

Perception of Team-Based Learning Among Tunisian Dental Students in a Removable Partial Denture Module

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Abstract

Introduction: Team-Based Learning (TBL) is an active instructional strategy increasingly adopted in medical education to enhance student engagement and learning. At the Faculty of Dental Medicine of Monastir, Tunisia, TBL was recently introduced in the removable partial denture module for third-year students. This study aimed to evaluate dental students' perceptions of TBL upon their initial exposure to the method.

Methodology: A total of 123 third-year dental students were invited to participate during the 2023–2024 academic year. Students completed a five-point Likert scale questionnaire assessing three dimensions: perception of TBL, perception of teamwork, and satisfaction with TBL session conditions.

Results: Dental students exhibited a highly favorable perception of the use of TBL in dental education. The highest satisfaction levels were recorded in TBL perception items, with 92.8% indicating they learned new information during TBL. Regarding TBL session conditions, 62.9% agreed that a three-hour session was adequate to understand the course objectives. The TBL format was generally preferred over the traditional format. 24.2% of participants reported discomfort in an amphitheater, while only 40.4% of students expressed strong agreement or agreement regarding their preparedness for the individual readiness assurance test (IRAT).

Conclusion: Students encountering TBL for the first time reported favorable perceptions of this educational strategy, suggesting its implementation in dental university to improve learning quality.

Keywords: team-based learning, dental student, student perception

1- Introduction

Since its introduction by Larry Michaelsen at a U.S. business school in 1970 as an alternative to conventional teaching methods, team-based learning (TBL) has grown in popularity all around the world [1,2,3]. A number of medical educators have also successfully implemented this approach [2]. Nevertheless, TBL in medical education is a relatively novel concept and has not been implemented extensively in Tunisia.

Although conventional lecture-based education can effectively facilitate information retention, students in health professions must also develop critical thinking skills and the ability to apply their knowledge in new contexts [4]. The majority of class time is allocated to collaborative assignments that emphasize applying course material to address potential future challenges faced by students [5,6].

The implementation of TBL as a pedagogical approach aims to improve medical students' adaptability in problem-solving, knowledge retention, skill application, and teamwork [2,7,4]. TBL is a method of active learning that integrates the efficacy of small group learning techniques within bigger groups [2,8,9].

TBL is a good method for building deep-learning abilities which are crucial for medical professionals since they have better comprehension of the course ideas. Furthermore, numerous data indicate that implementing the TBL method increases student motivation and boosts the enjoyment of learning. Employing TBL fosters student engagement in their education [7, 10].

This study aimed to evaluate third-year dental students' perceptions of TBL at the faculty of dental medicine of Monastir, where they encountered this methodology for the first time.

2- Methodology

This cross-sectional study was conducted at the Faculty of Dental Medicine of Monastir during the 2023–2024 academic year. A total of 123 third-year dental students were invited to participate. They experienced TBL for the first time in a session dedicated to the removable partial denture. The study was approved by the Ethic committee of the Faculty of Dental Medicine.

- TBL Steps

We begin by forming permanent teams of 5-6 students who can collaborate for a semester. In step 1, before the start of each unit, students are provided with assigned materials. In step 2, students complete an individual readiness assurance test (iRAT) featuring 10 multiple-choice questions. This allows the instructor to evaluate the students' grasp of the essential concepts from the readings. In step 3, once they submit their answers, students will retake the same quiz as a team readiness assurance test (tRAT). They will engage in discussions about each question and work together to reach a consensus on their team answers. They get prompt feedback on whether their team responded accurately. In the following step, the instructor provides students with clarification on the concepts they have been finding challenging during the tRAT. The tutor presents a mini lecture to the class, after which students are well-equipped to tackle more complex problems for the next phase: the Team Application. At this stage, students apply the knowledge they have gained up to this point. Afterward, they have the chance to submit a written appeal if they believe that a question was poorly worded and present valid arguments for their answer [11,3].

- Data collection

A formal questionnaire was administered to students at the end of the unit to solicit their feedback regarding their experiences with TBL. The data collection sheet includes 15 questions and was divided into three major sections: perception of TBL (8 items), perception of teamwork (5 items), student satisfaction about TBL session condition (2 items).

The questions were evaluated using a five-point Likert scale designed to measure levels of satisfaction. This rating scale ranged from 1 to 5, corresponding to an increasing degree of agreement with each statement: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

- Statistical analysis

Satisfaction options were grouped as a categorical variable, then frequency percentages referring to satisfaction levels, were deduced among the survey participants, and respective bar charts were built to visualize results. The assessment of the internal consistency of the questionnaire was conducted utilizing the Cronbach α . All statistics were realized using the SPSS statistical package (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.).

