

# Study Method Modification Based on the Evaluation Methodology in Second Year Dental Students

Modificación del Método de Estudio en Base a la Metodología de Evaluación en Estudiantes de Segundo Año de Odontología

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**ABSTRACT:** This project aimed to enhance the acquisition of procedural knowledge among second year dentistry students enrolled in the courses Dental Biomaterials and Odontology Preclinical Module I (DBOP-I) at the Universidad de Talca. The objective was to determine whether a modification in the evaluation methodology could improve students' study approaches and thereby strengthen the learning of the competencies included in the module syllabus, particularly during procedural sessions. To this end, a new evaluation instrument named Odonto-Board (O-B) was designed for the subunit "Composite Resin Restorations," replacing the traditional Entry Test (ET) system. Upon obtaining informed consent, students were invited to participate, and the project was implemented and assessed over a three-week period. Feedback regarding both methodologies (ET and O-B) was collected through opinion surveys. In conclusion, the modification of the evaluation strategy contributed to a positive shift in students' study methods, and the new instrument was perceived as a valuable tool for enhancing learning.

**KEY WORDS:** Odontology, methodology education, evaluation of study.

## INTRODUCTION

Current teaching practices must continually evolve to meet the needs and characteristics of new generations. Contemporary instructional methodologies should effectively engage students who have grown up immersed in digital technologies, encouraging the use of innovative strategies and technological tools that enhance learning outcomes (Lemos *et al.*, 2023). Several authors (Bell *et al.*, 2008; Schmidmaier *et al.*, 2011; Pumilia *et al.*, 2020) argue that learning in medical education does not always ensure medium- or long-term knowledge retention, as students tend to forget previously studied material when they are not regularly and systematically exposed to it.

In the Dentistry program at the Universidad de Talca, students advance in their clinical training by completing preclinical modules during the second and third years of the curriculum. These modules aim to prepare students to perform low and medium

complexity therapeutic procedures by equipping them with the necessary foundational knowledge and skills. This training is guided by an established treatment plan focused on managing the most prevalent oral diseases and restoring patients' oral health. Learning objectives are achieved through a combination of theoretical instruction and practical exercises carried out in a simulated clinical environment using mannequins or anatomical models.

To assess students' prior learning before the practical activities of the Dental Biomaterials and Odontology Preclinical I module (DBOP-I), written assessments known as Entry Tests (ET) have been administered for decades at the beginning of each session. Students prepare for these tests during their individual study time using a practical activities text, which provides guides, information, and protocols for all activities scheduled throughout the academic year.

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The implementation of ETs requires the preparation of 15 to 18 tests annually, each containing 1 to 3 questions presented in two different versions to accommodate students in groups A and B. This process involves printing the tests (approximately 400 letter-sized pages per year), grading them, and dedicating additional time to provide feedback on the assessed content. Moreover, because the tests are generated from a single, narrowly defined source, the range of questions shows limited variation across academic years.

There is a shared perception among the module instructors that this assessment tool directs students' study efforts toward highly specific, session-dependent content that is poorly retained over time and ultimately fails to meet the intended learning objectives. This approach diverges from the curricular orientation and the principles of the educational model at Universidad de Talca, which emphasize the autonomous, individualized, and sustained acquisition of knowledge. Students are expected to assume an increasingly active role in their learning process, progressively developing the ability to self-regulate their academic work and to cultivate collaborative skills. The model also underscores the instructor's role in implementing strategies that effectively support the development of the required competencies. Learning is conceived as both an individual and collective endeavor, in which students actively engage with new information to construct meaningful connections based on their prior knowledge (Vice-Rectorate of Undergraduate Studies, 2021).

In preclinical education, reading has traditionally been the primary instructional focus; however, this approach has faced several limitations that have prompted the adoption of contemporary pedagogical strategies (Bin Rubaia'an, 2023). According to White *et al.* (2014), the design and implementation of didactic readings as an active learning exercise are insufficient, ultimately yielding a passive learning experience that does not effectively enhance student understanding.

Education is a dynamic process that requires continuous refinement. However, research in the medical field indicates that current academic curricula often fail to incorporate innovative teaching methodologies, rendering them inadequate for achieving meaningful long-term progress (Challa *et al.*, 2021). To enhance learning, engagement, and student motivation, educators must develop strategies that enrich the overall educational experience. A

thorough understanding of students' diverse learning styles and the adaptation of pedagogical approaches to accommodate these differences is essential for improving academic performance (Bin Rubaia'an, 2023).

