lectures, clinical sessions and assessment methods in Oral Medicine and Periodontology courses in Faculty of Dentistry, Ain Shams University in the academic year (2019-2020) and a web-based questionnaire was developed to assess students' perceptions about implementing these strategies in the course content as well as in teaching and assessment methods.

## Materials and methods:

Prior 2019, the oral medicine and periodontology courses were presented in two semesters of the fourth and fifth year in bachelor of dental science under graduate program. Over an average period of twenty-five weeks per year, students attended 2 hours lectures and two hours clinical sessions weekly.

### *Implementing interactive educational strategies*

The Interactive educational strategies were introduced in the courses during the academic year 2019-2020. Therefore, the courses' content and structure were reshaped into modules of grouped related topics. Pre-reading activities were used to refresh and reinforce students with previously taught basic knowledge. Interactive teaching activities were also implemented in the most of lectures including "Think, pair and share activities", "Brain storming", "Pop quizzes" or "Movies/picture comments".

Case based learning, role playing, posters and assignments presentations for small groups were introduced in biweekly tutorial

sessions as well as formative self-assessment rubrics, simulated cases and practical clinical guides which were used in clinical settings. For assessment; both formative and summative were used, the continuous assessment using problem solving questions, case based multiple choice questions or short answered questions were also used through the year and at the end of each module in tutorial sessions or online class-rooms as well as students' competitions and clinical logbook.

### ***Study sample and design***

The study was designed as a cross-sectional questionnaire-based analysis of the students' perceptions about course content, teaching and assessment methods targeting fourth and fifth years (2019-2020) students enrolled in the under graduate oral medicine and periodontology courses, at the Faculty of Dentistry Ain Shams University, Egypt.

### ***Questionnaire development and design***

A self-developed questionnaire was prepared to determine students' perceptions for modifications made in the course. It was adapted from a questionnaire published by (25).

The questionnaire consisted of forty questions distributed into five sections:

- Section A included demographic data recording (gender and student level).
- Section B questions were about the course content and lectures (preferred lecture duration, method of lecturing, timing of lecture and schedule announcement).
- Section C included questions on preferences of teaching methods and interactive learning.
- Section D included the preference and grading of studying sources (text book, scientific articles, university books, lecture notes and online source, and clinical logbooks).
- Section E included the preferred assessment methods (problem solving, group assignments, online quizzes, short answer and multiple-choice questions).

Students were also asked to specify main points of weakness and strengths and to give suggestions for improvement for the course.

Most of the questions were answered using a 3-point Likert scale (1 = agree, 2 = neutral, and 3 = disagree), 6 multiple-choice questions, 10 linear scale questions scored from 1 to 5 (1 = very bad, 5 = excellent) and 3 open-ended questions for free comments on the course.

The questionnaire was written in English, with brief explanation about the purpose of the study. The confidentiality and sole use of the information for the mentioned purpose were ensured and that completing the questionnaire is considered informed consent of the participants. Approval to conduct this study was given by the Faculty of Dentistry, Ain Shams University, research ethics committee (FDASU-REC R 062003).

A pilot study was performed on 10 students from the cohort of students before the commencement of the study to determine the acceptability and clarity of the questionnaire and to confirm its validity, minimal adjustments were made in the questionnaire based on the pilot study.

The questionnaire was then transformed into a google online form (***Supplementary materials***) and the link was sent to the students at the end of the second semester before the final examination of the academic year 2019-2020. However, the students were not informed that their perceptions about the educational methods will be assessed at the end of the course to limit the bias, they were encouraged to complete the questionnaire anonymously, emphasizing that it was not mandatory and were evaluated exclusively by the authors.

### ***Data analysis***

Data were analyzed using Statistical Package for Social Sciences (SPSS) (version 16, SPSS Inc., Chicago, IL, USA). Descriptive and crosstab analysis were used to analyze the demographic data and data related to study variables. Responses were quantified as a percentage of the total number of responses received for each question.

