EDUCATIONAL BREAKOUT AS A GAMIFICATION STRATEGY IN HIGHER EDUCATION: SYSTEMIC REVIEW

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ABSTRACT: The use of educational breakouts, or escape rooms, has grown considerably in the field of higher education in recent years, establishing itself as an innovative strategy within active learning methodologies. The aim of this study was to analyze this educational practice and evaluate its impact on student learning. To this end, a systematic review of the literature was conducted using the Web of Science, Scopus, and Dialnet databases, covering the period between January 2019 and September 2024. The keywords used for the search included: breakout, higher education, gamification, escape room, and game-based learning, or their equivalents in Spanish. Inclusion criteria (peer-reviewed academic articles in English or Spanish focused on higher education and active methodologies) and exclusion criteria (non-educational publications or those published before 2019) were applied, resulting in a final selection of 28 studies. The findings indicate that these experiences, particularly through collaboration, can enhance students' academic performance and motivation across multiple areas of knowledge. Furthermore, the role of technology was identified as a key facilitator in the implementation of these activities, whether in face-to-face, online, or hybrid environments. Ultimately, the effective design of these practices by educators is essential to maximize their impact and ensure they are aligned with the specific needs of learners. The main limitations of the study include the methodological heterogeneity of the selected works and the limited number of longitudinal studies that would allow for an assessment of the sustained impact of such strategies. In conclusion, educational breakouts represent

a pedagogical approach with strong transformative potential for contemporary university teaching.

KEYWORDS: Higher education, breakout, gamification, innovation, ICT.

BREAKOUTS EDUCATIVOS COMO ESTRATEGIA DE GAMIFICACIÓN EN EDUCACIÓN SUPERIOR: UNA REVISIÓN SISTÉMICA

RESUMEN: El uso de breakouts educativos, o escape rooms, ha aumentado considerablemente en el ámbito de la educación superior en los últimos años, consolidándose como una estrategia innovadora dentro de las metodologías activas. Por ello, el objetivo de este estudio ha sido analizar esta práctica educativa y evaluar su impacto en el aprendizaje de los estudiantes. Para ello, se llevó a cabo una revisión sistémica de la literatura en las bases de datos Web of Science, Scopus y Dialnet, abarcando el periodo comprendido entre enero de 2019 y septiembre de 2024. Las palabras clave utilizadas para esta búsqueda fueron: breakout, educación superior, gamificación, escape room y aprendizaje basado en juegos, o sus equivalentes en inglés. Se aplicaron criterios de inclusión (artículos académicos en español o inglés centrados en educación superior y metodologías activas) y exclusión (publicaciones no educativas o anteriores a 2019), seleccionándose finalmente 28 estudios. Los resultados obtenidos indican que este tipo de experiencias puede favorecer, a través de la colaboración, tanto el rendimiento académico como la motivación de los estudiantes en diversas áreas del conocimiento. Asimismo, se identificó el papel clave de la tecnología en la implementación de estas actividades, ya sea en entornos presenciales, virtuales o híbridos. En definitiva, el buen diseño de estas prácticas por parte del profesorado es vital para que su eficacia sea óptima y se ajusten a las necesidades del alumnado. Como principales limitaciones del estudio se señala la heterogeneidad metodológica de los trabajos analizados, así como la escasez de investigaciones longitudinales que permitan evaluar el impacto sostenido de estas estrategias. Se concluye que los breakouts representan una propuesta didáctica con gran potencial transformador en la enseñanza universitaria actual.

PALABRAS CLAVE: Educación superior, breakout, gamificación, innovación, TIC.

EXTENDED ABSTRACT

Introduction

The growing interest in the use of gamification strategies in higher education has led to the proliferation of innovative didactic experiences aimed at increasing student motivation and engagement. Among these strategies, educational breakouts, also known as escape rooms, stand out as immersive activities that involve solving puzzles and challenges within a narrative structure. Originating from the realm of entertainment and video games, these activities have been adapted to educational settings to foster critical thinking, problem-solving, collaboration, and active learning. Their adoption has been particularly accelerated by the COVID-19 pandemic, which forced a shift toward hybrid and online learning environments. In this context, digital escape rooms have provided valuable tools to maintain student engagement and ensure pedagogical continuity.

Despite their growing popularity, the didactic foundations, implementation strategies, and long-term impact of educational breakouts in higher education remain underexplored. This systematic review addresses this gap by analyzing 28 academic articles published between January 2019 and September 2024. The main objectives are: (1) to examine the pedagogical approaches and design principles underpinning breakout activities in university contexts; and (2) to assess the integration and role of digital technologies in supporting these experiences.

Methodology

This research followed the PRISMA 2020 guidelines for systematic reviews. A comprehensive search was conducted in three databases: Web of Science, Scopus, and Dialnet. Search terms included "breakout," "gamification," "escape room," "game-based learning," and "higher education," with their respective translations in Spanish. Boolean operators (AND, OR) were used to refine the queries.

Inclusion criteria were established as follows: peer-reviewed journal articles published between January 2019 and September 2024, written in English or Spanish, with a focus on higher education and active methodologies. Exclusion criteria included publications unrelated to the educational field or lacking methodological rigor. After removing duplicates and screening titles, abstracts, and full texts, 28 studies were selected for in-depth analysis.

The studies were categorized according to the country of origin, year of publication, field of knowledge, learning environment (digital, physical, or hybrid), and research methodology (qualitative, quantitative, or mixed methods). Particular attention was paid to the size and diversity of student samples, the technological tools used, and the presence of theoretical frameworks.

Main Findings

The selected studies revealed a diverse and growing body of research across multiple disciplines, with Spain and the United States being the most prolific contributors. The majority of articles were published in 2021 and 2022, coinciding with the increased need for engaging remote learning solutions during the pandemic.

From a didactic perspective, educational breakouts are frequently associated with the development of transversal competencies, such as teamwork, communication, digital literacy, and autonomy. The activities are often framed within constructivist and experiential learning theories, incorporating elements of gamification—such as points, badges, leaderboards, and narrative immersion—to enhance student engagement. The concept of "flow," as defined by Csikszentmihalyi (1990), emerges as a critical component for achieving sustained concentration and enjoyment.