The aforementioned evidence aligns with the observations made by the teaching team regarding the use of ET. For students, this assessment format tends to promote a study approach centered on answering highly specific questions. Consequently, the expected knowledge is not always retained over time, leading to difficulties in its subsequent and effective application. Moreover, from an environmental standpoint, the implementation of ETs relies on a non sustainable practice, as it requires printing numerous paper-based tests which, once corrected, offer limited value as study materials or for future review.

Based on the considerations described above, the central question guiding this study is whether modifying the evaluative method positively influences the study strategies that students employ to acquire the knowledge required in the educational program during the practical sessions of the DBOP-I module. Accordingly, the general objective of this project is to determine whether the implementation of an alternative evaluative method produces a beneficial impact on students' learning approaches and their acquisition of the competencies established in the syllabus. To achieve this, three specific objectives were established: (1) to diagnose the current study strategies used by students, their perceptions of the evaluations applied in the module, and their willingness to adopt a new assessment format; (2) to implement a new evaluation instrument targeting the knowledge required in the practical sessions of the DBOP-I module; and (3) to evaluate students' perceptions of this modified evaluative method and its influence on their learning strategies.

## MATERIAL AND METHOD

In this descriptive, experimental, mixed-method, cross-sectional study, we proposed replacing the traditional ET used in the final subunit of the DBOP-I module composite resin restorations with a new evaluative methodology. This alternative approach was designed to be collaborative and interactive, promoting greater student engagement in the development and consolidation of knowledge related to the description of techniques and protocols for applying restorative biomaterials in adult patients.

This activity, referred to as the Odonto-Board (O-B), consisted of creating a virtual whiteboard developed using platforms such as Jamboard, PowerPoint, or Canvas. The assignment was completed in groups of 4 to 5 students and consisted of reviewing the content corresponding to the composite resin restorations subunit included in the practical activities text of the DBOP -I module (10 pages). Students were instructed to extract only the most relevant information and organize it in a simplified manner on the virtual whiteboard. They were also required to incorporate original images they created to support comprehension. To prevent cognitive overload, the use of a maximum of ten sticky notes was established, with the option of using abbreviations. Beyond these brief guidelines, the O-B functioned as an open format tool, allowing students to individualize their learning process and apply diverse study strategies, thereby promoting autonomy and self-directed learning. Evaluation of the O-B was conducted using a rubric that had been previously published and made available to students.

For the development of this study, an opinion survey (OS) was first administered to identify students' primary study strategies for preparing for the ET (among 3 predefined options), as well as their opinions and perceptions regarding the ET as an evaluative method for acquiring the cognitive knowledge associated with the practical sessions. The survey also assessed their willingness to engage with new evaluation methodologies.

The project was presented to students one month in advance through an oral briefing supported by a slide presentation. As part of this introduction, an example of the proposed activity previously implemented in another thematic unit using the Jamboard platform was provided to serve as a model. The complete presentation remained accessible on the Educandus platform of the Universidad de Talca until the conclusion of the module. To formalize their participation, students were asked to provide informed consent indicating their willingness to take part in the study.

For the 46 students who agreed to adopt the modified evaluative method, the O-B activity was implemented in the composite resins subunit. The activity was carried out over a 3 week period and was evaluated using a rubric grounded in Bloom's taxonomy,

which enabled the assessment of the learning achieved through the creation of the O-B.

Once the activity was completed, a second OS was administered to assess students' perceptions of the new evaluative methodology as a tool for guiding and supporting the acquisition and development of the knowledge required for the practical sessions. This survey also sought to gather feedback for refining the instrument and informing its future implementation within the module. Both surveys, as well as the presentation and informed consent, were administered digitally via Google Forms, ensuring the anonymity of all respondents.

## RESULTS

Of the total 47 students enrolled, 46 (98 %) agreed to adopt the new methodology as an evaluative tool. The results were analyzed using simple descriptive statistics. Among the participants, 32 students (69.6 %) identified as female and 14 (30.4 %) as male. The mean age was 20.2 years for the ET and 20.4 years for the O-B group. Additionally, 45 students (97.8 %) were in their second year of the Dentistry program (Table I).

To characterize the study methodologies used by the students, three options with their corresponding descriptions were presented (repetition-based study, elaboration, and organization). Differences between male and female students were observed only in this parameter.

