

Gamified flipped classroom as a pedagogical strategy in higher education: From a systematic vision

Aula invertida gamificada como estrategia pedagógica en la educación superior: Desde una visión sistemática

Anghelo Josué Guerrero-Quiñonez

anghelo.guerrero@utelvt.edu.ec

<https://orcid.org/0000-0002-3253-685X>

Technical University Luis Vargas Torres of Esmeraldas,
Ecuador

Olga Quiñónez Guagua

olga.quinonez@utelvt.edu.ec

<https://orcid.org/0000-0001-7415-8466>

Technical University Luis Vargas Torres of Esmeraldas,
Ecuador

Rosa Graciela Barrera-Proaño

rosa.barrera.proano@utelvt.edu.ec

<https://orcid.org/0000-0002-2152-866X>

Technical University Luis Vargas Torres of Esmeraldas,
Ecuador

ABSTRACT

The gamified flipped classroom is a pedagogical strategy that combines the principles of the flipped classroom model with gamification elements to improve the learning experience in higher education. From a systematic vision, this strategy is based on careful planning and the integration of different components to achieve a motivating and effective learning environment. First of all, the flipped classroom model implies that students acquire basic concepts outside of the classroom, through resources such as videos, readings or interactive materials. Then, in the classroom, time is spent applying those concepts through hands-on activities, discussion, and collaboration. This investment of class time allows students to work more actively and deeply with the contents, favoring the understanding and application of knowledge. On the other hand, gamification refers to the application of game elements and principles in the educational context. This includes the use of challenges, rewards, competitions, and immediate feedback to motivate students and encourage their engagement in learning. Gamification also promotes active participation, collaboration, and problem solving, which improves knowledge retention and the learning experience. By combining the flipped classroom with gamification, a dynamic and stimulating learning environment is created in higher education. Students have the opportunity to explore concepts on their own, before class, allowing them to arrive prepared and ready to more actively participate in classroom activities. In addition, gamification adds a playful and competitive element that motivates students to push themselves and improve themselves. From a systematic view, the gamified flipped classroom requires careful content planning, the appropriate selection of digital tools, and the design of challenging and meaningful activities. It also involves continuous assessment to measure student progress and adjust strategies accordingly.

Keywords: Flipped classroom, pedagogical strategy, higher education, learning environments.

RESUMEN

El aula invertida gamificada es una estrategia pedagógica que combina los principios del modelo de aula invertida con elementos de gamificación para mejorar la experiencia de aprendizaje en la educación superior. Desde una visión sistemática, esta estrategia se basa en una planificación cuidadosa y en la integración de diferentes componentes para lograr un ambiente de aprendizaje motivador y efectivo. En primer lugar, el modelo de aula invertida implica que los estudiantes adquieran los conceptos básicos fuera del aula, a través de recursos como videos, lecturas o materiales interactivos. Luego, en el aula, se dedica tiempo a la aplicación de esos conceptos a través de actividades prácticas, discusiones y colaboración. Esta inversión del tiempo de clase permite que los estudiantes trabajen de manera más activa y profunda con los contenidos, favoreciendo la comprensión y la aplicación del conocimiento. Por otro lado, la gamificación se refiere a la aplicación de elementos y principios de los juegos en el contexto educativo. Esto incluye el uso de desafíos, recompensas, competencias y retroalimentación inmediata para motivar a los estudiantes y fomentar su compromiso con el aprendizaje. La gamificación también promueve la participación activa, la colaboración y la resolución de problemas, lo que mejora la retención de conocimientos y la experiencia de aprendizaje. Al combinar el aula invertida con la gamificación, se crea un entorno de aprendizaje dinámico y estimulante en la educación superior. Los estudiantes tienen la oportunidad de explorar los conceptos por su cuenta, antes de la clase, lo que les permite llegar preparados y listos para participar de manera más activa en las actividades en el aula. Además, la gamificación agrega un elemento lúdico y competitivo que motiva a los estudiantes a esforzarse y superarse a sí mismos. Desde una visión sistemática, el aula invertida gamificada requiere una planificación cuidadosa de los contenidos, la selección adecuada de herramientas digitales y el diseño de actividades desafiantes y significativas. También implica la evaluación continua para medir el progreso de los estudiantes y ajustar las estrategias en consecuencia.

Palabras clave: Aula invertida, estrategia pedagógica, educación superior, ambientes de aprendizaje.

