

Board games as a learning strategy in the discipline Biological Bases of Stomatology

Juegos de mesa como estrategia de aprendizaje en la disciplina
Bases Biológicas de la Estomatología

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ABSTRACT

Background: The complexity of the biomedical basic sciences in Stomatology requires innovative teaching strategies that facilitate content assimilation.

Objective: To evaluate the main results of using board games on content related to epithelial tissue, the integumentary system, and the skull skeleton in the subject Osteomyoarticular System.

Methods: A quasi-experimental study was conducted at the Department of Basic Sciences of the Faculty of Stomatology of the University of Medical Sciences of Camagüey, during the first semester of the 2025–2026 academic year. Forty first-year students participated, divided into a control group (traditional teaching, $n=20$) and an experimental group (teaching supplemented with board games, $n=20$). Data processing and analysis were performed using descriptive statistics and Student's t-test for independent samples, with a p-value <0.05 considered significant. Theoretical, empirical, and mathematical-statistical methods were applied.

Results: The experimental group showed a significantly higher mean grade (8.7 ± 0.8) compared to the control group (7.1 ± 1.2) on the final assessment ($p=0.0001$). Greater motivation and active participation were observed in the study sessions within the experimental group.

Conclusions: The use of board games as a didactic strategy for teaching Biological Bases in Stomatology proved to be an effective method for improving academic performance and student motivation in the subject Osteomyoarticular System.

MeSH: students, dental; dental health services; teaching materials; education, medical

RESUMEN

Fundamento: la complejidad de las ciencias básicas biomédicas en Estomatología requiere estrategias didácticas innovadoras que favorezcan la asimilación de contenidos.

Objetivo: evaluar los principales resultados de la utilización de juegos de mesa sobre el contenido relacionado con tejido epitelial, sistema tegumentario y esqueleto de la cabeza en la asignatura Sistema Osteomioarticular.

Métodos: se realizó un estudio cuasiexperimental en el Departamento de Ciencias Básicas de la Facultad de Estomatología de la Universidad de Ciencias Médicas de Camagüey, durante el primer semestre del curso 2025-2026. Participaron 40 estudiantes de primer año, divididos en un grupo control (enseñanza tradicional, $n=20$) y un grupo experimental (enseñanza

complementada con juegos de mesa, $n=20$). El procesamiento y análisis de la información se realizó con estadística descriptiva y la prueba *t* de *Student* para muestras independientes, considerando significativo un valor de $p<0,05$. Se aplicaron métodos teóricos, empíricos y matemático-estadísticos.

Resultados: el grupo experimental mostró una calificación media significativamente mayor ($8,7 \pm 0,8$) en comparación con el grupo control ($7,1 \pm 1,2$) en la evaluación final ($p=0,0001$). Se observó una mayor motivación y participación activa en las sesiones de estudio dentro del grupo experimental.

Conclusiones: la utilización de juegos de mesa como estrategia didáctica para la enseñanza de las Bases Biológicas en Estomatología demostró ser un método efectivo para mejorar el rendimiento académico y la motivación de los estudiantes en la asignatura Sistema Osteomioarticular.

DeCS: estudiantes de Odontología; servicios de salud dental; materiales de enseñanza; educación médica

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INTRODUCTION

The discipline Biological Bases of Stomatology represents a fundamental pillar in the training of the future stomatologist, as it provides the scientific foundation necessary for understanding oral health-disease processes.⁽¹⁾ Within this discipline, the subject Osteomyoarticular System (SOMA), which includes the study of epithelial tissue, the integumentary system, and the skull skeleton, among other topics, presents a high degree of complexity and terminological density, which can lead to learning difficulties and demotivation among first-year students.⁽²⁾

Traditionally, the teaching-learning process has been based on expository methods and content memorization—strategies that do not always achieve meaningful learning.⁽³⁾ In this context, teaching innovation becomes essential.

Game-Based Learning (GBL) emerges as a pedagogical strategy that, through the incorporation of playful elements, seeks to enhance motivation, collaboration, and knowledge retention.^(4,5)

Every teacher must be aware that improving the quality of teaching means, among other things, the constant search for new methods that eliminate the simple repetition of definitions without a conscious understanding of concepts, which would prevent the discovery of the essential characteristics of the object of study, its regularities, links with other concepts, and its creative application.

Teachers of biomedical basic sciences have maintained an unceasing search for new teaching strategies aimed at helping students understand and assimilate the content taught.^(6,7,8) In their experience, they have quite frequently observed difficulties in assimilating basic concepts and expressing their embedded ideas, as well as in the correct use of spelling.

The objective of this research was to evaluate the main results of using board games on epithelial tissue, the integumentary system, and the skull skeleton in the subject Osteomyoarticular System.