Of the total number of students identified as female (33), for the ET, 19 (57.6 %) indicated studying using repetition methodologies, followed by 11 (33.3 %) who indicated elaboration methodologies. In contrast, during the development of the O-B, 21 (63.6 %) indicated having studied using elaboration, followed by 9 (27.3 %) using organization.

In the case of students identified as male (n = 13), during the ET, 7 (53.85 %) reported studying using

Table I. Distribution of the sample by sex, age, and years in the career.

Variable		OS ET N(%) = 46(100)	OS O-B N(%) = 46(100)
Sex	Male	14(30,4 %)	14(30,4 %)
	Female	32(69,6 %)	32(69,6 %)
	Prefer not to answer	0(0 %)	0(0 %)
Average Age		20,2 years	20,4 years
Average Years		2 years (97,8 %)	

elaboration-based strategies, followed by 6 (46.15 %) who reported using repetition-based strategies. During the development of the O-B activity, 7 (53.85 %) indicated studying using organization-based strategies, while 4 (30.75 %) reported using elaboration-based strategies. Considering the entire sample, during the ET, 24 students (52.2 %) stated that they primarily studied using repetition-based strategies, while 19 (41.3 %) reported using elaboration-based strategies.

In contrast, for the O-B activity, 25 students (54.3 %) stated that they mainly studied using elaboration-based strategies, while 16 (38.8 %) reported using organization-based strategies (Table II). Regarding the study time dedicated to preparing for the evaluation during the week, during the ET, 30 students (65.2 %) reported studying for 30–60 minutes, followed by 11 students (23.9 %) who reported studying for more than 60 minutes. Comparable study times were reported for the preparation of the O-B activity: 31 students (67.4 %) dedicated 30–60 minutes, and 11 students (23.9 %) reported spending more than 60 minutes.

For the specific questions regarding the ET and the learning achieved by students, 26 students (56.5 %) perceived that the ET measured their learning fairly well, followed by 16 students (34.8 %) who felt it measured learning to a very limited extent. In contrast, for the O-B activity, 27 students (58.7%) perceived that it measured

their learning fairly well, and 17 students (37 %) indicated that it measured it to a great extent. Regarding the retention of learning over time, in the case of the ET, 25 students (54.3 %) believed that learning was retained fairly well, while 18 students (39.1%) perceived that it was retained to a very limited extent. For the O-B, 23 students (50%) considered that learning would be retained fairly well, and 20 students (43.5 %) perceived it would be retained to a great extent.

When asked whether they used the ET during the academic year as a study or review tool, 42 students (91.3 %) responded no. In contrast, when asked about the potential use of the O-B as a study resource, 45 students (97.8 %) stated that they would use it in the future. Regarding sustainability, in the OS concerning the ET, 38 students (82.6 %) indicated a preference for digital evaluations. This preference increased to 43 students (93.5 %) when the same question was asked following the implementation of the O-B.

To quantify students' perception of the learning achieved while preparing the ET and the O-B, they were asked to rate their learning on a scale from 1 to 10, where 1 indicated I haven't learned anything and 10 indicated I have learned a lot. For the ET, the vast majority of students (80 %) rated their learning between 5 and 7 (average 6.21), whereas for the O-B, most ratings (72 %) fell between 8 and 10 (average 9.00) (Table III). Only

Table II. Distribution of student responses according to the methodology applied in the study.

Variable		OS ET N(%) = 46(100)	OS O-B N(%) = 46(100)
What study method do you primarily use to prepare for the ET/O-B?	By Repetition	24(52,2 %)	5(10,9 %)
	By Elaboration	19(41,3 %)	25(54,3 %)
	By Organization	3(6,5 %)	16(34,8 %)
How much time do you dedicate to studying to prepare for the ET/O-B during the week?	Nothing	0(0 %)	1(2,2 %)
	Less than 30 min.	5(10,9 %)	3(6,5 %)
	Between 30-60 min.	30(65,2 %)	31(67,4 %)
	More than 60 min.	11(23,9 %)	11(23,9 %)
Do you think that the ET/O-B are an effective method for measuring your learning in order to develop the practical activity of the session?	Not at all	2(4,3 %)	0(0 %)
	Slightly	16(34,8 %)	2(4,3 %)
	Quite a bit	26(56,5 %)	27(58,7 %)
	Very much	2(4,3 %)	17(37 %)
Do you perceive that the study you do, which is/was evaluated by the ET/O-B, generates learning that is retained over time?	Not at all	1(2,2 %)	0(0 %)
	Slightly	18(39,1 %)	3(6,5 %)
	Quite a bit	25(54,3 %)	23(50 %)
	Very much	2(4,3 %)	20(43,5 %)
¿Do you use the ET and would you use the O-B to review or study throughout the year?	Yes	4(8,7 %)	45(97,8 %)
	No	42(91,3 %)	1(2,2 %)
What is your opinion regarding the sustainability of the evaluation instruments?	Digital	38(82,6 %)	43(93,5 %)
	Printed	8(17,4 %)	3(6,5 %)