Educational breakouts have been applied across a wide range of fields, including STEM disciplines (e.g., programming, mathematics, chemistry), health sciences (e.g., medical training, pharmacy), language learning, and teacher education. These applications demonstrate the versatility of the breakout format in addressing diverse curricular goals.

One significant finding is the strong presence of digital breakouts, which account for 71% of the cases analyzed. Digital platforms offer scalability, flexibility, and accessibility, allowing educators to tailor the experience to different learning contexts. Tools such as Genially, Escapp, and custom-designed platforms have been instrumental in creating engaging virtual environments. Hybrid formats (25%) and purely physical experiences (4%) also appear, though logistical challenges such as space, time, and resources limit their widespread use.

Regarding student outcomes, the reviewed studies consistently report increased motivation, improved academic performance, and greater participation. However, some negative emotions, including anxiety and frustration, are also documented. These tend to arise when task complexity exceeds student preparedness or when insufficient scaffolding is provided. Effective design, including well-aligned narratives and timely hints, is crucial to mitigate these risks.

Discussion

The findings of this review align with existing literature on gamification and active learning, reinforcing the potential of breakouts as transformative educational tools. They are particularly effective when embedded within a coherent pedagogical framework that balances challenge and support. The integration of experiential learning, game-based learning, and cognitive load theory provides a robust foundation for understanding the mechanisms through which breakouts enhance learning.

The TPACK framework (Technological Pedagogical Content Knowledge) is especially relevant in this context. Educators who effectively implement breakouts often exhibit a high level of integration between technological tools, pedagogical strategies, and content knowledge. This alignment allows for the creation of meaningful, context-sensitive experiences that resonate with students' interests and learning needs.

Technology plays a dual role as both enabler and enhancer. In digital breakouts, it provides multimedia resources, interactive simulations, and real-time feedback, which contribute to a richer learning environment. In physical settings, digital tools support hybridization and assessment. Furthermore, technology facilitates inclusivity by accommodating diverse learning styles and providing multiple means of representation, action, and engagement—principles aligned with Universal Design for Learning (UDL).

Despite these advantages, challenges remain. The design and implementation of educational breakouts require significant time investment, instructional design expertise, and technical skills. Faculty development programs and collaborative planning are recommended to address these barriers. Additionally, the novelty of the breakout format may wane with repeated use, potentially reducing its motivational impact. Longitudinal studies are needed to assess the sustainability of its effects over time.

Conclusion

Educational breakouts represent a promising and adaptable strategy for enriching university teaching. Their capacity to combine narrative immersion, problem-solving, and collaboration positions them as powerful tools for fostering active and meaningful learning. When carefully designed and aligned with curricular objectives, breakouts contribute to the development of both cognitive and socio-emotional competencies.

This review highlights the importance of contextualized implementation, technological integration, and pedagogical coherence. Educators are encouraged to adopt a design-based approach that considers student diversity, learning goals, and institutional constraints. Furthermore, future research should explore the longitudinal effects of breakout participation, the scalability of these interventions, and their impact on equity and inclusion in higher education.

In summary, educational breakouts are not merely engaging activities; they are complex pedagogical interventions that require thoughtful planning and continuous refinement. Their potential lies not only in making learning fun but in transforming the educational experience into one that is immersive, participatory, and impactful.

1. INTRODUCTION

In the aftermath of the COVID-19 pandemic, the adoption of gamified strategies, such as breakouts or educational escape rooms on digital platforms, has gained significant traction. The increasing number of search results for terms like "escape," "breakout," "room," and "higher education" reflects the growing interest in these activities within university settings. Digital escape rooms have proven particularly valuable, enabling educators to sustain learning continuity while effectively engaging students in virtual or hybrid environments (Abdul Rahim, 2022; Heim et al., 2022; Willis and Bryan, 2022). Moreover, they offer an effective means to design immersive and interactive learning experiences (Ouariachi and Wim, 2020; Duncan, 2020), even in the absence of physical resources or specialized equipment (Haimovich et al., 2022).

Similarly, a substantial body of research highlights that integrating games and gamification strategies into the classroom enhances student satisfaction, academic performance, peer collaboration, and motivation to learn (Jenkins and Mason, 2020). At the same time, the logistical challenges associated with the physical implementation of educational escape rooms—such as constraints related to time,

space, and resources—have been mitigated by their digital adaptations, thereby increasing their flexibility and instructional applicability (Cain, 2019; Fotaris and Mastoras, 2019).

1.1. Origins of Educational Breakouts

Educational breakouts are a gamified learning activity that challenges students to solve a series of clues and puzzles in order to "escape" from a scenario set within a digital environment. These activities stem from escape rooms, which originally emerged in the realm of video games (Kroski, 2019). In such experiences, the action revolves around narratives in which participants find themselves in various enclosed settings (e.g., prisons, dungeons, mansions, laboratories), with the common goal of escaping their confinement. To achieve this, participants must solve puzzles, confront challenges, or tackle logical problems of varying degrees of difficulty. Typically, the complexity of the tasks gradually increases, maintaining participants engagement and motivation throughout the experience (Kroski, 2019; Queiruga-Dios et al., 2020).

In the context of educational breakouts, students are required to apply their knowledge and skills across different subject areas to complete the task within a limited time frame. These activities integrate technological elements and curricular content into an interactive and immersive learning experience (Walsh and Spence, 2018; Jiménez et al., 2020; Ouariachi and Wim, 2020).

A key characteristic, highlighted by several authors, is the importance of aligning the proposed challenges with the narrative and context designed for the educational activity. This approach helps to engage students in the storyline and motivates them to actively participate in the experience (Nicholson, 2018; Sánchez-Martín et al., 2020; Yllana-Prieto et al., 2023b).

A fundamental aspect of these experiences is the concept of "flow," introduced by Csikszentmihalyi (1990). This author defines flow as "the process of total involvement," wherein individuals become fully absorbed in a task that momentarily becomes their sole focus. This state of deep concentration is essential for student engagement, as flow facilitates more effective and meaningful learning. The objective extends beyond merely completing the experience or winning; rather, it aims to immerse students in a state of flow to enhance their achievement of learning goals.

1.2. Characteristics of Breakouts

To put these principles into practice, educators can design breakouts that cohesively integrate these theoretical elements. Key components to consider include

the following (Santamaría and Alcalde, 2020): narrative, points, badges, and leaderboards.

