

Interactive Gamification to Enhance Active Learning in Hematology and Health Determinants in University Students

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ABSTRACT

The objective of this pedagogical innovation experience was to enhance active learning in the Hematology and Health Determinants courses through gamification strategies. Through digital platforms such as Quizizz, Mentimeter and Educaplay, playful and interactive activities were implemented that significantly increased motivation (85.11% of positive responses) and content comprehension (95.75% of agreement or total agreement). In addition, 93.62% of the students considered Quizizz to be the most useful tool, highlighting its dynamism and immediate feedback. A total of 89.36% expressed interest in continuing to use these tools in other courses, which evidences their acceptance. Gamification also promoted active participation (97.87% indicated an increase) and strengthened collaborative work (100% recognized improvements, either significant or partial). Finally, 95.79% rated their level of understanding as good or excellent after implementation. These results confirm that gamification is an effective strategy to transform traditional educational dynamics, favoring meaningful, participatory and student-centered learning, which is key to respond to the challenges of higher education in Health Sciences.

Keywords: Gamification, active learning, didactic strategies.

INTRODUCTION

Educational innovation is fundamental to respond to the new demands of learning in higher education. In this context, a pedagogical innovation experience was implemented in the Hematology and Health Determinants courses at Universidad Continental, aimed at Medical Technology and Nursing students. The main objective was to strengthen active learning through gamification strategies using digital platforms such as Quizizz, Educaplay and Mentimeter. These tools allowed transforming the traditional teaching dynamics, promoting greater participation, motivation and understanding of the theoretical contents. Through interactive activities programmed weekly, students were able to apply the concepts learned in a playful way, receive immediate feedback and work collaboratively. The experience also sought to develop critical, analytical and technological competencies, necessary in the profile of future health professionals. This paper describes the process of implementing the innovation, the results obtained and the final reflections on its impact on learning, demonstrating that the use of active methodologies and emerging technologies can positively transform university education in Health Sciences.

METHOD

The present research is framed within the quantitative approach, with a descriptive, non-experimental, cross-sectional design. The objective was to analyze the impact of the implementation of gamification strategies in Hematology and Health Determinants courses, specifically in dimensions such as motivation, active participation, content comprehension and collaborative work among students.

The type of research is applied, since it seeks to offer concrete solutions to an educational problem identified in a specific context of higher education in Health Sciences. The intervention consisted of the systematic use of digital platforms such as Quizizz, Educaplay and Mentimeter, integrated in the theoretical and practical sessions throughout an academic semester.

For data analysis, descriptive statistics (absolute frequencies and percentages) were used, which were organized in tables that allowed a clear interpretation of student perception regarding the use of gamification as a didactic tool. The validity of the results was strengthened by applying the instrument anonymously and under ethical criteria of informed consent.

The population consisted of students enrolled in the courses of General Hematology and Health Determinants of the Continental University, belonging to the professional careers of Medical Technology and Nursing. For this research we worked with a census sample of 47 students, who actively participated in the gamification-based pedagogical innovation experience during the 2025-I academic semester. The sample was chosen as a non-probabilistic sample by convenience, considering that all participants were directly part of the intervention and were exposed to the use of the implemented digital platforms.

Data collection techniques and instruments

The survey technique was used for data collection, applied at the end of the intervention period. The instrument was a structured questionnaire elaborated ad hoc, composed of closed Likert-type questions and single selection, with the objective of knowing the student perception on key aspects such as motivation, participation, understanding of content, collaborative work and interest in the continued use of gamified tools.

The questionnaire was applied in digital format, guaranteeing anonymity and voluntary participation. The data obtained were systematized and analyzed using descriptive statistics, presenting the results in tables of absolute and relative frequencies (percentages) to facilitate the interpretation and discussion of the findings.