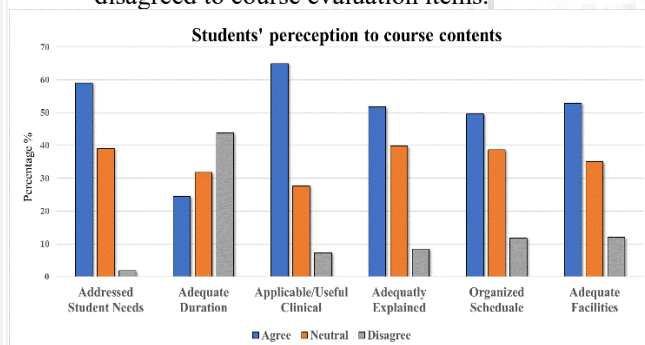
## Results:

A total of 274 students (36.53%) completed the questionnaire out of total 750 students (oral medicine and periodontology courses attendees in fourth and fifth academic levels of class 2020). Response rate was higher from senior students (52.9% in 5<sup>th</sup> year and 47.1% in 4<sup>th</sup> year) and the responders were predominantly females 180 (65.7%).

In response to the questions about courses and lectures content; (65%) of students agreed that their course was applicable and useful for clinical practice as well as for enriching their knowledge regarding dental management of medically compromised patients. Despite, (43.8%) of the students thought that the course content in relation to the duration was inadequate.

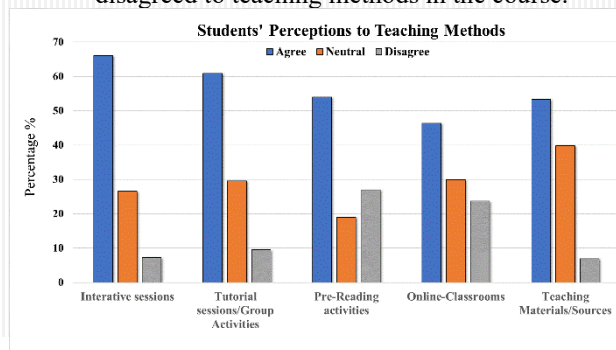
The percentages of students who agreed, disagreed or was neutral regarding each of the evaluated items in course content. The majority of the students preferred to announce the course schedule in advance (84.7%) and duration of the lecture between 45-60 minutes (85.8%). Regarding the preferred timing of the lecture early morning was preferred by (52.2%) students, while (42.3%) preferred the afternoon timing [Figure 1].

**Figure 1.** Percentages of students agreed, neutral or disagreed to course evaluation items.



The majority of the students (54.4%) agreed that teaching staff members encouraged them for effective participation while only (8.4%) disagreed. Regarding the teaching methods used in the course the highest percentages of students preferred interactive sessions (66.1%), followed by tutorial session and group activities (60.9%), pre-reading activities (54%) and online classrooms (46.4%) as presented in [Figure 2].

**Figure 2.** Percentages of students agreed, neutral or disagreed to teaching methods in the course.

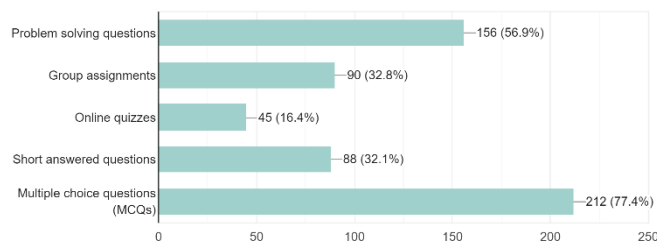


53.3% of students reported that the teaching materials were sufficient and (30.7%) of students agreed that teaching methods were interesting and (25.9%) were self-motivated to study. However, about half of the responders were neutral about whether teaching methods were interesting and if they were motivated to study.