- Narrative: The storyline can be inspired by a movie, a book, or an original story, creating an immersive experience. Examples include stopping a terrorist threat, solving a mystery, uncovering a lost pirate treasure, or escaping from a spaceship in distress (Queiruga-Dios et al., 2020). These themes, crafted by the designer, establish the atmosphere, foster emotional immersion, and spark participants' curiosity, with the aim of fully engaging the entire team in the experience.

- Points: Points reflect students' performance and keep them informed about their progress throughout the activity, providing extrinsic motivation to continue participating.

- Badges or medals: These serve as visual representations of achievements, acting as rewards for milestones reached during the activity.

- Leaderboards or rankings: While potentially contentious at lower educational levels, in higher education settings, they serve as a strong incentive for students to strive to outperform their peers or avoid being surpassed.

1.3. Pedagogical Foundations of Breakouts

The use of breakouts in education is grounded in the combination of gamification and game-based learning with experiential learning theory, collaborative learning, virtual learning, and cognitive load theory, all within a constructivist approach (Jonassen, 1999; Sidekerskienė and Damaševičius, 2023), as illustrated in Figure 1.

As fundamental pillars, studies highlight two key theoretical principles:

- Gamification: Defined as an active methodology that applies game dynamics and mechanics in non-game contexts to develop skills such as cooperation and engagement (Deterding et al., 2011).

- Game-based learning theory (Fernández-Raga et al., 2023): Suggests that incorporating games into the classroom and using elements such as challenge, competition, and rewards increases engagement and motivation in the learning process.

Furthermore, its implementation can be integrated with other relevant pedagogical foundations, including:

- Experiential learning theory (Morris, 2020): Posits that learning occurs through a cycle that includes experience, reflection, and abstraction. In the context of breakouts, students face immersive challenges that require critical

thinking and problem-solving skills. Reflection and abstraction take place as students collaborate to interpret their experiences, construct new knowledge, and apply it to real-world situations.

- Collaborative learning (Almendingen et al., 2022; Chelliah and Clarke, 2011): Involves students working together to achieve a common goal. Breakouts foster this type of learning by providing opportunities for collaboration in solving complex tasks and challenges. These tasks require the integration of diverse skills and perspectives, promoting teamwork and leveraging individual strengths.

- Virtual learning (Bailenson et al., 2008): Refers to the use of digital technologies to create a flexible educational environment. Breakouts can be conducted in virtual settings, making learning more accessible and universal. By incorporating multimedia elements such as videos, animations, and interactive simulations, breakouts adapt to different learning styles, effectively facilitating the implementation of Universal Design for Learning (Moreno-Rodríguez et al., 2023).

- Cognitive load theory (Sweller, 2011): Suggests that the amount and complexity of information affect the learning process. Educational breakouts manage cognitive load by presenting information gradually and providing support through scaffolding and feedback. They also promote active and experiential learning, reducing cognitive overload by allowing students to learn through practice rather than passive information reception.

Figure 1. *Theoretical Framework of Educational Breakouts*
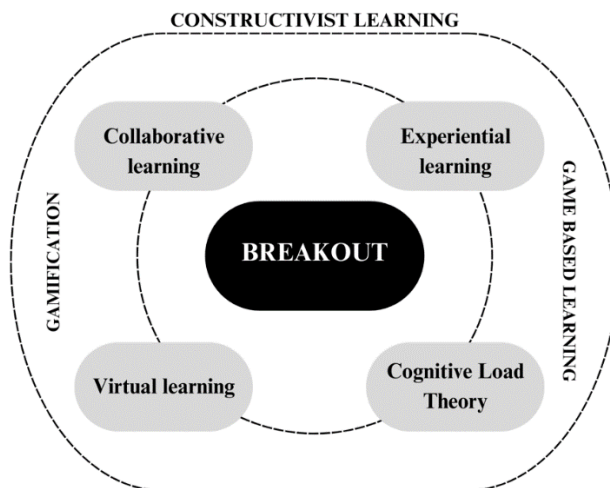
Taken together, these theoretical foundations provide a solid basis for understanding the use of breakouts from an educational perspective. By integrating elements from these approaches, educators can design immersive and engaging experiences that promote active and experiential learning, increase student participation and motivation, and support the development of critical problem-solving skills (Bistulfi, 2021; Bryant, 2021).

The growing relevance of these gamified practices in higher education has driven the need for a systematic literature review. Thus, based on the existing literature on this topic, two objectives are proposed to address the complexity of this field of study:

- To analyze the instructional strategies used in these experiences and their impact on student learning.

- To evaluate the integration of digital technology in educational breakout practices in higher education.

2. METHODOLOGY

To achieve the stated objectives, a systematic review was conducted following the PRISMA Statement (Page et al., 2021). Based on this, eligibility parameters, content criteria, and strategies for searching, selecting, and collecting information were established. Three specialized databases were used for data collection: Scopus, Web of Science, and Dialnet.

In the first phase, publications were selected based on titles, abstracts, and keywords containing the following terms: breakout, higher education, gamification, escape room, and game-based learning, or their equivalents in Spanish (*educación superior, gamificación, aprendizaje basado en juegos*). To filter the retrieved articles, Boolean logic was applied using operators such as AND and OR (e.g., *"game-based learning" OR "aprendizaje basado en juegos" OR "gamification" OR "gamificación" AND "higher education" OR "educación superior" OR "educación universitaria" OR "university education" AND "breakout"*). A total of 996 documents were identified (Web of Science: 678, Scopus: 193, Dialnet: 125). Duplicates and articles that did not correspond to the field of study were excluded.

In the second phase, to ensure that the reviewed studies were relevant and aligned with the research objectives, inclusion and exclusion criteria were applied, as detailed in Table 1. During this process, both researchers carefully examined the article titles and, after an initial screening, reviewed the abstracts of the remaining studies.

Finally, in the third phase, the selected documents were thoroughly analyzed, resulting in a final selection of 28 manuscripts for the systematic review. The selection process of the study set is illustrated in Figure 2.