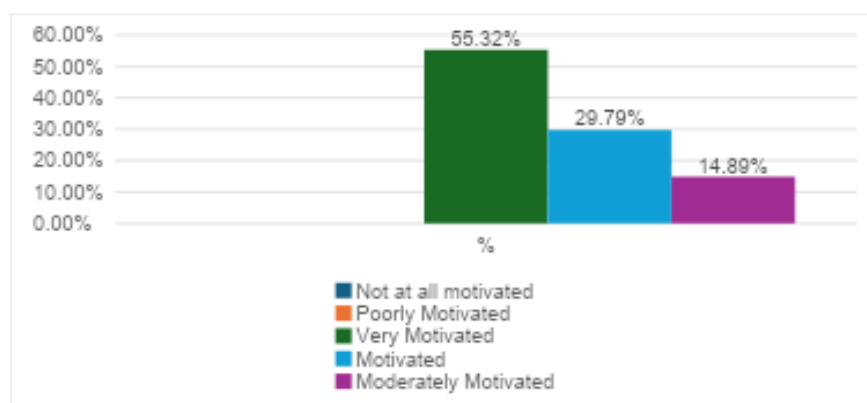
RESULTS

To evaluate the impact of the innovation, indicators of participation, academic performance and student perception were used.

Satisfaction surveys were applied where students rated the use of digital tools and their influence on their learning.

Table 1 Perceived level of motivation in gamification activities

Perceived level of motivation in gamification activities	fi	%
Not motivated at all	0	0.00%
Poorly Motivated	0	0.00%
Highly Motivated	26	55.32%
Motivated	14	29.79%
Moderately Motivated	7	14.89%
Total	47	100.00%

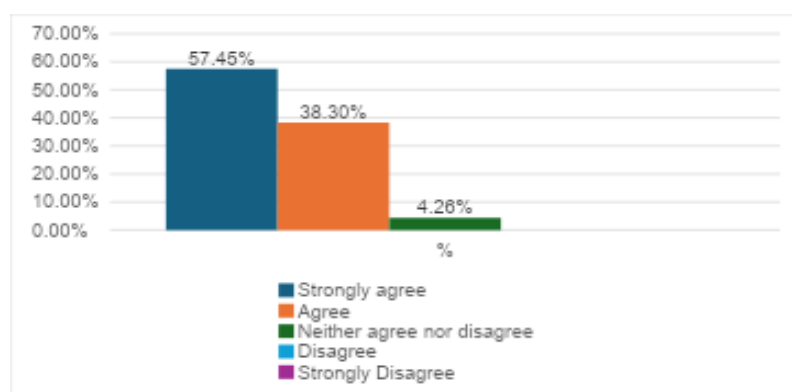


In response to the question "How motivated did you feel when participating in gamification activities? The results obtained show that most of the students perceived a high level of motivation when participating in gamification activities, since 55.32% declared themselves very motivated and 29.79% motivated, totaling

85.11% of positive responses between the two. Likewise, 14.89% indicated feeling moderately motivated, while there were no responses indicating that they were not very motivated or not motivated at all, which reflects that no student felt unmotivated by the activities. Taken together, these findings suggest that gamification proved to be an effective strategy to foster students' interest and active participation during the learning process.

Table 2 Perception of the usefulness of gamified platforms in the comprehension of content.

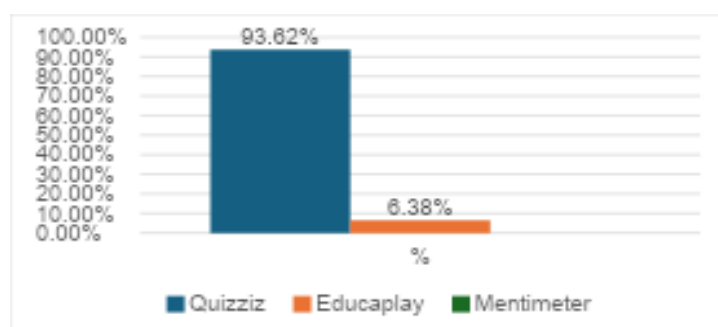
Perception of the usefulness of gamified platforms in the comprehension of content.	fi	%
otally agree	27	57.45%
Agree	18	38.30%
Neither agree nor disagree	2	4.26%
Disagree	0	0.00%
Strongly disagree	0	0.00%
Total	47	100.00%



For the question Do you consider that the platforms used (Quizizz, Educaplay, Mentimeter) facilitated the understanding of the topics? The results show that 57.45% of the students totally agreed and 38.30% agreed that the platforms used (Quizizz, Educaplay and Mentimeter) facilitated the understanding of the topics, totaling 95.75% of favorable opinions. Only 4.26% remained neutral, stating that they neither agreed nor disagreed, and there were no responses in disagreement or total disagreement. This distribution of responses evidences a highly positive perception regarding the impact of gamified platforms on the understanding of academic content, which highlights their value as a didactic tool in the teaching-learning process.