3- Results

3.1. Internal consistency (Cronbach α) of the questionnaire : The Cronbach's α values for each domain were 0.86 for TBL perception, 0.85 for teamwork perception, and 0.30 for TBL session condition. The mean Cronbach's alpha coefficient was 0.89, indicating good internal consistency.

3.2. TBL perception

The responses to the majority of questions indicated that students positively received various aspects of TBL. Students' responses regarding their perceptions of TBL are presented in Table I. Most of the students either agreed or strongly agreed that the Individual Readiness Assurance Test (IRAT) constituted an effective learning activity (74.2%), that Team-Based Learning (TBL)

facilitated their understanding of the course material (85.4%), and increase their sense of synthesis (75.8%).

The highest level of satisfaction was observed in item 'I learned new informations during the TBL' (92.8%). The majority of the students (77.4%) felt that they were focused during TBL session.

Although the overall perception of TBL was favorable, some limitations were noted. Only 40.4% of students felt adequately prepared for the IRAT, and 53.3% reported having completed all the required documents.

Regarding format preference, 59.7% of students favored the TBL format over traditional lectures, while 21.8% remained neutral and 18.6% preferred the traditional format.

3.3. Teamwork perception

Similar to the TBL domain, the results indicated favorable perceptions about all aspects of teamwork (Table II). Students exhibited a high level (82.7%) of comfort while collaborating in teams and expressed satisfaction with the engagement of their team members.

Strong agreement was noted with all items as they enjoyed working with their peers' (80.7%), they felt that their team showed good cohesiveness (86.3%) and there was mutual respect for other teammates' perspectives during TBL (86.3%).

Furthermore, 75.8% of students agreed or strongly agreed that group problem-solving was an effective way to reinforce their learning. Notably, 84.7% indicated that GRAT discussions allowed them to identify and correct their mistakes, thereby enhancing their understanding.

3.4. TBL session condition

46.8 % of students agreed and strongly agreed that being in an amphitheater facilitated the interaction among the teammates, 29 % were neutral and 24.2% were not comfortable in an amphitheater (Figure 1).

A majority of students (62.9%) expressed agreement or strong agreement that a 3-hour session was sufficient to understand the objectives of the course (Figure 2).

4- Discussion

The primary objective of our study was to investigate students' impressions of TBL upon their initial exposure to this methodology at the university level. This study examines the perspectives of third-year dental students concerning the implementation of TBL as an instructional technique for teaching removable partial dentures at the dentistry University of Monastir, Tunisia.

The significant agreement among students regarding the proposed items in the questionnaire reflects a thoroughly positive perception of the use of TBL in dental education.

Perception of TBL

The findings regarding TBL perception revealed that the students were thoroughly satisfied with their learning experience through TBL. The statement "I learned new information during the TBL" received the highest level of agreement at 92.8%. The items 'the TBL helped me understand the course material' and 'the TBL helped me increase my sense of synthesis' had also received respectively 85.4% and 75.8% of satisfaction. TBL facilitates several outcomes that are seldom realized in a traditional lecture [5]. This study indicates that students recognized the positive impact of TBL on their learning and comprehension. Students perceive that TBL facilitates their attainment of a higher level of learning and positively influences their learning attitudes [10,12,13].

Through TBL, students advance significantly beyond mere factual knowledge, attaining a level of understanding that is only possible by collaboratively addressing a series of complex and

challenging problems that cannot be effectively solved through individual effort [5]. A majority of students identified group problem solving as an effective method for applying their learned concepts, with a response rate of 75.8%. Research by Kim et al. [4] demonstrated that TBL effectively improves problem-solving skills, knowledge, and clinical performance.

Students reported that the IRAT and TRAT were beneficial and positively impacted their learning experience. The tests encouraged students to enhance their comprehension. A significant majority of students either agreed or strongly agreed that the IRAT constituted an effective learning activity (74.2%), and that the GRAT group discussions facilitated the correction of errors and the improvement of their understanding (84.7%).

Students engage in learning by comparing their responses with those of their peers and critically evaluating each other's answers to arrive at a final solution. The TBL strategy facilitates efficient teamwork and critical evaluation of tasks [15]. Conversely, these tests promptly inform the facilitator of the student's comprehension and requirements concerning the topic [11]. IRAT fosters personal accountability among students, while TRAT promotes teamwork [16]. Koles et al. [17] have indicated that information exchange among students during TRAT facilitates the acquisition of a foundational level of knowledge, as students engage in mutual teaching while selecting a consensus answer.