Table 1. *Inclusion and Exclusion Criteria for Studies on Breakouts in Higher Education*

Criteria	Inclusion Criteria	Exclusion Criteria
Type of Article	Scientific articles in the field of education published in indexed journals.	Articles that do not pertain to the educational field or do not use qualitative, quantitative, or mixed-method research.
Time Frame	January 2019 to September 2024.	Prior to 2019.
Language	Spanish and English.	Other languages.
Study Focus	Documents that describe the use of breakouts in higher education.	Studies whose focus does not align with university-level education or address constructs unrelated to the topic.

Figure 2. *Flow Diagram of the Systematic Review Process*
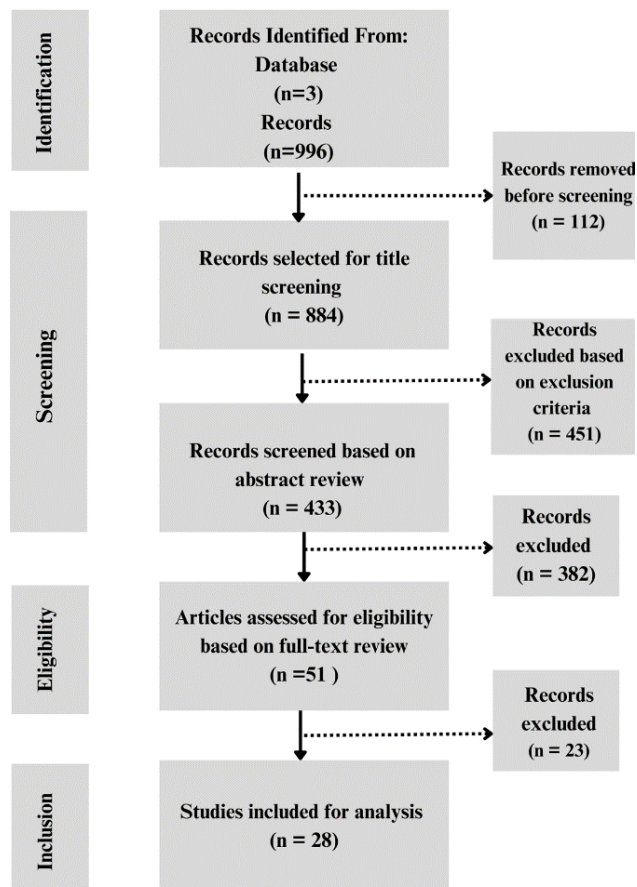
3. RESULTS

To fulfill the objectives established in this research, the most significant findings from the review are presented below.

3.1. Contextual Characteristics of the Studies

A descriptive analysis was conducted to obtain the results, considering various aspects such as the year of publication, the country where the study was carried out, and the quartile ranking of the selected research articles. The figures corresponding to the statistical analysis were generated using Excel (Microsoft 365).

The manuscripts selected for the systematic review have been organized in Table 2 according to the variables established at the beginning of the study. The scientific documents are presented in chronological order to facilitate reading and comprehension.

Thus, the highest number of studies (9) were conducted in 2022, followed by 2021 (6), 2024 (5), and 2023 (5), with fewer studies from 2020 (2) and 2019 (1) (see Figure 3).

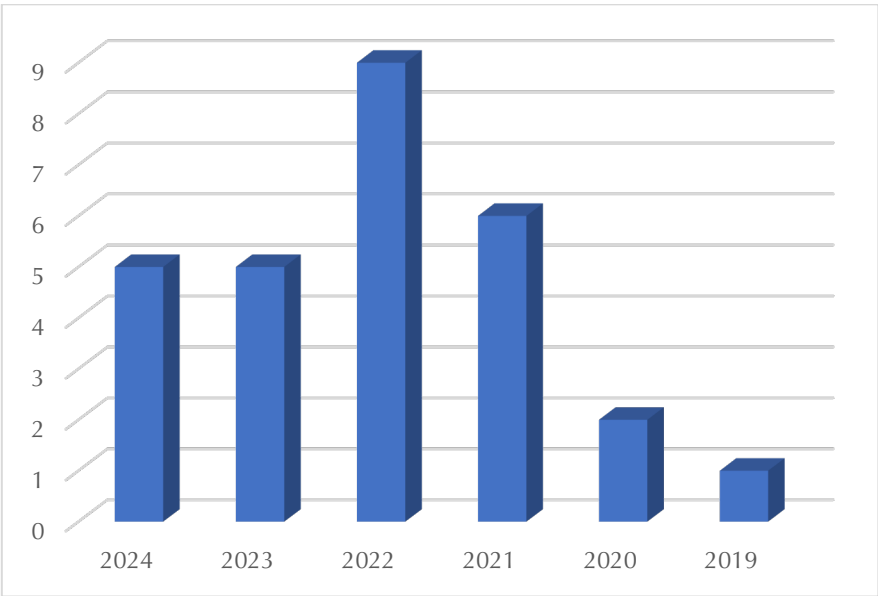**Figure 3.** *Distribution by Year of Publication*

Table 2. *Summary of the Analyzed Studies*

|	Author(s)	Year	Country	Title	Journal	Citations	Field of Knowledge	Applied Methodology	Learning Environment	Research Methodology	Sample
	General Data						**Didactic Information**			**Research Information**	
1	Brown et al.	2019	United States	An Escape Room as a Simulation Teaching Strategy	Clinical Simulation in Nursing	192	Clinical Simulation	Serious Game-Based Learning	Digital	Qualitative	33
2	Santamaría & Alcalde	2020	Spain	Una experiencia universitaria de gamificación en línea o en el aula presencial: ¿es este recurso de aprendizaje posible en ambos entornos?	Revista Brasileira de Linguística Aplicada	26	Computer Tools Applied to Translation	Gamification	Physical/Digital	Qualitative	46
3	Queiruga-Dios et al.	2020	Spain	A Virus Infected Your Laptop. Let's Play an Escape Game	Mathematics	37	Calculus Course	Game-Based Learning	Digital	Qualitative	46 students and 40 teachers
4	Bilbao-Quintana et al.	2021	Spain	Developing Visible Thinking and Motivation Through the Curricular Design of an Escape Room in Higher Education	Revista Electrónica Educare	17	Visible Thinking	Gamification	Digital	Quantitative	238
5	Bryant	2021	United States	Harry Potter and the Osteopathic Medical School: Creating a Harry Potter-Themed Day as a High-Yield Review for Final Exams	Medical Science Educator	10	Osteopathy	Gamification	Digital	Qualitative	162
6	Bistulfi	2021	United States	Pushing Active Learning Into Assessment With a Genetics Escape-Room Final: Gamification to Develop Team Skills in STEM, on Ground and Online	Journal of Higher Education Theory and Practice	3	STEM Education (Genetics)	Gamification	Physical/Digital	Mixto	43
7	López-Pernas et al.	2021	Spain	Escapp: A Web Platform for Conducting Educational Escape Rooms	IEEE Access	50	STEM Education	Game-Based Learning - Gamification	Physical/Digital	Quantitative	413
8	Rosillo & Montes	2021	Spain	Escape Room Dual Mode Approach to Teach Maths during the COVID-19 Era	Mathematics	30	Mathematics	Game-Based Learning - Gamification	Digital	Mixto	106
9	López-Pernas et al.	2021	Spain	Comparing Face-to-Face and Remote Educational Escape Rooms for Learning Programming	IEEE Education Society Section	42	Programming Course	---	Physical/Digital	Quantitative	132
10	Weisberger et al.	2022	United States	Engaging Preservice Teachers in the Design of Digital Breakout Games in an Educational Technology Course	Journal of Digital Learning in Teacher Education	7	English Learning	Game-Based Learning	Digital	Qualitative	23

