

The empirical evaluation of game-based learning in medical education

Evaluación empírica del aprendizaje basado en juegos en educación médica

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Abstract

Gamification has become an innovative strategy in medical education, promoting motivation and active learning. However, its improper application can lead to adverse effects by focusing on superficial aspects, such as point accumulation, without clear pedagogical objectives. At the Faculty of Medicine in Tampico, students face a high cognitive load due to the complexity of the content, highlighting the need to empirically evaluate the gamification components that influence the perceived effectiveness of learning. The objective of this study was to analyze the relationship between key elements of educational gamification, such as meaningful learning, challenge utility, ease of recall, and overall satisfaction, with the perceived effectiveness of learning in students at the Faculty of Medicine in Tampico. A descriptive-correlational, cross-sectional study was conducted with the participation of 250 students (aged 18-29) who had participated in gamified activities. A structured Likert-type questionnaire, validated by experts and tested in a pilot study, was used. Data analysis was performed using multiple linear regression with SPSS software. The results indicated that the perception of meaningful learning and overall satisfaction with gamified dynamics were the main predictors of the perceived effectiveness of gamified learning, explaining 67% of the total variance. These results suggest that gamification enhances motivation, comprehension, and content retention. This study reinforces the need to implement well-structured gamified practices aligned with clear pedagogical objectives

Keywords: educational gamification; medical education; perceived effectiveness; meaningful learning; gamified challenges

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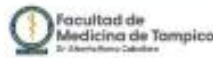
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Resumen

La gamificación se ha consolidado como una estrategia innovadora en la educación médica, favoreciendo la motivación y el aprendizaje activo. No obstante, su aplicación inapropiada puede generar efectos adversos al centrarse en aspectos superficiales, como la acumulación de puntos, sin objetivos pedagógicos claros. En la Facultad de Medicina de Tampico, los estudiantes enfrentan una alta carga cognitiva debido a la complejidad de los contenidos, lo que resalta la necesidad de evaluar empíricamente los componentes de gamificación que influyen en la eficacia percibida del aprendizaje. El objetivo de este estudio fue analizar la relación entre los elementos clave de la gamificación educativa, como el aprendizaje significativo, la utilidad de los retos, la facilidad de recuerdo y la satisfacción general, con la eficacia percibida del aprendizaje en estudiantes de la Facultad de Medicina de Tampico. Se realizó un estudio descriptivo-correlacional, transversal, con la participación de 250 estudiantes (de 18 a 29 años) que habían participado en actividades gamificadas. Se utilizó un cuestionario estructurado tipo Likert, validado por expertos y probado en un piloto. El análisis de los datos se realizó mediante regresión lineal múltiple con el software SPSS. Los resultados indicaron que la percepción de aprendizaje significativo y la satisfacción general con las dinámicas lúdicas fueron los principales predictores de la eficacia percibida del aprendizaje gamificado, explicando el 67% de la varianza total. Estos resultados sugieren que la gamificación mejora la motivación, comprensión y retención de contenidos. Este estudio refuerza la necesidad de implementar prácticas gamificadas bien estructuradas y alineadas con objetivos pedagógicos claros.

Palabras clave: gamificación educativa; educación médica; eficacia percibida; aprendizaje significativo; retos gamificados





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INTRODUCTION

Do games truly enhance learning in medical education? At the Faculty of Medicine in Tampico, students face an intense academic workload, making it necessary to identify which game-based strategies are effective and which require reconsideration. This study analyzes four key elements of educational gamification—satisfaction, ease of use, perceived usefulness, and learning perception—with the aim of determining which ludic strategies most effectively enhance learning outcomes.

OBJETIVE

To determine which elements of educational gamification are associated with more effective learning among medical students by evaluating the impact of satisfaction with game-based dynamics, ease of recall, perceived usefulness, and learning perception.

METHODOLOGY

A quantitative, cross-sectional, and descriptive study with correlational analysis using multiple linear regression was conducted.

The sample included 109 third-year medical students from the Autonomous University of Tamaulipas (Tampico campus), who participated voluntarily and anonymously.

Data were collected using a 28-item digital Likert-type questionnaire (1–5) structured across four dimensions: meaningful learning, perceived usefulness, ease of recall, and satisfaction.

The instrument demonstrated expert-validated content validity and high internal consistency (Cronbach's $\alpha = 0.97$).

Data collection was performed via an online survey, and statistical analysis was conducted using SPSS to identify predictors of perceived effectiveness of gamified learning.

RESULTS

Multiple linear regression analysis showed that perceived meaningful learning and overall satisfaction with game-based dynamics were the primary predictors of the perceived effectiveness of gamified learning. These variables accounted for 67% of the total variance (Figure 1), suggesting that gamification enhances both comprehension and motivation among medical students.



Figure 1. Mean scores of the measured variables.

Table 1. Multiple linear regression analysis of the study variables.

Variable	Standardized Beta	Sig. (p)	Interpretation
Perception of meaningful learning	0.41	0.004	Significantly positive predictor of perceived efficacy.
Usefulness of challenges	0.27	0.028	Also contributes, although with less weight.
Ease of recall	0.09	0.215	Not significant.
Overall satisfaction	0.33	0.008	Good predictor, positively influences.

CONCLUSIONS

Game-based learning strategies strengthen active learning and student satisfaction. Gamification emerges as an effective educational tool for improving motivation, knowledge retention, and positive perceptions of the learning process in medical education.

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