Perception of teamwork

There are many aspects of teamwork that may be noticed when adopting TBL. Some of these traits include mutual respect for the viewpoints of other teammates and cooperation with other members of the team [10]. The fact that students expressed a high level of pleasure with the teamwork items in this survey is indicative of their optimistic perspective about the significance of teamwork.

According to the findings of the present research, students reported that they liked working with their peers and that they believed their team had a lot of cohesion. According to Huitt et al.'s findings [18], students valued the opportunity to study in groups and were acquiring the knowledge and abilities necessary to work well in groups on tasks.

Additionally, TBL is beneficial to students in that it helps them enhance their soft skills and boosts their confidence in themselves. When they are working together, the students are more serious and productive in their work. They enhanced their ability to assume leadership roles, as well as their communication skills, self-confidence, and leadership abilities [5]. Other writers have also reported results that are comparable. Alizadeh et al. [19] observed that TBL leads to improvements in shared leadership, while Oldland et al. [20] discovered that students thought that involvement in TBL allowed them to create effective learning, higher confidence, better communication, and collaboration.

Students are motivated to put in more effort to learn when they receive feedback in real time [5].

One of the most significant benefits of TBL was the involvement of experts, who served as facilitators and offered them helpful feedback. They contributed to the enhancement of students' learning experiences. Feedback is regarded as the essential instrument for learning and success. Enhanced knowledge, skills, and behaviors are documented for feedback purposes. In TBL, feedback is essential, and immediate feedback clarifies students' ambiguities. Feedback is delivered through IRAT, TRAT, and discussions [21].

The questionnaire responses indicated a preference for TBL and teamwork; however, several challenges associated with TBL were observed. Resistance to teamwork may stem from instructors' insufficient experience with TBL. Davidson [22] identified a heightened preference for active learning among a sequential cohort of medical students, attributed to the growing familiarity of educators with active learning methodologies. Resistance to teamwork can be addressed through

structured team-building exercises, the design of discussion-provoking activities, and the application of expert facilitation skills. Teamwork may be enhanced by extending the duration of team collaboration beyond 12 weeks [1].

Approximately 53.3% of participants indicated agreement or strong agreement regarding the completion of 100% of the required documents. In contrast, only 40.4% of students expressed strong agreement or agreement about feeling prepared for the IRAT, which is viewed as a limitation. The primary reason is the cultural and educational dilemma characterized by a reliance on spoon-fed instruction and a preference for teacher-centered learning. Students demonstrated diminished interest in pre-reading assigned material, likely due to years of exposure to traditional lectures, which may have conditioned them to be less inclined to engage as self-directed learners [21]. Effective and meaningful interaction with students occurs when they are adequately prepared for class [5].

Student satisfaction about TBL session condition

On the other hand, 46,8 % of students agreed and strongly agreed that being in an amphitheater facilitated the interaction among the teammates, 29 % were neutral and 24,2% were not comfortable in an amphitheater. TBL demonstrates significant adaptability to various spatial constraints, including fixed seating arrangements in an amphitheater. The optimal space facilitates student clustering in small circles or around compact tables [11]. The TBL classroom should promote discussions. Thus, the design should be flat, incorporating small tables to facilitate student seating arrangements that enable clear visibility and audibility of all team members [23]. A large amphitheater commonly utilized for lectures is generally not conducive to TBL. The optimal classroom arrangement includes a position for the instructor that allows visibility of all students, while also ensuring that students can see one another. If a student is able to stand, speak, and be audible to everyone present, an amplification system is unnecessary. Running the class in an appropriate room is essential to foster discussion and establish an environment conducive to engagement [24]

A majority of students (62.9%) expressed agreement or strong agreement that a 3-hour session was sufficient to understand the objectives of the course. Gullo et al. [25] stated that one of the most challenging tasks for a facilitator in a TBL classroom is to ensure that they do not exceed the time limit that has been established. The first thing that needs to be done is to make sure that the phases of discussion have been allotted a sufficient amount of time. The facilitator needs to be on the lookout for the ticking clock at all times. If some students are taking too long to respond, you may need to cut the team-to-team discussion periods short or even interrupt them. Awareness of time necessitates a realistic assessment of the number of questions per session. An excess of questions coupled with inadequate time for review and discussion can be exasperating for students.