Almost all the students (97.8%) preferred the university book or lecture handouts as a source for studying compared to text books, scientific articles or other online sources and (62%) found the clinical log book was useful compared to (10.6%) who disagreed.

In the opinion of the students about assessment methods in the course; the most interesting types of questions were the MCQs (77.4%), followed by the problem-solving questions (56.9%) as demonstrated in [Figure 3].

**Figure 3.** Percentages of students agreed, neutral or disagreed to assessment methods in the course.



(48.9%) of the students agreed that course exams assessed the different learning outcomes of the course which was slightly higher than those who were neutral (41.2%). The grade distribution for the different assessment methods were adequate for (43.8%) of students compared to disagreeing students (13.5%). Students were asked to score each of studying sources and assessment questions on a scale from 1 to 5, the frequency distributions of the



scores for each evaluated item is presented in [Table 1].

**Table 1:** Frequency distribution of students' level of agreement for the studying sources and assessment methods of the course

Evaluated Item/ Scale <sup>†</sup>	Frequency Distributions (%)				
	1	2	3	4	5
1. School book/ Lecture handout	2.7	3.5	13.5	34.4	45.9
2. Textbook	30.9	24.7	27	10.8	3.9
3. Scientific Articles	25.7	31.5	28	10.9	3.9
4. Open online resources	16.2	17	34.4	25.1	7.3
5. Problem solving questions	5.8	11.2	32.8	30.5	19.7
6. Multiple choice questions	2.3	3.5	15.4	38.6	40.2
7. Group Assignments	13.9	18.5	32	23.2	12.4
8. Short, answered questions	9.7	14.7	40.5	23.2	12
9. Online quizzes	30.9	24.3	25.9	11.6	7.3

<sup>†</sup>Likert five points scale: (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree.

Students shared their impressions of the overall quality of the educational strategy in the course in terms of points of strength, weakness and suggestion for improvement in a non-obligatory open-ended written format and the average response rate was 57.4%. [Figure 4] presents examples of students' written comments.

**Figure 4.** Examples of students' written comments and points of strength, weakness and suggestion for improvement of the course.

"Organization and focusing on problem solving techniques in teaching. I can say with no doubt this is the best teaching technique for nowadays to improve students and prepare them to be good dentists. Group work always better and more organized I really hope this technique applied to all other subjects"

"The main weakest point is there is no sufficient exams for evaluating us periodically and help us to fix the information in our brains, plus the amount of the course is very large in a relation to the time of the year and practical sections isn't good enough for teaching us and for practicing"

The students' comments were reviewed and categorized into points of strengths, weakness and suggestions for improvements; Strengths included: 1) clinically relevant learning experience, and 2) good interaction and communication with professional staff. The main weak points were: 1) insufficient instructors in the clinical sessions as well as inconsistency among instructors in teaching methods and 2) inadequate duration of the course in relation to the content.

The students' suggestion for improvement were: 1) develop strategies to provide students with more clinical sessions to acquire more clinical problem solving skills and 2) regular updating of the course content to keep

the students up to date regarding recent techniques and materials in clinical practice, 3) the need to update the grade distribution in order to assign more marks for continuous assessment rather than final assessment, 4) increasing the number of staff members capable of implementing interactive learning strategies and 5) raising the awareness of the students regarding how to be an effective team member.

Generally, students agreed that problem-based learning improved their critical thinking (63.9%) compared to (4.4%) who disagreed and (31.8%) who were neutral.

## Discussion:

Students' perceptions on their learning atmosphere are crucial for course development. Therefore, the current research question was driven to test the effectiveness of interactive educational approach in view of the actual experiences of students enrolled in a rich and clinically relevant course such as Oral Medicine and Periodontology.

The questionnaire was designed so that the easily scored 3-point Likert scale was used to investigate the direction of students' opinions preventing responders from making random or contradictory choices. While, the 5 linear scale helped to grade and compare the students' perspectives towards specific methods. Moreover, general opinions about the course were collected using non obligatory open-ended questions.

