Artículos

Genially gamification tool for teaching and learning Mathematics

Genially herramienta de gamificación para la enseñanza y el aprendizaje de las matemáticas

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Resumen

Este artículo propone el uso de la herramienta de gamificación Genially para la enseñanza y aprendizaje de las Matemáticas a estudiantes de primer año de Bachillerato de la Unidad Educativa Mario Oña Perdomo de Montúfar, provincia del Carchi, Ecuador. La metodología empleada fue

mixta, incorporando enfoques transversales, documentales, exploratorios y de campo. Se diseñaron diversas actividades para el proceso de enseñanza-aprendizaje de las Matemáticas a partir de los resultados de encuestas y entrevistas a estudiantes y docentes. El estudio demuestra que el método propuesto, que combina un estilo lúdico y participativo apoyado en la tecnología de Genially, es muy eficaz para mejorar la comprensión y el interés de los alumnos por las Matemáticas. Los resultados subrayan la capacidad de este enfoque no sólo para mejorar la experiencia de aprendizaje, sino también para proporcionar una evaluación significativa del progreso de los estudiantes. Se destaca la importancia de adoptar estrategias pedagógicas innovadoras que tengan eco en la generación actual de estudiantes. Se sugiere que la integración reflexiva de herramientas tecnológicas es esencial para maximizar el compromiso de los estudiantes.

Palabras clave: Genialidad, gamificación, matemáticas, enfoque lúdico y participativo, educación tecnológica.

Abstract

This article proposes the use of the Genially gamification tool for teaching and learning Mathematics to first-year Baccalaureate students at the Mario Oña Perdomo Educational Unit in Montúfar, Carchi Province, Ecuador. The methodology employed was mixed, incorporating cross-sectional, documentary, exploratory, and field approaches. Various activities were designed for the Mathematics teaching-learning process based on survey and interview results from students and teachers. The study demonstrates that the proposed method, which combines a playful and participatory style supported by Genially's technology, is highly effective in enhancing students' understanding and interest in Mathematics. The findings emphasize this approach's ability to not only improve the learning experience but also provide meaningful assessment of student progress. The importance of adopting innovative pedagogical strategies that resonate with the current generation of learners is highlighted. It suggests that the thoughtful integration of technological tools is essential for maximizing student engagement.

Keywords: Genially, gamification, mathematics, playful and participatory approach, technological education.

Introduction

In the contemporary educational context, the integration of digital tools and innovative strategies has become essential to enhance teaching and learning. Gamification, a pedagogical approach that incorporates game elements in educational settings, has emerged as a powerful tool to motivate students and improve their participation in the learning process (Gómez & Porras, 2018). In this context, the Genially tool is presented as a versatile and dynamic resource that allows the creation of gamified experiences in the teaching of Mathematics (Orellana-Cordero et al., 2020) (Ponce y Ochoa, 2021). (Zambrano & Rodríguez, 2022).

Genially offers the possibility of transforming educational content into interactive and attractive presentations, integrating visuals, multimedia and gamification elements in an intuitive way (Trejo, 2019). This approach seeks not only to convey mathematical concepts in a conventional way, but also to engage students in a playful and participatory way (Jiménez et al., 2020). Gamification with Genially thus becomes a didactic strategy that fuses the academic rigor of Mathematics with fun and commitment, creating a stimulating educational environment that promotes the deep understanding of concepts and the practical application of mathematical skills (Armie & Membrive, 2022).

The Genially tool can be effectively leveraged to design and apply gamified strategies in the teaching of Mathematics at various educational levels (Orellana-Cordero et al., 2020). By immersing yourself in the possibilities and specific features of Genially, you will discover how this tool not only facilitates the presentation of content, but also enhances the creativity of the teacher and the active participation of the students, generating a more dynamic, interactive and effective educational environment (Bustos, 2023).

In this study, we propose the Genially gamification tool for the teaching and learning of Mathematics in the students of the first year of Baccalaureate of the Educational Unit "Mario Oña Perdomo", canton Montúfar, province of Carchi, Ecuador. Specifically, gamified didactic strategies are developed with the Genially tool in the teaching and learning of Mathematics.