Table 3 Preference of gamified platforms for learning

Preference of gamified platforms for learning	fi	%
Quizizz	44	93.62%
Educaplay	3	6.38%
Mentimeter	0	0.00%
Total	47	100.00%

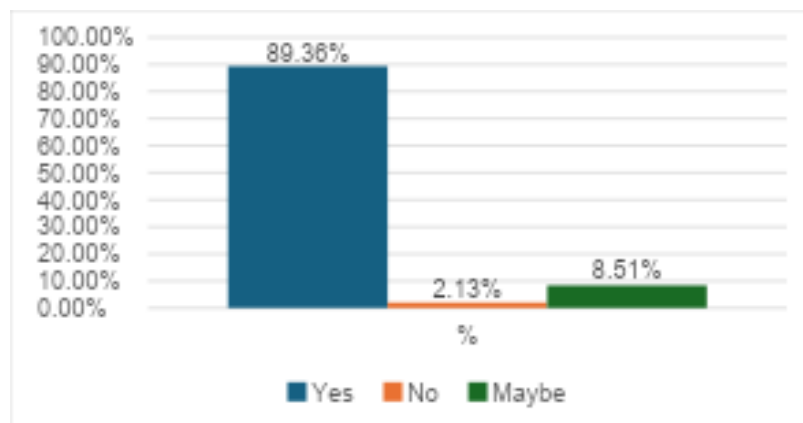


For the question Which platform did you consider most useful for your learning? The results reveal a clear student preference for the Quizizz platform, which was selected by 93.62% of respondents as the most useful

gamified tool for their learning, while Educaplay was preferred by only 6.38% and Mentimeter received no choice. This marked inclination towards Quizizz suggests that its interactive, dynamic and immediate feedback features are highly valued by students, consolidating it as the most effective option to favor the teaching-learning process in gamified contexts.

Table 4 Interest in continuing the use of gamified tools

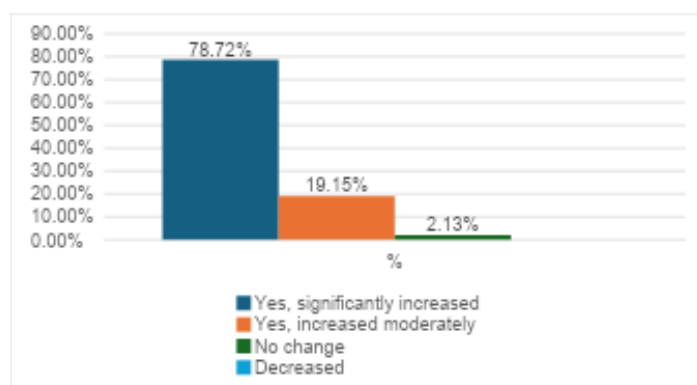
Interest in the continued use of gamified tools	fi	%
Yes	42	89.36%
No	1	2.13%
Maybe	4	8.51%
Total	47	100.00%



For the question Would you like to continue using these tools in other courses? The majority of students expressed interest in continuing to use gamified tools in their learning process, as 89.36% responded affirmatively. Some 8.51% indicated that they might be interested in continuing with their use, while only 2.13% expressed that they did not want to continue. These results reflect a high acceptance and satisfaction with the gamified strategies implemented, which suggests that their incorporation in future educational experiences could maintain and even enhance students' motivation and commitment.

Table 5 Impact of gamified activities on active participation.