INTRODUCTION

In higher education, it is essential to explore innovative pedagogical strategies that promote active, meaningful and motivating learning for students. One of these emerging strategies is the gamified flipped classroom, which combines the flipped learning approach with gamification elements to transform the educational experience in the context of higher education. This strategy is based on a systematic vision that integrates pedagogical, technological and motivational aspects to achieve more effective and attractive learning.

In this introduction, we will explore the concept of the gamified flipped classroom as a pedagogical strategy in higher education from a systematic perspective. The key elements of this strategy will be discussed and arguments supported by citations and relevant literature references will be presented that highlight the benefits and effectiveness of its

implementation.

Higher education is undergoing a significant shift towards a student-centered approach, where active participation and knowledge construction are encouraged. The flipped classroom, also known as the flipped classroom, has emerged as a promising pedagogical strategy that reverses the traditional order of teaching and learning by transferring the presentation of content outside of the classroom and using class time for practical and application activities (Lozano, L. M., & Pérez, A. 2020).

Gamification, on the other hand, employs game elements in a non-gaming context to motivate and engage students. By applying game principles and mechanics, such as challenges, rewards, and competitions, a more engaging and motivating learning environment is created. The combination of the flipped classroom and gamification gives rise to an enriched pedagogical approach, where students are actively involved in their learning process through interactive, collaborative and playful activities (Hamari, J., Koivisto, J., & Sarsa, H. 2014).

From a systematic vision, the gamified flipped classroom considers various interrelated aspects to guarantee the effectiveness of the approach. This implies the appropriate selection of technological platforms, the development of interactive and attractive content, the structuring of collaborative activities and meaningful evaluations, as well as the motivation and continuous commitment of students (Hew, K. F., & Lo, C. K. 2018).

The application of the gamified flipped classroom in higher education has shown significant benefits, such as greater student engagement and motivation, deeper learning, and improved academic results. Furthermore, this strategy can promote key skills for the 21st century, such as problem solving, collaboration and critical thinking (Sailer, M., Hense, J. U., Mayr, S. K., & Mandl, H. 2017).

DEVELOPMENT

Gamification in higher education

Gamification in higher education has been the subject of study and research by various authors, who have developed criteria and approaches to understand its application and benefits. The views of some of these authors are presented below:

Karl M. Kapp: Kapp (2012) points out that gamification in higher education involves using game elements and principles, such as challenges, rewards, and competitions, to motivate and engage students in the learning process. He highlights that gamification encourages active participation, collaboration and problem solving, thus improving knowledge retention and the learning experience.

Yu-Kai Chou: Chou (2015) proposes a framework called Octalysis, which focuses on eight main areas of human motivation to design effective gamification experiences. These areas include elements such as epic meaning, development and achievement, empowerment, and belonging. According to Chou, by incorporating these elements into higher education, students' intrinsic motivation and commitment to learning can be increased.

Sebastian Deterding: Deterding (2014) highlights that gamification in higher education must be designed carefully and considering the needs and characteristics of students. He proposes avoiding the superficial approach of simply adding points or badges to learning activities and instead focusing on creating meaningful and authentic experiences that promote students' intrinsic motivation and engagement.

Andrzej Marczewski: Marczewski (2015) proposes the use of a framework called "User Types Hexad" for the implementation of gamification in higher education. This framework classifies students into six different types based on their preferences and motivations, such as achievement, socialization, altruism, influence, exploration, and mastery. By knowing student profiles, educators can tailor gamification strategies to meet individual needs and increase student engagement and engagement.

Lee Sheldon: Sheldon (2012) proposes the application of gamification through the creation of role-playing games in the classroom. His approach is based on the idea that students take on specific roles in a simulated game context, where they must face challenges and make decisions that affect their progress in the game. According to Sheldon, this methodology encourages immersion, collaboration, and active learning, giving students a more meaningful and motivating learning experience.

These authors have contributed to the understanding of gamification in higher education, offering different perspectives and approaches for its effective implementation. Integrating the principles and elements of games in higher education can promote students' intrinsic motivation, enhance participation and engagement, and facilitate deeper and more meaningful learning.

Gamified system design

The design of a gamified system is a complex process that requires considering several key elements to ensure its effectiveness and success. Some important aspects to take into account when designing the gamified system are described below:

Clear objectives: It is essential to establish clear objectives and define what is expected to be achieved with the implementation of the gamified system. This can include increasing student engagement, improving intrinsic motivation, strengthening specific skills, or fostering collaboration, among others.

User identification: It is essential to understand the characteristics and needs of the users of the gamified system. This involves knowing your level of experience, your preferences, interests and motivations, in order to adapt the design and elements of the game to your specific characteristics.