Methodology

Study Site Description

The research was carried out at the "Mario Oña Perdomo" academic institution located in the parish of San José, canton Montúfar, province of Carchi, northern Ecuador. The "Mario Oña Perdomo" educational center belongs to Zone 1 – District 04D02 Montúfar Bolívar, AMIE code 04H0034. It is an urban Educational Institution, it works in face-to-face mode with a morning session, its type of education is regular and with educational level: Initial, Basic Education and Baccalaureate. It's a Fiscal Institution, it's in a Sierra school system." It has a total of 81 teachers, 3 directors, 6 administrative staff and 1631 students

Focus and type of research

The methodology had a mixed approach because it allowed us to measure the variables more accurately and understand how they relate to the gamification tool Genially and the teaching-learning process of the subject of Mathematics. It was framed in a type of descriptive research because the relevant facts in the teaching-learning process of the subject of mathematics were identified and described.

Research phases

The development of gamified didactic strategies with the Genially tool in the teaching-learning of Mathematics for students in the first year of Baccalaureate was divided into several phases or stages.

Research & Planning

A review of the literature on gamification in education and its impact on mathematics teaching was conducted.

The specific learning objectives for the Mathematics course of the first year of Baccalaureate were identified.

The functionalities of the Genially tool and its ability to gamify educational content were explored.

Definition of Gamified Objectives

Clear educational objectives were established to be achieved through gamification.

Key math concepts and skills to be addressed throughout gamification were identified.

Gamified Structure Design

Different mathematical assessment tests were designed in line with the objectives of the course.

Interactive Content Creation

Genially was used to develop interactive resources that facilitate the teaching of mathematical concepts.

Multimedia elements, such as videos, images, and graphics, were integrated to make the experience more engaging.

It was ensured that the contents are accessible and understandable for students in the first year of Baccalaureate.

Bioethical considerations

The subjects involved in this study were first-year high school students and mathematics teachers. The students are under 18 years of age, so consent was sought from the legal representatives. The purpose of the study was made known to the teachers through a talk, requesting their authorization and acceptance. They were verbally informed of the most relevant aspects of the research and it was clarified that the participant can withdraw at any time from the research process and confidentiality is maintained.

Results

Phases of the Proposal

Phase 1: Planning

A project plan was decided that specified the people involved, the procedure and the expected outcomes at each step, including design and development.

Phase 2: Design

It was necessary to specify the schemes that allowed the objectives of the course to be achieved, so it is crucial that the objectives set during the planning phase are in line with the elements to be developed

Phase 3: Development

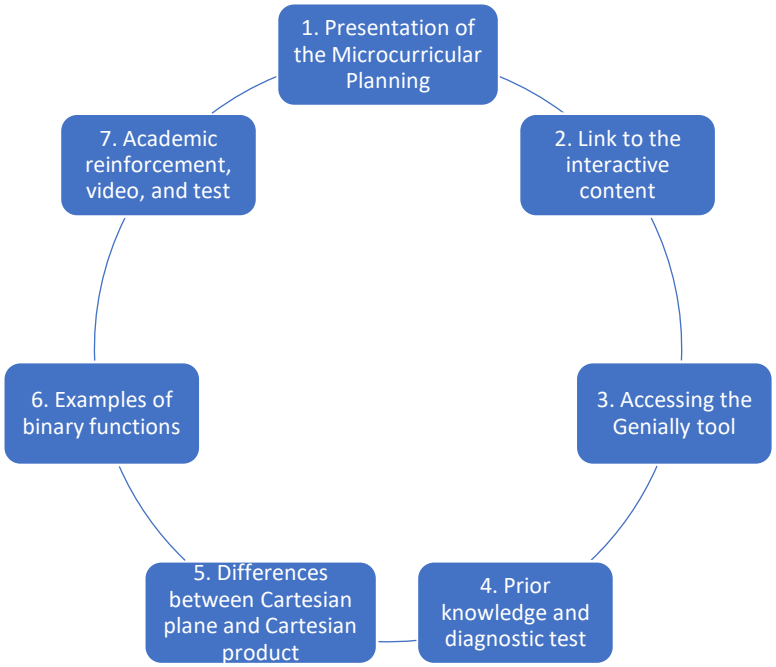
In this phase of development, the planned and designed actions were updated. The writing tool made it possible to develop the system's own games, and each content area had a challenge activity.

Proposal Activities

For the activity (Figure 1), within the framework of the Microcurricular Planning, the teacher provided students with access to the interactive content through the link provided in the Genially tool: https://view.genial.ly/64a5fe8e0a087f00176cc9ad/presentation-funcionesxp1. In this virtual environment, the topic was introduced and the objectives were clearly established. The session began by activating the students' prior knowledge and carrying out a diagnostic test to assess the initial level of understanding. During the presentation, the fundamental differences between the Cartesian blueprint and the product were addressed. Subsequently, the conceptualization of binary functions was deepened, addressing illustrative examples of reflexive, symmetric and transitive functions.