Previous research indicates that TBL serves as an effective alternative to the conventional lecture-based method, as evidenced by the finding that 59.7% of surveyed students favored TBL over traditional lectures [10, 26,12]. In this study, it was observed that 21.8% of participants remained neutral, while 18.6% expressed a preference for the traditional lecture format. They may have inherited a culture of lecture-based learning from their elementary school days, which could explain this. The implementation of TBL can bring about the necessary cultural shift to prioritize student-centered learning. In order to make learning easier for medical students, medical schools should adopt various teaching-learning strategies that get students more involved [5]. Nonetheless, TBL warrants additional exploration. Prior investigations have shown that the way students perceive their adaptation to new methodologies is essential [27]. This assists educators in the identification of

deficiencies and the enhancement of the educational process [2]. We persist in adjusting the TBL process in accordance with the feedback of our students.

Study limitations:

One of the study's limitations is that the questionnaire did not request the sex of the participants, which prevented the comparison of their perceptions of TBL application between the two genders. Furthermore, the sample size was limited. Our findings indicate the necessity of conducting a larger study to validate our results and establish the perception of TBL. Additionally, it would be helpful to see if TBL exposure changes students' teamwork perceptions.

Conclusion

Our first experience with TBL adopted for our fifth-year dental students revealed that they perceived the method positively. They demonstrated that they had high satisfaction toward several aspect of TBL which promotes the use of this methodology at our university. Despite the special circumstances of being in amphitheater instead of flat classrooms, TBL is a welcome effective strategy which enhances the quality of learning.

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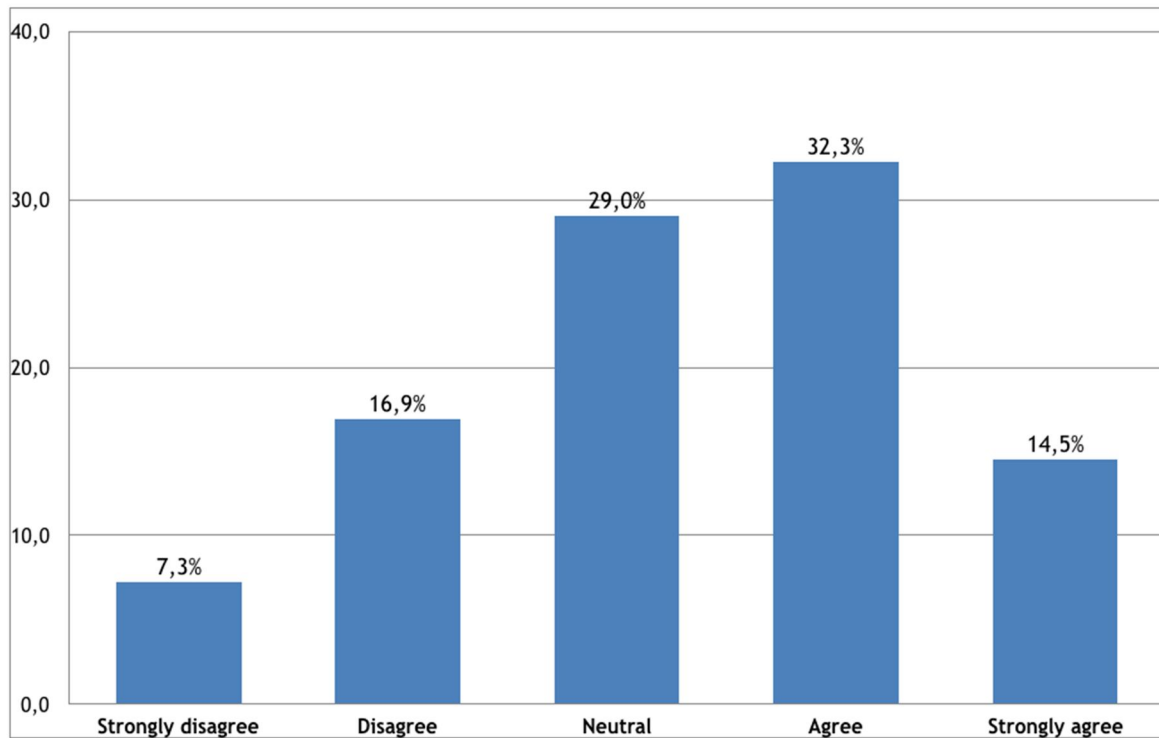
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Table I : Distribution of Students' Responses on the TBL Perception Domain During the TBL Session.