Table 2. *Summary of the Analyzed Studies (Continued)*

	Author(s)	Year	Country	General Data		Citations	Didactic Information			Research Information	
				Title	Journal		Field of Knowledge	Applied Methodology	Learning Environment	Research Methodology	Sample
11	Almending en et al.	2022	Norway	Breakout Rooms Serve as a Suitable Tool for Interprofessional Pre-Service Online Training among Students within Health, Social, and Education Study Programs	Education Sciences	7	Health Programs, Social Education, and Teacher Training	Game-Based Learning	Digital	Quantitative	5412
12	Haimovich et al.	2022	Israel	"The Masked Scientist": Designing a Virtual Chemical Escape Room	Journal of Chemical Education	23	Chemistry	--	Physical Digital	Mixed-methods	1060
13	Llorente-Cejudo et al.	2022	Spain	Learning Landscapes and Educational Breakout for the Development of Digital Skills of Teachers in Training	Interaction Design and Architecture(s) Journal	10	Early Childhood and Primary Education	Gamification	Digital	Quantitative	968
14	Fernández-Portero & Castillo-Rodriguez	2022	Spain	Gamification in the English Language Class: Analysis of Pre-service Teachers' Perceptions	Computer Assisted Language Learning Electronic Journal	17	English as a Foreign Language (EFL)	Gamification	Digital	Mixed-methods	95
15	Sánchez-Ruiz et al.	2022	Spain	Educational Digital Escape Rooms Footprint on Students' Feelings: A Case Study within Aerospace Engineering	Information	17	Aerospace Engineering	Game-Based Learning	Digital	Quantitative	296
16	Huraj et al.	2022	Slovakia	The Impact of a Digital Escape Room Focused on HTML and Computer Networks on Vocational High School Students	Education Sciences	8	HTML and Computer Networks	Gamification	Digital	Quantitative	16
17	Willis & Bryant	2022	United States	Harry Potter and the Osteopathic Medical School Part 2: Creating a Virtual Harry Potter-Themed Day as a High-Yield Review for Final Examinations	Medical Science Educator	6	Osteopathy	Gamification	Digital	Quantitative	23
18	Magreñán et al	2022	Spain	Teaching calculus in the first year of an engineering degree using a Digital Escape Room in an online scenario	Computer Application in Engineer education	21	Mathematics	Game-Based Learning - Gamification	Digital	Quantitative	51
19	Vilana-Prieto et al	2023	Spain	The escape room and breakout as an aid to learning STEM contents in primary schools: an examination of the development of pre-service teachers in Spain	Education 3-13	13	STEAM Education	Game-Based Learning - Gamification	Physical	Quantitative	66
20	Moreno-Rodriguez et al	2023	Spain	Educational Breakout Based on StarWars for Learning the History of Spanish Sign Language	Information	2	Symbolic Language	Gamification	Digital	Quantitative	59

Table 2. *Summary of the Analyzed Studies (Continued)*

|	General Data					Citations	Didactic Information			Research Information	
	Author(s)	Year	Country	Title	Journal		Field of Knowledge	Applied Methodology	Learning Environment	Research Methodology	Sample
21	Sidekerskie nė & Damaševiči us	2023	Lithuania	Out-of-the-Box Learning: Digital Escape Rooms as a Metaphor for Breaking Down Barriers in STEM Education	Sustainability	26	STEAM Education	Game-Based Learning - Gamification	Digital	Mixed - methods	77
22	Yllana-Prieto et al	2023	Spain	Influence of two educational Escape Room – Breakout tools in PSTs' affective and cognitive domain in STEM (science and mathematics) courses	Heliyon	13	STEAM Education	Gamification	Physical/ Digital	Quantitative	65
23	Wilkins et al.	2023	United States	Collaborative learning in online breakout rooms: the effects of learner attributes on purposeful interpersonal interaction and perceived learning	International Journal of Educational Management	2	Various Subjects in Higher Education	---	Digital	Quantitative	664
24	Padilla Piernas et al.	2024	Spain	Escape Rooms virtuales: una herramienta de gamificación para potenciar la motivación en la educación a distancia	*RIED-Revista Iberoamericana de Educación a Distancia*	6	Education	Gamification	Digital	Mixed - methods	98
25	Santamaria & López-Pernas	2024	Spain	Estrategias de pistas en escape rooms educativos: un enfoque de minería de procesos	Revista de Educación	0	Translation and Interpreting	Gamification	Digital	Quantitative	4
26	Velazquez Garcia et al.	2024	Mexico	Innovación Educativa en la Formación Superior: Aplicando Gamificación a Través Del Uso de una Sala de Escape Educativa	Ciencia Latina Revista Científica Multidisciplinar	0	Engineering	Gamification	Digital	Quantitative	125
27	Pérez Garcia et al.	2024	Spain	Gamificar en el ámbito universitario online para favorecer la motivación del alumnado: una experiencia en el Grado de Pedagogía	EDUTEC. Revista Electrónica de Tecnología Educativa	0	Pedagogy	Gamification	Digital	Qualitative	39
28	Castillo Rodríguez et al	2024	Spain	The Breakout in Final Examination: An Experiment with Preservice Primary Education Teachers	Ubiquitous Learning: An International Journal	0	Education	Gamification	Physic/ Digital	Mixed - methods	126

In terms of country of origin, Spain (57%) contributes the largest share of publications, followed by the United States (25%), as illustrated in Figure 4.