Selection of suitable game elements: The gamified design must include a careful selection of the game elements to be used, such as points, levels, challenges, rewards, leaderboards, narratives and avatars, among others. These elements must be aligned with the objectives of the system and be relevant and motivating for users.

Feedback and rewards: The gamified system must provide constant and relevant feedback to users about their progress and performance. In addition, meaningful and motivating rewards should be offered to recognize user achievement and encourage their participation and commitment.

Adaptability and personalization: It is important to design the gamified system in such a way that it allows the adaptability and personalization of the user experience. This means offering alternative routes and options, providing the ability to choose activities or challenges based on individual interests, and allowing users some degree of control over their progress in the system.

Integration with the curriculum: The design of the gamified system must ensure proper integration with the academic curriculum. The elements and activities of the game must be aligned with the contents and learning objectives established in the curriculum, so that the gamified system supports and enriches teaching and learning.

Evaluation and monitoring: It is essential to design an evaluation and monitoring system that allows collecting data and measuring the impact and effectiveness of the gamified system. This may include monitoring the progress of users, analyzing their participation and performance, and making adjustments or improvements to the system design based on the results obtained.

These are just some key aspects to consider when designing a gamified system in higher education. It is important to note that the design must be iterative and flexible, allowing for feedback from users and continuous improvement of the system over time.

Dimensions or categories of gamification

When designing a gamified system, it is useful to consider different dimensions or categories that help structure and organize the elements of the game. These dimensions may vary according to the approaches and models proposed by different authors, but below are some of the common dimensions used in gamification:

Game mechanics: This dimension refers to the specific elements of the game, such as points, levels, challenges, rewards, leaderboards, avatars, narratives, among others. These mechanics are used to motivate, engage and guide users through the gamified system.

Game dynamics: Game dynamics refer to the behavior patterns and interactions that occur within the gamified system. This includes activities such as competition, cooperation, exploration, problem solving, and decision making. Game dynamics are essential to generate engagement and keep users motivated.

Social components: This dimension focuses on the social interactions that are fostered in the gamified system. It can include elements such as user collaboration, teamwork, communication, peer feedback, and community interaction. The social components are important to encourage active participation and a sense of belonging of the users.

Aesthetics and design: This dimension is related to the visual aspect and the aesthetic experience of the gamified system. It includes elements such as interface design, graphics, colors, sounds, and music. An attractive and well-executed design can influence the perception and experience of users, generating greater interest and commitment.

Progression and personalization: This dimension refers to the ability of the gamified system to adapt and adjust to the individual needs of users. It can include the ability to choose different learning paths, avatar or character customization, individual goal setting, and personalized feedback. Progression and personalization are important to increase intrinsic motivation and user engagement.

These dimensions represent just one way of organizing the gamification elements, and may vary depending on the approach and model used. However, they provide a useful basis for considering the different aspects that can influence the effectiveness and design of a gamified system.

Digital tools for gamification

There are several digital tools that can be used to implement gamification in the educational field. These tools offer different functionalities and features that facilitate the creation of interactive and engaging gamified experiences. Here are some popular tools for gamification:

Classcraft: Classcraft is an online platform that allows you to gamify the classroom. Provide game elements such as points, levels, and rewards to motivate and engage students. It also offers tools for classroom management, tracking student progress, and creating challenges and missions.

Kahoot!: Kahoot! is a game-based learning tool that allows you to create interactive quizzes, polls, and discussions. Students can participate in real time using their mobile devices and compete for points and rankings in a fun and competitive gaming environment.

Breakout EDU: Breakout EDU is a platform that offers gaming experiences in the classroom, based on puzzle solving and collaboration. Students work in teams to solve problems and unlock locks using physical and digital items. The platform provides predefined resources and scenarios, as well as tools for educators to create their own gamified activities.

Classcraft Studio: Classcraft Studio is a tool that allows educators to design their own personalized gamified experiences. It offers a wide range of game elements, such as points, avatars, equipment and power-ups, which can be adapted according to the needs and objectives of the classroom.

Minecraft: Minecraft is a construction and adventure video game that can be used as a gamification tool in the classroom. Educators can create in-game scenarios and missions that require the application of specific concepts and skills. Minecraft encourages creativity, collaboration, and problem solving, making it a powerful tool for gamification in learning.

These are just some of the digital tools available for gamification in education. It is important to explore and select the tool that best suits the objectives and specific needs of each educational context. In addition, it is advisable to consider the integration of multiple tools and approaches to provide a rich and varied gamified experience.