	Strongly disagree		Disagree		Neutral		Agree		Strongly agree		Total	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	N	(%)
Individual readiness assurance tests (IRAT) were a good learning activity	1	0,8	15	12,1	16	12,9	65	52,4	27	21,8	123	100
TBL helped me to understand the course material.	3	2,4	8	6,5	7	5,6	68	54,8	38	30,6	123	100
The TBL helped me increase my sense of synthesis	2	1,6	8	6,5	20	16,1	63	50,8	31	25	123	100
I learned new informations during the TBL sessions .	1	0,8	1	0,8	7	5,6	55	44,4	60	48,4	123	100
I was focused during TBL session.	3	2,4	9	7,3	16	12,9	73	58,9	23	18,5	123	100
I generally felt prepared for the IRAT.	4	3,2	38	30,6	32	25,8	40	32,3	10	8,1	123	100
I have completed 100% of the required documents.	5	4	43	34,7	10	8,1	56	45,2	10	8,1	123	100
I prefer a TBL format over a traditional lecture format.	8	6,5	15	12,1	27	21,8	45	36,3	29	23,4	123	100

Table II : Distribution of Students' Responses on the Teamwork Perception Domain During the TBL Session.

	Strongly disagree		Disagree		Neutral		Agree		Strongly agree		Total	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	N	(%)
I enjoyed working with my peers.	2	1,6	6	4,8	16	12,9	59	47,6	41	33,1	123	100
My team showed good cohesiveness.	1	0,8	3	2,4	13	10,5	67	54	40	32,3	123	100
There was mutual respect for other teammates' perspectives during TBL	2	1,6	2	1,6	13	10,5	62	50	45	36,3	123	100
Group problem solving is an effective way to practice what I have learned	1	0,8	12	9,7	17	13,7	60	48,4	34	27,4	123	100
The GRAT group discussions allowed me to correct my mistakes and improve my understanding.	2	1,6	6	4,8	11	8,9	56	45,2	49	39,5	123	100



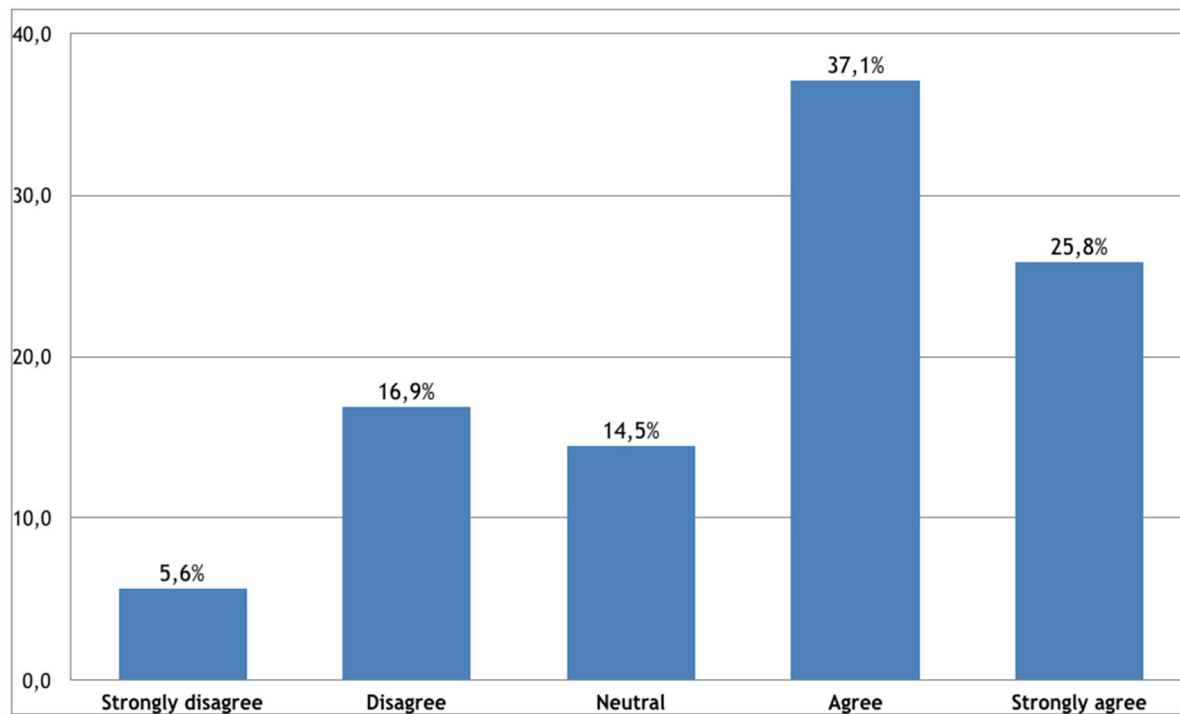


Figure 1 : Students' reaction towards the item 'Being in an amphitheater facilitated the interaction among the teammates'

Figure 2 : Students' reaction towards the item 'A-3-hour session was sufficient to understand the objectives of the course'