Figure 4. *Country-wise Distribution*
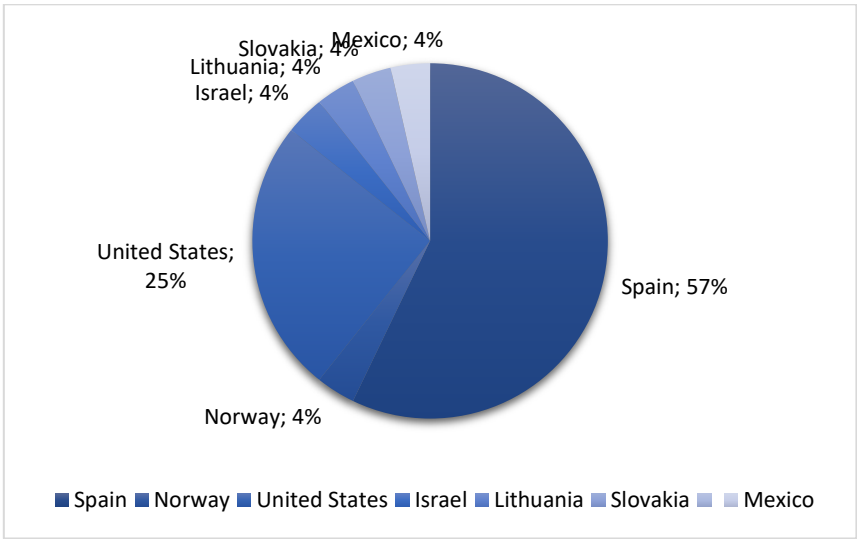
Regarding the quartiles of the journals based on the SCImago Journal Rank (SJR), Figure 5 shows that the majority are high-impact and high-quality journals, with 39% classified in Q2 and 29% in Q1 (see Figure 5).

Figure 5. *SJR Quartile Distribution*
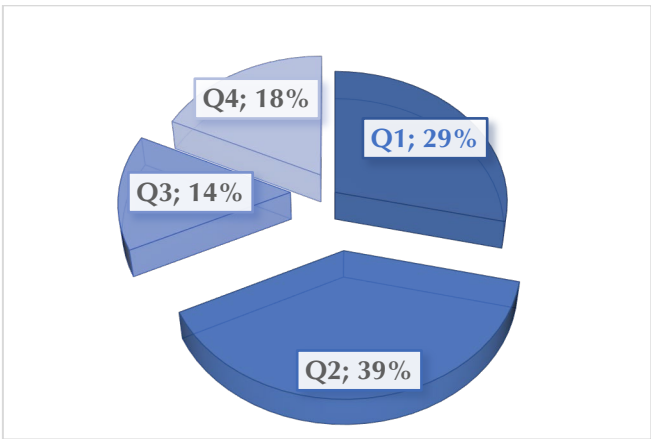
3.2. Methodological Characteristics of the Studies

Similarly, analyzing the methodological characteristics of the studies described in Table 2, it is observed that the majority of the selected articles correspond to quantitative research (54%), followed by mixed-methods studies (25%) and qualitative research (21%) to a lesser extent.

Additionally, the analysis highlights the number of participants included in the samples. One study surpasses 5,000 participants, although the vast majority involve fewer than 100 participants.

Figure 6. *Sample Participants*
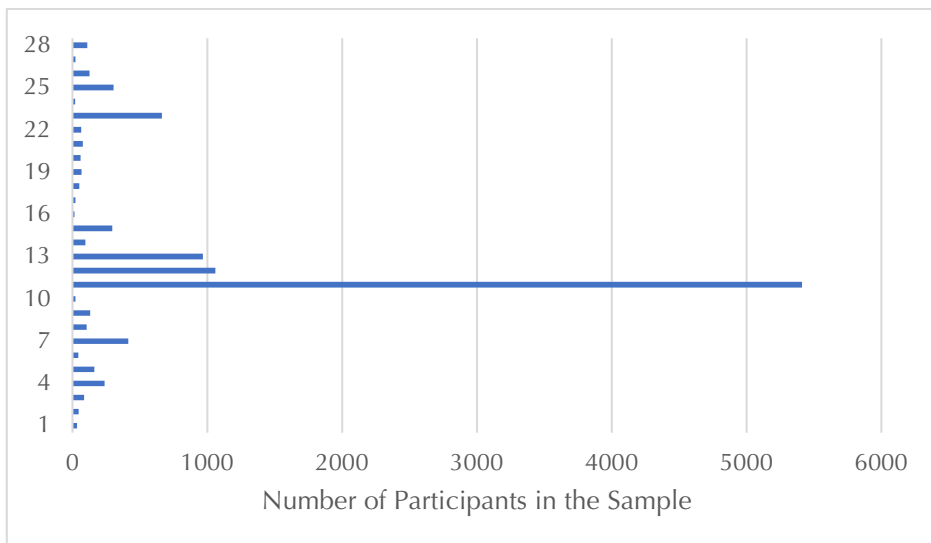
3.3. Analysis of the Research Content

The following section presents the results related to the content of the analyzed articles. To begin, a co-occurrence analysis of keywords was conducted using VOSviewer (see Figure 7), allowing the identification of three main groups of frequently occurring and interrelated concepts in the reviewed research.

First, concepts related to gamification and motivation (marked in yellow), which correlate with breakouts or escape rooms. Second, concepts associated with students (marked in red), where e-learning emerges as a learning approach linked to digital environments. Finally, game-based learning (marked in green), which connects with keywords such as escape room, serious games, and active learning.