METHODS

A quasi-experimental longitudinal study was conducted at the Department of Basic Biomedical Sciences of the Faculty of Stomatology of the University of Medical Sciences of Camagüey, during the first semester of the 2025–2026 academic year.

The study population consisted of first-year students of the Stomatology degree program. A non-probabilistic convenience sample was formed, maintaining the teaching groups already established by the institution.

Inclusion criteria: being enrolled as a first-year Stomatology student in the 2025–2026 academic year and providing informed consent to participate. Students who did not complete all subject activities were excluded. They were divided into:

- Experimental group (EG): 20 students who participated in learning sessions using board games.
- Control group (CG): 20 students who received the traditional teaching methodology.

Theoretical methods: the historical-logical method was used to analyze the background of game use in medical education; and analysis-synthesis was used to process theoretical information and design the intervention.

Empirical methods:

- Scientific observation: during the game sessions, to assess student interaction, understanding, and motivation.
- Standardized written assessment: applied at the end of the semester to both groups (final exam) with multiple-choice and essay questions on the three topics covered. Grades were expressed on a scale of 0 to 5 points.
- Questionnaire applied to the EG to measure individual motivation and perceived ease of study, recording their perception of whether they felt more or less motivated and whether they found studying easier or harder. Descriptive statistics (frequencies) were used to summarize the results.

Intervention (educational product to the EG):

Three board games were designed and implemented as a complement to theoretical teaching. Each game was applied upon completion of the corresponding topic, in 90-minute workshop sessions guided by the professor:

- Epithelium Crossword: A crossword puzzle with definitions of key epithelial tissue terms (e.g., simple epithelium, keratinization).
- Skin Parcheesi: An adaptation of the Parcheesi board game, where colored squares were associated with questions about the structure, function, and clinical correlations of the integumentary system.
- Bone Dominoes: A domino game with tiles linking bone names to their descriptions.

For the expert criterion assessment of the product, 5 specialists in biomedical basic sciences were consulted, all holding the teaching rank of Assistant Professor, with over 10 years of experience and a Master's or Doctoral degree. The indicators evaluated were: didactic relevance, content clarity, suitability for the student level, and motivational potential. Measurement was performed using a 5-point Likert scale.

Statistical methods:

Written assessment data were processed using SPSS v.25.0 software. Descriptive statistics (mean, standard deviation, and frequencies) were used to summarize the results. To compare mean grades between the EG and the CG, Student's t-test for independent samples was applied, after verifying normality (Kolmogorov-Smirnov test) and homoscedasticity (Levene's test), establishing a significance level of $p < 0.05$. Survey data were analyzed using descriptive statistics (frequencies and percentages).

Ethical considerations

The study respected the Declaration of Helsinki.⁽⁹⁾ Written informed consent was obtained from each participant after a detailed explanation of the objectives. Data confidentiality was guaranteed, and it was emphasized that participation would not affect their regular academic evaluation. The research protocol was approved by the Ethics Committee of the Faculty of Stomatology.

RESULTS AND DISCUSSION

In the teaching-educational process of the Stomatology degree program at the University of Medical Sciences of Camagüey, the teaching aids developed -based on gamification- have been shown to facilitate individual participation, allow longer and more active retention of the concepts and phenomena studied, create cognitive interests, add more emotionality to the process of knowledge appropriation, and contribute to student self-affirmation.

Monitoring the proper completion of independent study allows for maintaining feedback within the complex teaching-learning process, where evaluation is a subjective action, determined to some extent by the evaluators' preparation.

Under these conditions, it is necessary for the assessment system to be as robust as possible, thereby increasing the importance of ensuring that the instruments used in controls have the required quality and are put to the test.⁽¹⁰⁾ The SOMA subject teaching collective works to meet these requirements.

Scientific observation was assessed as effective; students interacted with the content and strengthened their relationships with each other, felt motivated, and demonstrated an intrinsic understanding of the concepts included in the games.

Table 1 compares the grades on the final assessment. A statistically significant difference was observed between the two groups. The EG obtained a mean grade of 8.7 points with a standard deviation of 0.8, while the CG obtained a mean of 7.1 points with a standard deviation of 1.2. Student's t-test confirmed this difference ($t(38) = 4.89, p=0.0001$).

Table 1. Mean grades on the written assessment at the end of the semester. Faculty of Stomatology. University of Medical Sciences of Camagüey. Academic year 2025–2026

Group	n	Mean Grade $\pm$ SD	p-value
Experimental	20	8.7 $\pm$ 0.8	0.0001
Control	20	7.1 $\pm$ 1.2	–

Source: final assessment.