Flipped learning in higher education

The flipped learning or inverted classroom approach in higher education has been the subject of research and analysis by several authors, who have provided different perspectives and approaches on its implementation and benefits. The views of some of these authors are presented below:

Jonathan Bergmann and Aaron Sams: Bergmann and Sams (2012) are considered the pioneers of flipped learning. They emphasize that this approach involves reversing the traditional teaching structure, where students acquire knowledge outside of the classroom by reviewing multimedia materials, such as videos, and then spend class time on practical application and problem solving. They argue that this allows for more active and personalized learning, as students have the opportunity to delve into concepts and receive individualized support during class time.

Eric Mazur: Mazur (2009) is known for his work in the field of active teaching and the implementation of the "peer learning" technique. From his perspective, flipped learning provides an opportunity to implement more interactive teaching strategies, such as group discussion and debate, which encourages active student participation and allows them to build their own knowledge.

Robert Talbert: Talbert (2017) highlights the importance of proper organization and structuring of content in a flipped learning environment. He argues that pre-study materials must be carefully designed to guide students toward learning objectives, and that classroom spaces must be planned to promote interaction and application of concepts. According to Talbert, the key to the success of flipped learning lies in good planning and instructional design.

José Antonio Bowen: Bowen (2012) emphasizes that flipped learning not only implies changing the order of activities, but also rethinking the role of the teacher. From his perspective, teachers must move from being mere transmitters of knowledge to facilitators of learning. Bowen stresses the importance of taking advantage of class time to develop critical thinking skills, collaboration, and the practical application of knowledge.

Peter Pappas: Pappas (2013) highlights the importance of continuous feedback in flipped learning. He argues that teachers should provide students with regular feedback on their progress and performance, both during pre-study and in-class activities. Pappas also highlights the need to incorporate formative and summative assessments to effectively assess student learning.

These authors have contributed to the understanding of flipped learning in higher education, providing different perspectives and recommendations for its successful implementation. His ideas highlight the importance of active student participation, personalization of learning, and redefinition of the role of the teacher to promote more meaningful and effective learning.

AI and the Flipped classroom in higher education

The integration of Artificial Intelligence (AI) in the Flipped Classroom model has generated new opportunities and approaches in higher education. AI can play an important role in the flipped learning process by providing support and personalization for learners. Here are some ways AI can complement and enhance the Flipped Classroom in higher education:

Data collection and analysis: AI can help collect and analyze large amounts of student-generated data, such as responses to assessment questions or activity logs on online learning platforms. This allows educators to gain insight into student performance and difficulties, which in turn makes it easier to tailor content and activities to meet their individual needs.

Learning Personalization: The AI can use the data collected to personalize the learning process. You can offer personalized recommendations about the content to review, the activities to complete and the additional resources that can benefit each student. This allows students to progress at their own pace and address their areas of weakness, which promotes more efficient and effective learning.

Instant Feedback: AI can provide instant feedback to students on their performance on activities and assessments. You can identify common mistakes, suggest alternative approaches, and provide detailed explanations to help students understand and correct their mistakes. This allows for a more autonomous learning process and provides immediate guidance for skill development.

Virtual assistants: AI-based virtual assistants, such as chatbots or conversation agents, can be available to answer questions and provide support to students at any time. These assistants can provide clarification, additional explanations, and guidance on course content, helping students resolve questions quickly and efficiently.

Predictive Analytics: AI can use predictive analytics algorithms to identify patterns and trends in student data. This can help educators predict academic performance, identify potential difficulties, and provide early interventions to support at-risk students. By anticipating the needs of students, AI can help improve the effectiveness and efficiency of the Flipped Classroom.

RESULTS

The results obtained on gamification, artificial intelligence (AI) and Flipped Learning in higher education have been promising and have shown significant benefits for students. Here are some of the notable results:

Better participation and motivation: Gamification has been shown to increase student participation and motivation in the learning process. The introduction of game elements, such as challenges, rewards and competitions, has generated a greater commitment on the part of the students, which translates into greater dedication and effort in the development of academic activities.

Autonomous and personalized learning: Both AI and Flipped Learning have facilitated autonomous and personalized learning in higher education. AI enables the personalization of content and learning activities according to the individual needs of each student, which promotes a more individualized approach. For its part, Flipped Learning gives students the opportunity to acquire basic knowledge independently, allowing them to progress at their own pace and delve into areas of interest.