Impact of gamified activities on active participation.	fi	%
Yes, significantly increased	37	78.72%
Yes, increased moderately	9	19.15%
No change	1	2.13%
Decreased	0	0.00%
Total	47	100.00%

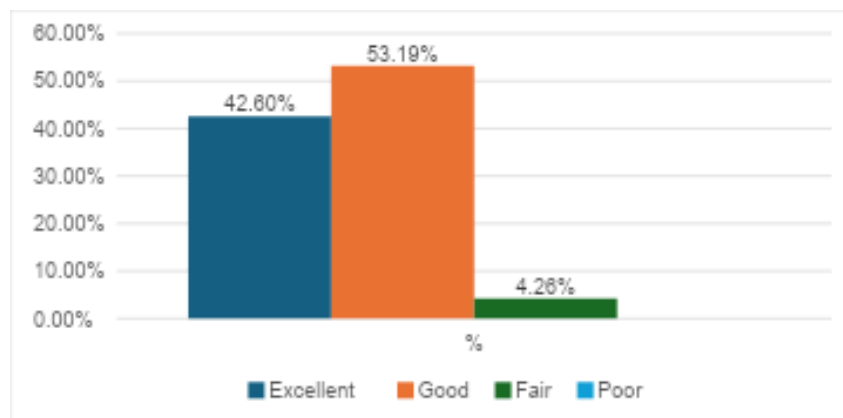


For the question Do you consider that your active participation increased thanks to the gamified activities? The results indicate that the gamified activities had a positive impact on students' active participation, since 78.72%

reported that their participation increased significantly and 19.15% indicated a moderate increase. Only 2.13% indicated no change, and no students reported a decrease in their participation. These findings confirm that the gamification strategies not only encouraged motivation, but also promoted a more dynamic and engaged participation in the educational process.

Table 6 Self-assessment of the level of comprehension after the use of gamified platforms.

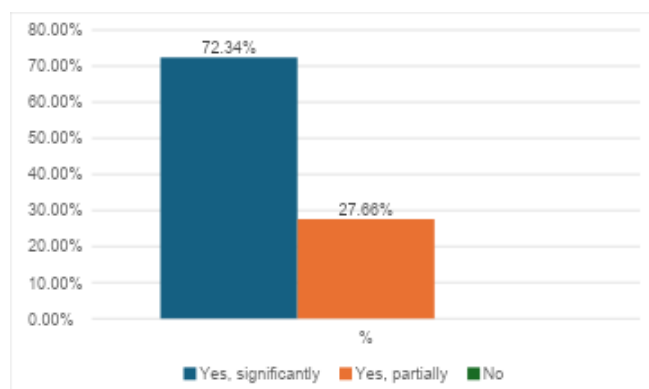
Self-assessment of the level of comprehension after the use of gamified platforms	fi	%
Excellent	20	42.60%
Good	25	53.19%
Fair	2	4.26%
Poor	0	0%
Total	47	100.00%



For the question How would you rate your level of understanding of the content after using gamified platforms? Most of the students positively evaluated their level of understanding after using gamified platforms, since 53.19% rated their understanding as good and 42.60% as excellent, totaling 95.79% of favorable ratings. Only 4.26% considered their understanding as regular, and no poor self-evaluations were reported. These results reflect that the use of gamified platforms was not only well received, but also effectively contributed to strengthening the understanding of academic content.

Table 6 Student perceptions of the impact of gamification on teamwork and collaboration

Strengthening collaborative work through gamification	fi	%
Yes, significantly	34	72.34%
Yes, partially	13	27.66%
No	0	0.00%
Total	47	100.00%



For the question Did gamification help strengthen teamwork and collaboration? The results show that gamification strengthened collaborative work among students, since 72.34% indicated that such strengthening was significant, while 27.66% stated that it was partial. No negative responses were recorded. These data show

that the implementation of gamified strategies not only had a positive impact on motivation and content comprehension, but also favored interaction and teamwork, essential elements for a more dynamic and participatory learning.

DISCUSSION

The results of the present research confirm that gamification is an effective pedagogical strategy to promote active learning in higher education contexts in Health Sciences. This conclusion aligns with that reported by Domínguez et al. (2013), who demonstrated that the implementation of gamification elements can increase student engagement and motivation, although they stress the importance of careful design to avoid distraction from the content.