Table 2 shows the results of the questionnaire applied to the EG students regarding individual motivation for studying when using the games. As can be seen, 100% felt motivated to study and delve deeper into the content on the topic.

Table 2. Motivation for studying. Faculty of Stomatology. University of Medical Sciences of Camagüey. First semester. Academic year 2025–2026

EG responses	Motivation for studying	
Expresses being motivated	20	100
No motivated	0	0
Total	20	100

Source: questionnaire.

Table 3 shows the results of the questionnaire related to the ease of studying when using the games. As estimated, 100% of the students felt greater ease in studying and delving deeper into the content.

Table 3. Ease of studying. Faculty of Stomatology. University of Medical Sciences of Camagüey. First semester. Academic year 2025–2026

EG responses	Ease of studying	
Expresses greater ease	20	100
Expresses less ease	0	0
Total	20	100

Source: questionnaire.

The results of this study demonstrate that the implementation of board games as learning objects produces a significant improvement in the academic performance of Stomatology students in the content of the SOMA subject. The finding of a mean grade almost 1.6 points higher in the experimental group is consistent with what has been reported by other research^(11,12) that applies game-based learning in the field of medical education, where improvements in concept retention and in student intrinsic motivation have been observed.

The effectiveness of this strategy can be attributed to several pedagogical and cognitive factors: first, the playful component reduces anxiety when studying complex, terminology-dense content, creating a more relaxed learning environment conducive to meaningful assimilation.⁽¹³⁾ Second, games such as crossword puzzles and dominoes demand active manipulation of information, which favors deeper cognitive processing than the passive reception characteristic of lectures.⁽¹²⁾

This active process facilitates the encoding of information into long-term memory through the social dynamics of games by encouraging peer discussion, which clarifies doubts, promotes collaborative learning, and consolidates knowledge through mutual explanation and the negotiation of meanings.

The observation of greater motivation in the EG coincides with studies conducted^(14,15) in similar contexts, where students perceive these activities as more attractive, interactive, and less monotonous than traditional classes. This is crucial in the first year of the degree program, a

critical period of adaptation to higher education where interest in the profession is forged and the foundations of autonomous learning are built. Motivation, as a trigger for effort and persistence, thus becomes a result as valuable as the improvement in grades.

It is important to highlight that the success of the strategy lies not only in the playful element, but in its intentional and structured integration within the didactic design of the discipline. Each game was applied upon completion of the theoretical topic as a review, application, and formative assessment tool. This is consistent with what was proposed by Muñoz,⁽¹³⁾ who emphasizes that gamification must serve clear learning objectives.

Although the results are encouraging, it is necessary to recognize the limitations of this study. The quasi-experimental design, with intact, non-randomized groups, may introduce biases. The sample, although representative of a cohort, is small and belongs to a single faculty, which limits the generalizability of the findings. Future research could expand the sample, include a longitudinal follow-up to assess medium-term retention, compare different types of games or platforms (digital vs. analog), and explore their impact on subsequent clinical competencies.

Despite these limitations, the findings provide concrete evidence that supports the transition from a pedagogical model centered on the unidirectional transmission of knowledge toward one that is student-centered, active, and experiential. Gamification, in its concrete expression of board games, presents itself not as mere entertainment, but as a valid and effective educational methodology for addressing the inherent complexity of the biomedical basic sciences.

The formal incorporation of these playful strategies into the curricular design of the discipline Biological Bases of Stomatology is recommended, as a valuable complement to enrich its program and promote more solid and meaningful knowledge.

Scientific contribution

This study contributes to the literature on educational innovation in health sciences, providing local empirical evidence on the effectiveness of a low-cost, easy-to-implement intervention. It reinforces the idea that simple-appearing strategies, such as crossword puzzles, Parcheesi, or

dominoes, when redesigned for pedagogical purposes, can have a significant impact on student performance and engagement, offering a viable alternative to enrich the teaching-learning process.

CONCLUSIONS

The use of board games as a didactic strategy made it possible to improve assessment as a component of the teaching-learning process in the subject SOMA by systematizing the objectives; with greater student motivation and participation.