Improved feedback and assessment: Both AI and Flipped Learning have improved feedback and assessment in higher education. The AI provides instant and detailed feedback to students, allowing them to identify and correct errors in a timely manner. Additionally, AI can analyze large data sets and provide educators with valuable insights into student performance and difficulties, facilitating more accurate and targeted feedback. On the other hand, Flipped Learning allows for a more formative and continuous assessment, since educators have more time in the classroom to interact with students and provide individualized feedback.

Development of 21st century skills: The integration of gamification, AI and Flipped Learning has enabled the development of 21st century skills in higher education students. Gamification fosters skills such as collaboration, problem solving, decision making, and creativity. AI and Flipped Learning promote critical thinking, autonomy, self-regulation and time management. These skills are essential in today's world and prepare students to face the challenges of society and the job

market.

In summary, the results obtained on gamification, AI and Flipped Learning in higher education have shown benefits in terms of participation, motivation, personalized learning, improved feedback and development of 21st century skills. These approaches have transformed the teaching and learning process, creating more dynamic and effective environments for students in higher education. However, it is important to highlight that more research and studies are needed to better understand the efficacy and limits of these practices in different educational contexts.

CONCLUSIONS

The gamified flipped classroom is presented as an innovative pedagogical strategy in higher education. By combining the principles of flipped learning with gamification elements, an interactive and motivating learning environment is created. From a systematic vision, this strategy seeks to effectively integrate pedagogical, technological and motivational aspects to improve the learning experience of students in higher education.

The gamified flipped classroom offers an innovative way of teaching and learning in higher education. By combining the flipped classroom model with gamification, a stimulating environment is created that motivates students, enhances their participation, and promotes deeper and more meaningful learning. From a systematic perspective, this strategy requires careful planning and effective integration of the components to obtain successful results in the teaching and learning process.

The integration of AI into the Flipped Classroom model in higher education offers significant advantages by providing personalized support, instant feedback, and predictive analytics. This allows for a more adaptive and effective learning experience, thus improving student engagement and outcomes. However, it is important to highlight that AI should not replace human interaction and the role of the educator, but rather complement and enrich the teaching and learning process.

REFERENCES

- Chou, Y. K. (2015). Actionable Gamification: Beyond Points, Badges, and Leaderboards. Octalysis Media.
- Deterding, S. (2014). Eudaimonic Design, Or: Six Invitations to Rethink Gamification. In Proceedings of the 2014 ACM SIGCHI Conference on Designing Interactive Systems (pp. 485-494). ACM.
- Del Mundo, D. C. (2021). Project (G.O.A.L) Gamified Off-line Alternative Learning approach to grade 7 science. *Sapienza: International Journal of Interdisciplinary Studies*, 2(2), 46–54. <https://doi.org/10.51798/sijis.v2i2.99>
- Dicheva, D., Dichev, C., Agre, G., & Angelova, G. (2015). Gamification in Education: A Systematic Mapping Study. *Journal of Educational Technology & Society*, 18(3), 75-88. Retrieved from <https://www.jstor.org/stable/pdf/jeductechsoci.18.3.75.pdf>
- Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does Gamification Work? — A Literature Review of Empirical Studies on Gamification. In Proceedings of the Annual Hawaii International Conference on System Sciences (HICSS) (pp. 3025-3034). DOI: 10.1109/HICSS.2014.377
- Hew, K. F., & Lo, C. K. (2018). Flipped Classroom Improves Student Learning in Health Professions Education: A Meta-Analysis. *BMC Medical Education*, 18(1), 38. DOI: 10.1186/s12909-018-1144-z
- Kapp, K. M. (2012). *The Gamification of Learning and Instruction: Game-Based Methods and Strategies for Training and Education*. John Wiley & Sons.
- Lozano, L. M., & Pérez, A. (2020). Flipped Classroom: An Analysis of Research. *International Journal of Educational Technology in Higher Education*, 17(1), 21. DOI: 10.1186/s41239-020-00194-2
- Marczewski, A. (2015). User Types Hexad: A multi-dimensional framework for gamification design and analysis. *International Journal of Serious Games*, 2(2), 3-22.
- Sailer, M., Hense, J. U., Mayr, S. K., & Mandl, H. (2017). How Gamification Motivates: An Experimental Study of the Effects of Specific Game Design Elements on Psychological Need Satisfaction. *Computers in Human Behavior*, 69, 371-380. DOI: 10.1016/j.chb.2016.12.033
- Sheldon, L. (2012). *The Multiplayer Classroom: Designing Coursework as a Game*. Cengage Learning.