The response rate in this web-based survey was 36.53% and the responder sample was (274) out of total target population (750) which was higher than minimum calculated required representative sample for this type of studies (260) (26) and was within the range of response rates reported as reviewed in similar studies (20-47%) (27). Furthermore, students were excited to express their opinions freely and in their own words as manifested by the high response rate for open ended questions in this survey (57.4%).

The results indicated a general satisfaction with all active teaching methods introduced in the course as well as assessment methods especially those which improve critical thinking as interactive sessions, group activities,

MCQs and problem-solving questions. These findings are in agreement with other researchers investigated dental curriculums modifications using active learning strategies, which also indicated a positive attitude towards this approach (16,21,28).

These perceptions were supported by the studies which showed that medical students generally adopt a multi style approach where they use all sensory modes to learn (29). Furthermore, students take a more active role in their education and the knowledge is learned in a clinical or patient-related context, which gives an understanding at an applied level that also explain why higher percent of students agreed that the course was applicable and useful for clinical practice.

However, several studies (15,18,23,30) have attempted to explore and highlight the limitations of this student-centered approach. The most frequently reported obstacle interfering with implementing this approach include time constraints that were also reflected by the students in the present study as one of the main weak points and probably explain why students thought the course duration was inadequate. The least preferences towards online classrooms and quizzes showed by the students could be attributed to other obstacle that was reported in literature which is the lack of technical support.

The majority of students showed preference for early lectures not exceeding 60 minutes, this finding was in agreement with several other studies (2,25,31) and supported the importance of interactive teaching activities which could be suitable to be implemented in this lecture timing and duration.

Students preferred the lecture handouts as source of studying over both text book and online sources and agreed that clinical logbook was useful. This supports the findings of previous studies, which reported that students considered these handouts to be adequately guiding the learning process in different dental courses (21,25,32). This may be attributed to the fact that students may concentrate and interact more in a lecture or clinical setting when they are not busy trying to take notes. Furthermore, handouts are useful for mapping out the

curriculum and specific learning objectives for the course.

Conversely, some students may rely entirely on the handouts and become passive listeners as suggested by Brazeau (33), this may explain why about 50% of the responders thought that the teaching materials were sufficient, but they were neutral when they were asked if the teaching methods were interesting and motivating.

As relatively high percent of students were neutral regarding their perceptions to the instructor effectiveness, the course is adequately explained and organized, and exams assessed the different learning outcomes; this finding is probably supported by the theory suggested by (23) that students might need assistance in appreciating the value of student-centered curriculum or that they might not be developed mentally to be ready for it. Furthermore, the students' experiences might not be consistent for different active learning exercises and assessment methods as received by different staff members; a reflection that was also reported in the current study.

### **Conclusion:**

The results of the conducted survey indicated that the active learning methods are prominently preferred by students. Further considerations should be given to greater use of problem based-learning opportunities and implementing flipped class teaching methods with a reduction in didactic lectures time and content.

It is highly recommended that future curriculum modifications should be supported by regular faculty development and capacity building programs on the recent modalities of curriculum design, teaching and learning methods and how to implement them effectively in order to minimize the discrepancies between instructors. Furthermore, it is wise to develop new techniques for assessing competency, as well as creating interdisciplinary curricula increasing collaborations with other health professions and blending the basic and clinical sciences with provision of some elements in an online format.

The long-term effectiveness of introducing this approach into our dental

programs can be evaluated using longitudinal studies of postgraduate student cohort to determine the impact of their transferable skills on their professional performance and ability to be lifelong learners.

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### Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request

### Disclosure statement

All the authors disclosed no conflict of interest. The authors alone are responsible for the content and writing of the article.

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**Supplementary material:** Google online form for students' perceptions questionnaire about oral medicine and periodontology courses ASU (2019-2020). <https://forms.gle/s9YFv6PBmzzM6UQQ8>