Figure 7. *Co-occurrence of Keywords*
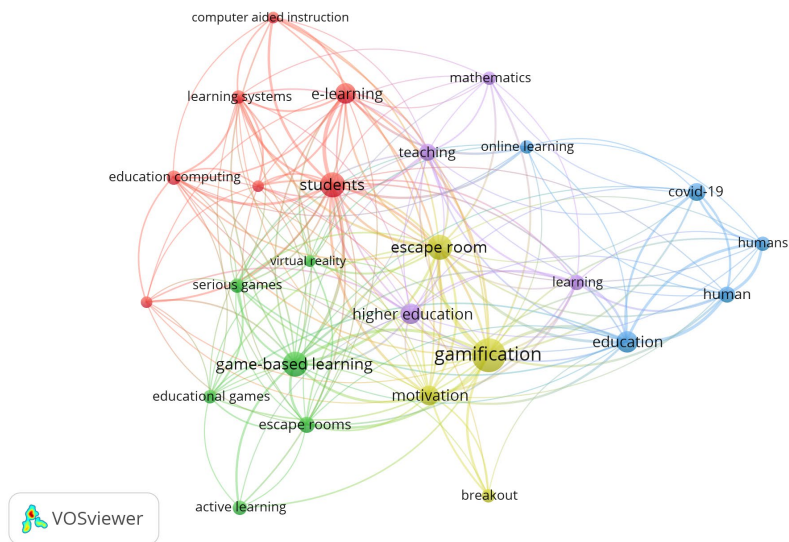
Similarly, Figure 8 presents the most frequently used keywords in the selected articles, identifying escape room, gamification, and game-based learning or higher education, which were used as the main search terms for the analyzed studies. Additionally, other frequently occurring keywords include motivation, active learning, and STEM.

Figure 8. *Most Frequently Used Keywords*
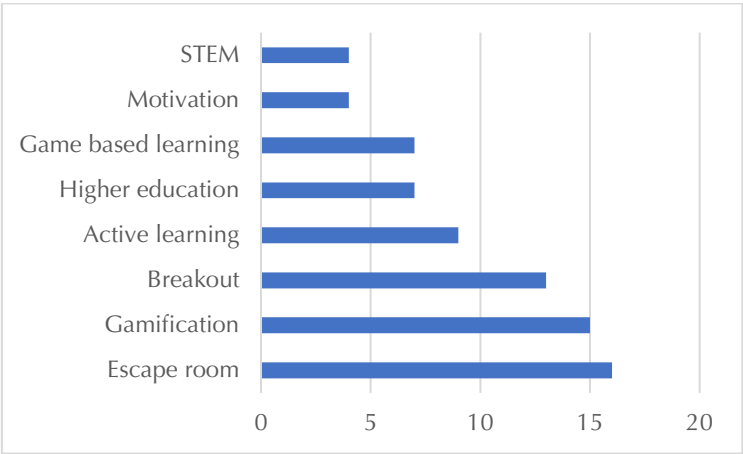
Finally, the most relevant results related to the three analyzed dimensions are presented.

3.4. Didactic Implementations of the Experience

In the field of higher education, the implementation and design of breakout activities provide unique opportunities for educators to develop essential competencies and perspectives for their professional practice. During the design process, authentic and meaningful scenarios are created, allowing content and pedagogy to be adapted through the use of technology. This approach fosters the development of the TPACK model, which assesses competence in technological, pedagogical, and content knowledge. Educators with a strong implementation of this model tend to place greater value on the use of technology in their curricula, facilitating deeper thinking and learning (Weisberg et al., 2022).

Furthermore, several authors have demonstrated that escape rooms promote collaborative work, where students develop values such as empathy, solidarity, and autonomy, contributing to the collective achievement of learning outcomes (Brown et al., 2019; Wilkins et al., 2023).

Additionally, educational breakouts are applied across various fields within higher education. In medicine, students learn about the symptoms of various diseases or develop technical skills related to their treatment (Brown et al., 2019; Bryant, 2021; Willis and Bryant, 2022). In STEM education, breakouts foster students' specialization and adaptability in scientific disciplines (Bistulfi, 2021; Hermanns et al., 2017; López-Pernas et al., 2021a; Yllana-Prieto et al., 2023a; Yllana-Prieto et al., 2023b; Sánchez-Ruiz et al., 2022; Sidekerskienė and Damaševičius, 2023). In the field of mathematics, several studies highlight their application in problem-solving activities (Queiruga-Dios et al., 2020; Rosillo and Montes, 2021; Magreñán et al., 2022), while in chemistry, they have been used to enhance student engagement and conceptual understanding (Haimovich et al., 2022).

In computer science, breakouts focus on problem-solving and exposure to real-world practical cases (Borrego et al., 2017; López-Pernas et al., 2021b; Huraj et al., 2022). In language learning, they have been implemented to foster engagement and motivation in acquiring new linguistic skills (Santamaría and Alcalde, 2020; Weisberg et al., 2022). Finally, in teacher training, breakouts support future educators in developing innovative pedagogical strategies and enhancing their digital competencies (Castillo-Rodríguez et al., 2024; Fernández-Portero and Castillo-Rodríguez, 2022; Llorente-Cejudo et al., 2022; Weisberg et al., 2022).

3.5. Impact on Students' Learning Process

Regarding the impact on learning, numerous studies have demonstrated the success of gamification in higher education, showing that students who engage in these practices tend to achieve better academic performance and higher motivation (Bilbao-Quintana et al., 2021; Padilla et al., 2024; Pérez García et al., 2024; Velázquez et al., 2024). In general terms, various investigations have highlighted that these activities generate positive emotions such as joy, enthusiasm, and enjoyment. At the same time, they promote a more open mindset and even increase students' confidence in their STEM-related skills (Yllana-Prieto et al., 2021; Yllana-Prieto et al., 2023a).

However, the implementation of educational breakouts may also generate certain negative emotions, such as anxiety or discouragement, due to the complexity of the task, the time required to complete it, or students' lack of prior knowledge. Specifically, as highlighted in the study by Santamaría and López-Pernas (2024), educators should provide guided hints to ensure an effective experience, while still encouraging autonomous problem-solving and maintaining a high level of student engagement. Simultaneously, both the content and the structure of the narrative must be appropriate for the participants' level (López-Pernas et al., 2019; Queiruga-Dios et al., 2020).

3.6. Influence of Technological Mediation in These Practices

Finally, the role of technology in facilitating these practices is analyzed. As shown in Figure 9,71% of the experiences take place in fully digital environments, 25% in hybrid environments, and only 4% in physical spaces.