As part of the academic reinforcement, an educational audiovisual material was incorporated, followed by an evaluation in the form of a test to consolidate learning effectively. This comprehensive pedagogical approach sought to maximize students' understanding and engagement through an interactive educational experience tailored to their learning needs.

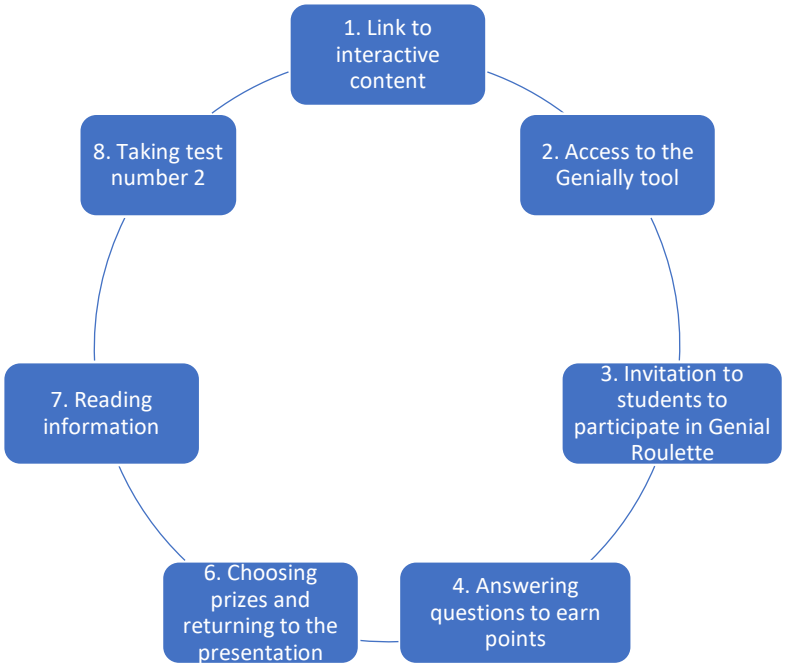
Figure 1. Activity One of the Proposal



For activity 2 (Figure 2), using the link provided (https://view.genial.ly/64a95351f084cc0011088884/presentation-funcionesxp2), students were directed to the interactive presentation in Genially. In this environment, they were invited to participate in the dynamics of "cool roulette", designed to consolidate the knowledge acquired in the previous class. By answering specific questions, students had the opportunity to accumulate points and select a prize from options such as pet, trip or box, and then return to the presentation.

The detailed information on slides 4 and 5 was presented to delve deeper into the topic, followed by an educational video on slide 6. To assess comprehension, test 2 on mathematical functions was performed. This playful and participatory approach sought not only to reinforce previous concepts, but also to maintain students' interest and motivation throughout the lesson, using Genially's technology effectively as a pedagogical resource.

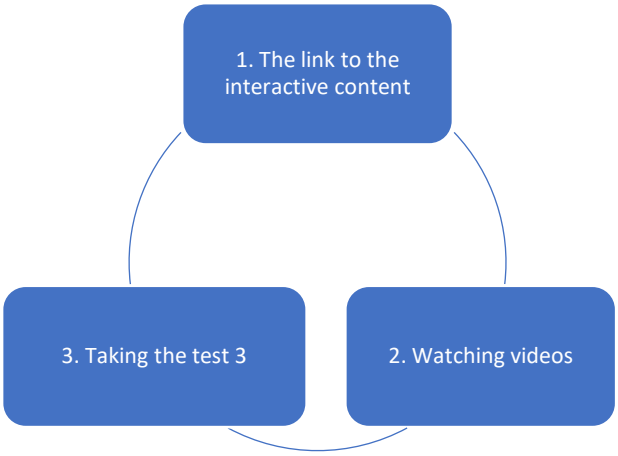
Figure 2. Activity two of the proposal



For activity 3 (Figure 3), the interactive content of slides 2, 3, 4 and 5 in the Genially presentation (https://view.genial.ly/64aff0081623280019192aa0/presentation-funcionesxp3) was explored and was an essential component of the learning session. Through these slides, students had the opportunity to delve into the fundamental concepts related to mathematical functions. In addition, comprehension was enriched by watching a video dedicated to mathematical asymptotic graphs.