BIBLIOGRAPHICAL REFERENCES

1. Moore U, ed. Principles of Oral Anatomy, Histology and Embryology. 5ed. Elsevier; 2021.
2. Ferrer Rosabal LC, Rosabal Fernández AM, Ortiz Zequeira MA, Domínguez Rodríguez D. Medio alternativo para el aprendizaje de anatomía dental en estudiantes de segundo año de Estomatología. EdumedHolguín 2021 [Internet]. Holguín: Universidad de Ciencias Médicas de Holguín; Nov-Dic. 2021 [cited 17/05/2025]. Available in: <https://edumedholguin2021.sld.cu/index.php/edumedholguin/2021/paper/viewFile/85/51>
3. Vidal Ledo MJ, Triana Álvarez EA, Reyes Camejo T, González Rodríguez R. Education 4.0 and its Application in Higher Medical Education. REMS [Internet]. 2023 [cited 17/05/2025];37(3):[aprox. 16 p.]. Available in: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0864-21412023000300015&lng=es
4. Gómez-Urquiza JL, Gómez-Salgado J, Albendín-García L, Correa-Rodríguez M, González-Jiménez E, Cañadas-De la Fuente GA. The impact on nursing students of using games as a learning method: A systematic review. Nurse Educ Today [Internet]. 2019 [cited 17/05/2025];76:73-80. Available in: <https://europepmc.org/article/med/30453202>
5. Soasty Vera MR, Borroto Cruz ER, Vidal Ledo M. Gamificación: una estrategia didáctica en el proceso enseñanza-aprendizaje de la educación médica superior. Educ Med Super [Internet]. 2024 [cited 17/05/2025];38:[aprox. 15 p.]. Available in: <https://ems.sld.cu/index.php/ems/article/view/4333>

6. Viciado Tomey A. Enseñanza de las Ciencias Básicas Biomédicas. Viejas deudas y nuevos retos. Rev Haban Cienc Med [Internet]. 2020 [cited 17/05/2025];19(5):[aprox. 7 p.]. Available in: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1729-519X2020000600001
7. Aldana Zabala JJ, Vallejo Valdivieso PA, Isea Argüelles J. Investigación y aprendizaje: retos en Latinoamérica hacia el 2030. ALTERIDAD [Internet]. 2021 [cited 17/05/2025];16(1):78-91. Available in: http://scielo.senescyt.gob.ec/scielo.php?script=sci_arttext&pid=S1390-86422021000100078
8. Betancourt Valladares M, Barciela Calderón JA, Betancourt Gamboa K, Bermejo Correa RM, García González MC. Valoraciones de estudiantes sobre el tratamiento didáctico de la integración morfofuncional en el aparato masticatorio. Morfovirtual 2022 [Internet]. La Habana: ICBP Victoria de Girón; 2022. [Cited 17/05/2025]. Available in: <https://morfovirtual.sld.cu/index.php/morfovirtual22/2022/paper/viewPaper/191>
9. Asociación Médica Mundial (AMM) Declaración de Helsinki de la AMM – Principios éticos para las investigaciones médicas con participantes humanos. 75ª Asamblea General. Helsinki, Finlandia: AMM; octubre 2024. Available in: <https://www.wma.net/es/policies-post/declaracion-de-helsinki-de-la-amm-principios-eticos-para-las-investigaciones-medicas-en-seres-humanos/Leguizamón>
10. Espinoza Freire EE. Importancia de la retroalimentación formativa en el proceso de enseñanza-aprendizaje. Univers y Soc [Internet]. 2021 [cited 17/05/2025];13(4):389-397. Available in: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2218-36202021000400389&lng=es&nrm=iso
11. Pérez Fernández MR, Ponce de León Narváez R, Sánchez Rodríguez T, Jordán Padrón M. Uso de juegos didácticos en la disciplina de Anatomía. Rev Med Electron [Internet]. 2014 [cited 17/05/2025];24(1):41-8. Available in: <https://revmedicaelectronica.sld.cu/index.php/rme/article/view/31>
12. Cereceda C, González D. Aprendizaje activo como modelo de enseñanza en ciencias de la salud. Rev Soc Esp Dolor [Internet]. 2023 [cited 17/05/2025];30(2):146-147. Available in: http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1134-80462023000200011&lng=es
13. Muñoz Comonfort A, Rojas-Lemus M, López-Valdez N, Bizarro-Nevares P, Fortoul TI. Estrategia lúdica para estimular el aprendizaje en la asignatura Biología Celular e Histología Médica. Investigación Educ Med [Internet]. 2023 [cited 17/05/2025];12(46):11-18. Available

in: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S2007-50572023000200011&lng=es

14. Corrales Reyes IE, Mamani Benito O, Apaza Tarqui EE, Mejia Christian R. Motivación de logro general y rendimiento académico en estudiantes cubanos de Estomatología. Rev Cubana Estomatol [Internet]. 2022 [cited 17/05/2025];59(4):[aprox. 14 p.]. Available in:

http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0034-75072022000400004&lng=es

15. Cunill López ME, Curbelo Alfonso L. Una aproximación a la autorregulación del aprendizaje desde la evaluación formativa en la educación médica. Educ Med Super [Internet]. 2021 [cited 17/05/2025];35(1):[aprox. 4 p.]. Available in:

http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0864-21412021000100019&lng=es

Conflict of interest statement

The authors declare no conflict of interest.

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