in the O-B's OS was the attractiveness of the instrument evaluated. A total of 37 students (80.4 %) rated it as very attractive, while the remaining 9 (19.6 %) rated it

as quite attractive. Furthermore, 45 students (97.8 %) perceived the activity as a positive learning experience (Table IV).

Table III. Perception of the quantification of how much has been learned by students according to the methodology applied.

Variable		OS ET N(%) = 46(100)	OS O-B N(%) = 46(100)
<b>From 1 to 10. ¿How much do you think you have learned with ET/O-B? Being 1 "I haven't learned anything" and 10 being "I've learned a lot."</b>	1	0(0 %)	0(0 %)
	2	3(6,5 %)	0(0 %)
	3	0(0 %)	1(2,2 %)
	4	2(4,3 %)	1(2,2 %)
	5	10(21,7 %)	0(0 %)
	6	9(19,6 %)	5(10,9 %)
	7	18(39,1 %)	6(13 %)
	8	1(2,2 %)	10(21,7 %)
	9	2(4,3 %)	13(28,3 %)
	10	1(2,2 %)	10(21,7 %)

Table IV. Perception of students about O-B in comparison to ET.

Variable		OS O-B N(%) = 46(100)
<b>In comparison to ET. ¿How attractive is the O-B for the learning process?</b>	Very attractive	37(80,4 %)
	Moderately	9(19,6 %)
	Not very attractive	0(0 %)
	Not attractive at all	0(0 %)
<b>¿Would you rate the experience of doing O-B compared to ET as positive or negative?</b>	Positive	45(97,8 %)
	Negative	1(2,2 %)

In the first OS corresponding to the ET, the question, why would you or would you not be willing to try a new methodology? was included. Similarly, in the OS applied after the O-B activity, students were asked to rate the overall experience as positive or negative, followed by the question, why was the O-B experience perceived as positive or negative?, both questions required brief, open-ended responses. The qualitative feedback obtained from these items was subsequently collected and organized into thematic categories according to the content of the students' remarks.

The grouped results were represented using a word-cloud visualization. For the first question, the most frequently mentioned reasons included an interest in trying new methodologies, the expectation of improved learning or study strategies, and the perception that the proposed activity would be more didactic (Fig. 1). For the second question, asked after completing the O-B activity, students overwhelmingly perceived the experience as positive. The main reasons cited were an improvement in learning, the motivational and didactic nature of the activity, its value as study material for future use, and the fact that it was significantly less stressful than the ET (Fig. 2).

**¿Por qué estaría o no estaría dispuesto a probar una nueva metodología?**



Fig. 1. "Word Cloud. ¿Why would you or would you not be willing to try a new methodology?

**¿Por qué la realización de la "Odonto-Board" fue percibida como una experiencia positiva o negativa?**



Fig. 2. "Word Cloud." ¿Why was the execution of the Odonto-Board perceived as a positive/negative experience?

Once the O-B activity was completed, access to the platform was reopened so that students could modify their boards based on feedback or personal preferences, with the aim of ensuring that the tool could serve as study material for future learning instances.

## DISCUSSION

The results demonstrated clear changes in the study methodologies employed by students to prepare for the practical sessions of the DBOP-I module. Students moved away from the repetition based strategies predominantly used for the ET and instead adopted elaboration-based approaches, generating their own study tool through the creation of the O-B. The modification of the evaluative method was intended to positively influence knowledge acquisition by leveraging principles of human cognitive architecture. Developing a specifically designed instrument—extracting information from the guide text, applying it to construct the O-B diagram, and segmenting and organizing its components—should foster improved information retention. By producing self-designed diagrams, students are expected to consolidate the most relevant content in long-term memory, thereby facilitating its retrieval and application during specific tasks. Furthermore, because the O-B is oriented toward constructing a procedural protocol for the module's practical sessions, it may also promote task automation during execution (Lotero-Botero *et al.*, 2011; Shaffer *et al.*, 2003).