This audiovisual resource provided a practical and visually stimulating perspective, contributing to the internalization of concepts. To evaluate and consolidate the knowledge acquired, Test 3 on real functions was implemented, providing students with an opportunity to apply what they have learned and strengthen their skills in this specific subject. This comprehensive approach, which combined interactive content, audio-visual material, and hands-on assessment, sought to enrich the learning experience and ensure a solid understanding of real mathematical functions.

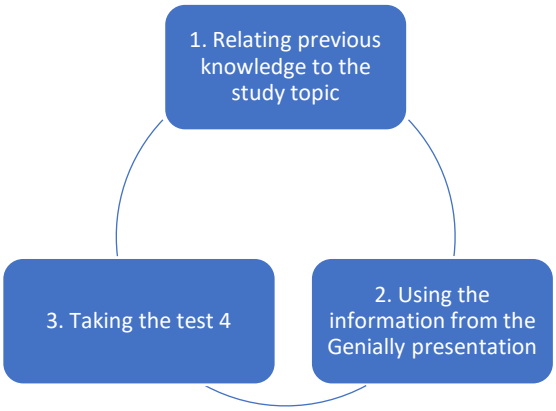
Figure 3. Activity three of the proposal



For activity 4 (Figure 4), significant connections were established between prior knowledge and the central topic of study, which in this case addresses the linear function and the slope of the line, which is a crucial step in the educational process. By leveraging the interactive presentation in Genially, which included content, images, and a specifically designed video, students were able to develop a deeper understanding of concepts related to linear functions and associated features, such as line slope.

The use of various visual and multimedia resources in Genially not only facilitated the assimilation of information, but also contributed to making the learning experience more engaging and participatory. As a measure of evaluation and practical application of the knowledge acquired, Test 4 on linear functions was implemented, offering students the opportunity to demonstrate their understanding and skills in relation to this specific topic. This comprehensive pedagogical approach sought not only to convey information, but also to encourage reflection and practical application to strengthen the understanding of linear functions and the slope of the line.

Figure 4. Activity Four of the Proposal



Discussion

The successful integration of the Genially tool into the framework of Microcurricular Planning, according to the results obtained, resonates with the growing trend in the educational literature that highlights the effectiveness of interactive technologies to improve teaching and learning. Recent studies have highlighted the importance of using digital platforms such as Genially to create dynamic and accessible virtual environments, which is in line with what has been expressed by Orellana-Cordero et al. (2020), in which he emphasizes that both educators and students consider that virtual learning environments should have psychopedagogical and didactic components. Novay et al. (2023), emphasizes that virtual environments for the subject of Mathematics favor the diversification of activities, adjusting to the needs and requirements of students. Likewise, the implementation of didactic strategies facilitates the promotion of educational games and collaboration at work. The activation of prior knowledge and the application of diagnostic tests at the beginning of the session are also supported, as these strategies have been shown to promote better student understanding and engagement (Berrocal & Ramírez, 2019).

The specific attention to the differences between the Cartesian plane and the product, as well as the detailed conceptualization of binary functions, reflect a concern to address fundamental

concepts in a comprehensive manner. Previous research has emphasized the importance of clear and detailed instruction in math, and this study aligns with that approach, using Genially's technology to improve content presentation (Catalán & Gómez, 2020). (Enriquez, 2020)

The inclusion of academic reinforcement elements, such as educational audiovisual materials and assessments in the form of tests, is supported by research indicating that the variety of assessment resources and methods contribute to more effective retention and consolidation of concepts (Romanian-González et al., 2019) (Bravo et al., 2021) (Zheng, 2022) . Taken together, the results suggest that combining traditional pedagogical strategies with interactive technological tools can offer a balanced and effective approach to teaching and assessment in contemporary educational settings.

On the other hand, the results obtained from the implementation of the "cool roulette" dynamic highlight the importance of playful and participatory strategies to reinforce students' prior knowledge. This approach aligns with current research that underscores the efficacy of pedagogical methods that integrate elements of play and participation to improve retention and understanding of academic concepts (Hernández-Horta et al., 2018) (Álvarez et al., 2020) (Soler-Cifuentes et al., 2021). The accumulation of points and the choice of prizes introduce a motivating component, supporting the idea that gamification can not only reinforce the concepts taught, but also keep students interested and motivated (Alsawaier, 2018) (Saleem et al., 2022).