Similarly, the implementation of escape rooms in physical settings has been observed to generate the same benefits as their virtual application (López-Pernas et al., 2021a). In most cases, digital tools serve as a support for these experiences, enabling both synchronous and asynchronous participation. The main goal is to optimize the use of resources—whether in physical or digital format—to facilitate knowledge transformation in multiple forms (Moreno-Rodríguez et al., 2023).

Additionally, in the context of distance education, Padilla et al. (2024) highlights that effective gamification practices depend on proper planning and design, ensuring that students receive timely and meaningful feedback throughout the learning process.

Figure 9. *Percentage Distribution by Practice Environment*
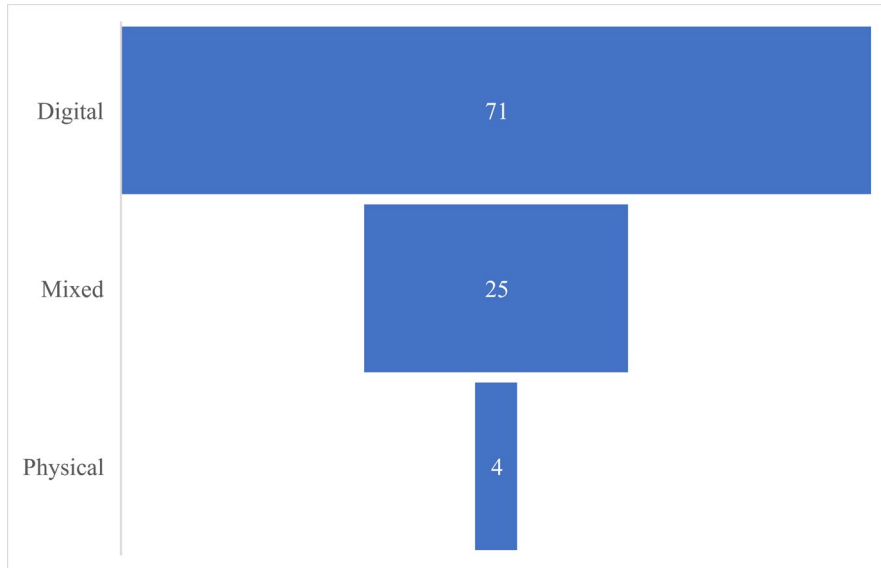
4. DISCUSSION AND CONCLUSIONS

This study presents a systematic review on the use of breakouts in higher education, aiming to analyze their impact on the teaching and learning process. The literature highlights how educational breakouts represent an innovative pedagogical strategy that integrates various learning theories and approaches to provide effective and engaging educational experiences.

Regarding didactic strategies, as noted by Taraldsen et al. (2020), the use of these practices enhances collaborative learning, whether in physical or virtual environments. Additionally, as other studies indicate, the use of active methodologies is positively correlated with student performance (García Magro and Martín Peña, 2021; Romero-García et al., 2020; Ruiz Domínguez and Ruiz, 2023). It is worth noting that breakouts are not limited to a specific subject area. This study has identified a broad range of disciplines, from humanities to sciences, where promising results have been observed (Santamaría and Alcalde, 2020; Sidekerskienė and Damaševičius, 2023; Rosillo and Montes, 2021; Weisberg et al., 2022).

Regarding implementation across different disciplines, the reviewed studies reveal significant diversity. In health sciences, for instance, breakout activities have been used to simulate clinical scenarios and foster diagnostic decision-making (Brown et al., 2019; Willis and Bryant, 2022). In STEM fields, breakouts have enhanced students' technical skills in areas such as programming, chemistry, and mathematics (Haimovich et al., 2022; Magreñán et al., 2022; López-Pernas et al.,

2021). In teacher education, they have supported the development of digital competencies and pedagogical reflection (Weisberg et al., 2022; Castillo-Rodríguez et al., 2024). These adaptations reflect the specific needs of learners, considering their prior knowledge, learning objectives, and institutional contexts.

However, implementation also presents challenges. Common difficulties include time constraints in designing the activities, initial resistance from instructors unfamiliar with active methodologies, and technical limitations in virtual environments. To address these issues, several studies suggest gradual integration of gamified elements, the use of digital templates or platforms (e.g., Genially, Escapp), and targeted professional development in instructional design with a playful approach.

In terms of impact on the learning process, student motivation emerges as a recurring theme in academic research. The analyzed articles suggest that motivation and engagement significantly improve when the experience is well-planned and the narrative aligns closely with participants' interests (Pérez García et al., 2024). Thus, educational breakouts not only enhance motivation and commitment but also support the development of critical skills such as problem-solving, communication, and teamwork, providing a strong foundation for effective learning adapted to modern needs. Moreover, as noted by González-Acosta et al. (2020), this directly contributes to improved academic performance. However, the experience may be unsatisfactory if the narrative structure does not allocate adequate time or if the challenges are excessively complex (Clauson et al., 2019; Schlegel et al., 2019).

In relation to technological mediation, the findings have broad implications for higher education, identifying effective teaching practices centered on student engagement and active learning experiences, as previously noted by Area Moreira (2018). Similarly, other studies have highlighted challenges associated with physical implementations, such as time constraints and lack of resources (Cain, 2019; Fotaris and Mastoras, 2019; Prieto-Andreu and Moreno-Ger, 2024), which can be overcome in digital formats. The results suggest that digital breakouts not only facilitate accessibility and flexibility, but also allow for the integration of multimedia elements, enhancing the overall learning experience (Moreno-Rodríguez et al., 2023).

This study reinforces the pedagogical value of breakouts in higher education, demonstrating their potential to foster immersive, student-centered learning experiences. The continuous redesign and refinement of these practices present an open field for innovation, promoting a more experiential and transformative educational model. This shift challenges traditional teaching methodologies and positions digital technologies as integral components of modern education, rather than merely instructional tools. However, ensuring effective implementation requires careful planning, well-structured narratives, and a deep understanding of students' cognitive and emotional engagement.

As for the limitations of this study, future research should delve deeper into the specific components of breakout experiences, such as the complexity of challenges and the impact of storytelling on student engagement. Additionally, an important area of exploration is whether the recurrent use of breakouts with the same students maintains or diminishes motivation over time. Addressing these questions through longitudinal studies or experimental research will provide valuable insights into the long-term effectiveness of gamified learning experiences in higher education.

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