The use of platforms such as Quizizz, which obtained an acceptance of 93.62% in this experience, coincides with the findings of Rodríguez-Ferrer et al. (2021) and Ramos Zaga (2021), who evidenced that tools such as Kahoot and Quizizz not only foster motivation, but are also associated with improvements in academic performance, thanks to the immediate feedback and the competitive nature of these applications.

Likewise, the 95.75% of positive perceptions regarding content comprehension after the use of gamified platforms is similar to the results of Anicama Silva (2020), who identified improvements in the academic performance of Education Sciences students after employing gamified strategies. This relationship can be explained from Ausubel's (1963) theory of meaningful learning, where the activation of prior knowledge and the active involvement of the student generate deeper and more lasting learning.

Regarding the strengthening of collaborative work (100% positive perceptions), parallels are evident with the proposal of Apaza Vera and Garnica Achahuanco (2022), who, in primary education contexts, also reported improvements in the collaborative resolution of arithmetic problems through gamification. This suggests that, regardless of educational level, gamification can develop key social competencies such as cooperation and communication.

The high levels of motivation (85.11%) and active participation (97.87%) observed are partly explained by what Landers (2014) pointed out in his gamified learning theory, in which game elements act as moderating variables that intensify the effects of instructional activities on learning.

On the other hand, the acceptance of the continued use of these tools (89.36%) confirms their perceived value and potential pedagogical sustainability. This finding is consistent with the meta-analysis of Hamari, Koivisto and Sarsa (2016), who, after reviewing multiple empirical studies, concluded that gamification tends to generate high levels of satisfaction and engagement when properly implemented.

From a methodological perspective, the descriptive and cross-sectional design used in the present experience shares similarities with other Peruvian research such as that of Ramírez Quispe and Vilca Echea (2022), who also addressed the use of Quizizz and Mentimeter in university education and found a positive impact on the development of digital and cognitive competencies.

Finally, the study confirms that digital tools not only make teaching more dynamic, but also contribute to a more participatory educational experience, centered on the student and adjusted to the challenges of the 21st century. This is related to Siemens' (2005) connectivism proposal, which states that learning in digital environments is nurtured by interaction, collaboration and technological accessibility, pillars clearly enhanced through gamified strategies.

CONCLUSIONS

Gamification significantly enhances student motivation: the implementation of digital tools such as Quizizz, Educaplay and Mentimeter generated high levels of motivation in students (85.11%), corroborating that the incorporation of playful dynamics promotes a more stimulating and participatory learning environment, in agreement with studies by Domínguez et al. (2013) and Landers (2014).

Gamified platforms favor the comprehension of academic content: 95.75% of students recognized an improvement in their comprehension, which validates the contribution of these strategies to the construction of meaningful learning, as pointed out by Ausubel (1963) and Anicama Silva (2020).

Quizizz stands out as the most valued tool: its dynamism, interactivity and immediate feedback position it as the platform preferred by 93.62% of the students. This finding coincides with previous research such as those of Ramos Zaga (2021) and Rodríguez-Ferrer et al. (2021), which highlight the potential of Quizizz and Kahoot in university contexts.

Gamification promotes active participation and collaborative work: 97.87% indicated an increase in their participation and 100% reported improvements in teamwork. This shows that these strategies not only have an impact on the individual, but also on the collective, strengthening essential social competencies, as also demonstrated by Apaza Vera and Garnica Achahuanco (2022).

High acceptance of gamification as a sustainable methodology: 89.36% of the participants expressed interest in continuing to use these tools in other courses, suggesting a positive perception towards their systematic inclusion in the university curriculum, supporting what Hamari, Koivisto and Sarsa (2016) pointed out regarding the sustainability of the gamified approach.

Gamification represents an effective pedagogical response to the current challenges of higher education in Health Sciences: by integrating emerging technologies with active methodologies, this didactic strategy contributes to the development of critical, analytical and technological competencies, responding to the profile of the 21st century professional.

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