The detailed presentation of information on the slides (not shown), followed by an educational video, demonstrates an effective combination of multimedia resources to delve deeper into the topic. The inclusion of these visuals is supported by studies that highlight the importance of multimodality in teaching to cater to diverse learning styles (Joyce & Feez, 2018).

The assessment of comprehension through Test 2 on mathematical functions reinforces the idea that the incorporation of formative and summative assessments is essential to measure learning and guide future instruction. These results align with the literature highlighting the need for a balanced approach to assessment for a complete understanding of student progress (Gess-Newsome et al., 2019) (Jerrim et al., 2022)

The results of the integration of multimedia elements and practical evaluation in the present study offer a valuable perspective on the effectiveness of comprehensive pedagogical

approaches in the teaching of mathematical functions. The opportunity provided for students to delve into foundational concepts through interactive slides aligns with the current trend of using digital resources to enrich instruction. Recent studies support the idea that interactivity and concept visualization can improve information comprehension and retention (Buehl, 2023).

The inclusion of a video dedicated to mathematical asymptotic graphs provides a practical and visually stimulating element, which is consistent with research suggesting that presenting information in a multimodal manner can promote comprehension (Meneses et al., 2018) (Zhang et al., 2020). The internalization of concepts through audiovisual resources represents a pedagogical approach that recognizes the diversity of students' learning styles (Bernad-Cavero & Llevot-Calvet, 2018).

The results obtained by taking advantage of the interactive presentation in Genially reflect the effectiveness of the integration of interactive technologies to improve the understanding of specific mathematical concepts, in this case, linear functions and the slope of the line. Recent studies support the idea that the use of visual and multimedia resources can improve the assimilation of information and make the learning experience more engaging and engaging (Molina et al., 2018) (Rojas Flores et al., 2018) (Updated & Chacin, 2022).

The inclusion of interactive content, images, and a specifically designed video in Genially provided students with a more immersive experience, allowing them to actively explore the concepts presented. This approach is consistent with the educational literature that advocates the use of interactive technologies to encourage the active participation of students and promote more autonomous learning (Tuma, 2021) (Serrano et al., 2019) (Zainuddin, 2018).

The implementation of Test 4 on linear functions as an assessment measure and practical application underscores the importance of formative assessment in measuring learning and guiding future instruction. This approach aligns with the current trend of using assessments integrated into the learning process to strengthen understanding and apply the knowledge gained in practical situations.

Conclusions and recommendations

The findings of this study suggest that the playful and participatory approach, supported by Genially's technology, can be a valuable strategy to strengthen students' understanding and interest in mathematical topics, while offering an effective assessment of their learning. These results highlight the relevance of adopting innovative pedagogical approaches adapted to the needs of the current generation of students.

The implementation of the Real Function Test as a practical assessment measure reinforces the idea that formative and summative assessment is essential to measure learning and guide future instruction. The combination of interactive content, audio-visual material and practical assessment forms a comprehensive approach that not only enriches the learning experience, but also seeks to ensure a solid understanding of real mathematical functions. These results support the notion that the combination of diverse pedagogical strategies can have a positive impact on academic achievement and knowledge retention.

Finally, the results suggest that the comprehensive pedagogical approach used not only conveyed information effectively, but also encouraged reflection and practical application to strengthen the understanding of linear functions and line slope. These findings support the idea that careful integration of interactive technologies into the educational process can have a positive impact on student academic achievement and engagement.

It is recommended to consider integrating innovative pedagogical approaches that use interactive technologies such as Genially to engage students effectively. The adoption of educational methods adapted to the needs and preferences of today's generation can be instrumental in fostering more meaningful and motivating learning. In addition, the continuous exploration of technological tools and innovative pedagogical methods is suggested, maintaining a student-centered approach and the continuous improvement of educational quality.

It is suggested to continue with the integration of varied and practical assessments in the educational process. The combination of interactive content, audio-visual material and hands-on assessment represents a comprehensive approach that has proven to enrich the learning experience. It is suggested to continue exploring and adapting diversified pedagogical strategies to address the different learning modalities of students and ensure a solid understanding of real mathematical concepts. This integrated and balanced approach can have

a positive impact on both academic achievement and long-term knowledge retention. In addition, it is recommended that educational strategies be continuously reflected and adjusted according to the specific needs and outcomes of the group of students.

Finally, it is recommended to continue the careful integration of interactive technologies into the educational process. Attention to reflection and practical application is crucial, and it is suggested to maintain a student-centered approach to ensure the relevance and applicability of the concepts learned.

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