In an experiment conducted by van Blankenstein *et al.* (2011) with two groups of students, one group listened to an explanation about a specific problem, while the other was required to generate an explanation on their own. Although no immediate differences were observed in text retention, one month later the group that had actively engaged in self-explanation remembered 25 % more of the material. Similar findings were reported by Chi *et al.* (1994), who demonstrated that students instructed to explain each line of a text on the human circulatory system achieved significantly greater gains from pre-test to post-test compared with those who simply reread the text twice.

Regarding the study time dedicated to both activities (ET and O-B), most students reported spending 30–60 minutes per week, which aligns with the self-study time recommended in the module's formative program. Students largely perceived that the O-B more effectively measured the learning achieved compared to the ET. Likewise, the learning generated

through the creation of the O-B was regarded as more likely to be retained over time. By modifying the evaluative method, active learning is fostered, promoting higher levels of cognitive engagement, collaboration, and student protagonism in knowledge construction through the development of their own learning instruments (Shaffer *et al.*, 2003; Vice-Rectorate of Undergraduate Studies, 2021). Although the ET and O-B represent fundamentally different evaluation approaches, the new instrument was positively received by the students.

In contrast to the ET, students expressed a strong intention to use the O-B as a study tool in the future, recognizing its value for continued access throughout their university training and even in their professional practice. Its digital format facilitates ongoing revision and updates without deterioration, thereby enhancing the teaching learning process.

When comparing students' quantitative perceptions of the learning achieved through each evaluative method, the O-B consistently received higher ratings than the ET. Although these findings are encouraging, further research is required, particularly considering that this was the first implementation of the new methodology. The positive perception of the O-B reflects a shift in both study habits and evaluative dynamics. The adoption of more active methodologies such as the creation of the O-B appears to have promoted deeper learning and more sustained knowledge retention compared with the ET.

Students' willingness to adopt new methodologies, as reflected in their responses, suggests a genuine interest in engaging with innovative pedagogical approaches. Their emphasis on improving learning, together with the perception of the O-B as a less stressful evaluative experience, indicates positive shifts in attitudes toward assessment methods. Moreover, the digitalization of the evaluation aligns with current student preferences and demonstrates a commitment to more sustainable and responsible educational practices, optimizing the use of institutional resources.

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improvement of this resource, strengthening competency-based learning by promoting the synthesis of key concepts, collaborative work, and critical thinking. The originality and depth of their contributions have refined this tool, benefiting future cohorts of students and reinforcing an active, meaningful, and student-centered methodology within dental education.

**LARRUCEA-SAN MARTÍN, C.; ORTEGA-VERA, B.; CORREA-PLATA, B. & MORIS-MOYANO, M.** Modificación del método de estudio en base a la metodología de evaluación en estudiantes de segundo año de odontología. *Int. J. Odontostomat.*, 19(4):392-398, 2025

**RESUMEN:** Este proyecto tuvo como propósito mejorar la adquisición de conocimientos procedimentales en estudiantes de segundo año de la carrera de Odontología, inscritos en los cursos de Biomateriales Odontológicos y Módulo Preclínico Odontológico I (BOMPO-1) de la Universidad de Talca. El objetivo fue determinar si la modificación de la metodología de evaluación podía favorecer las estrategias de estudio de los estudiantes y, con ello, fortalecer el aprendizaje de las competencias incluidas en el programa, particularmente durante las sesiones procedimentales del módulo. Para este fin, se diseñó un nuevo instrumento de evaluación denominado Odonto-Board (O-B) para la subunidad "Restauraciones con Resina Compuesta", en reemplazo del sistema tradicional de Pruebas de Entrada (PE). Tras obtener el consentimiento informado, los estudiantes fueron invitados a participar, y el proyecto se implementó y evaluó durante un período de tres semanas. La retroalimentación sobre ambas metodologías (PE y O-B) se recopiló mediante encuestas de opinión. En conclusión, la modificación de la estrategia evaluativa contribuyó a un cambio positivo en las metodologías de estudio de los estudiantes, y el nuevo instrumento fue percibido como una herramienta valiosa para potenciar el aprendizaje.

**PALABRAS CLAVE:** Odontología, metodología educación, estudio de evaluación.

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