


Interaction and Interactivity in Gamification: an SLR on Communication in Learning from Open Access Publications

INTERACCIÓN E INTERACTIVIDAD EN LA GAMIFICACIÓN:
UNA SLR SOBRE LA COMUNICACIÓN EN EL APRENDIZAJE
DE PUBLICACIONES CON ACCESO ABIERTO

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Abstract: Gamification has been proven to be an effective tool and teaching strategy to promote improvements in behavior, participation, and learning routines. A Systematic Literature Review (SLR) was conducted on 155 articles published in open-access journals. The findings indicate a rising trend in the adoption of gamification across various fields. However, education and business have garnered greater research attention compared to health psychology and environmental sciences. The results of this review show that a good combination of components and player types can create effective and innovative tools to increase motivation on the participants. Besides, points were the most commonly used component without falling into "Pointsification". Meanwhile, the player type tends not to be considered in research design. Finally, most of the contributions turn out to be in an initial phase of innovation (emergent and applied stages) in gamification.

Keywords Engagement; Motivation; Playful Learning; Game Design; Educational Communication.

Resumen: La gamificación es una herramienta de enseñanza utilizada para promover mejoras en la conducta, la participación y rutinas de aprendizaje. Se lleva cabo una revisión sistemática de la literatura (SLR) de 155 artículos publicados en revistas de acceso abierto. Se advierte una tendencia creciente al uso de la gamificación en todos los campos, pero la educación y los negocios mostraron una mayor cantidad de estudios que la psicología de la salud y el medio ambiente. Los resultados indican que una combinación entre los componentes y tipos de jugadores puede crear herramientas eficaces e innovadoras para el incremento de la motivación en los participantes. Además, se muestra como los puntos es el componente más utilizado, pero sin llegar a la "Puntualización"; mientras que los tipos de jugadores no suelen considerarse en el diseño de investigación. Finalmente, la mayoría de las publicaciones se encuentran en una fase inicial de innovación.

Palabras clave: compromiso; motivación; aprendizaje lúdico; diseño de juego; comunicación educativa.



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1. Introduction

The development of Information and Communication Technologies (ICT) has brought with it an evolution towards the culture of open access, facilitating the democratization of scientific knowledge and greater diversity in the selection and communication of tools to solve problems of motivation, participation and immersion in social contexts. In this context, open access not only guarantees the transparency and replicability of research, but also allows for a more equitable analysis of global scientific production (Rosado *et al.*, 2024). In social science communication, the need to face new problems of lack of motivation and immersion means that those involved resort to the support of innovative tools (programs or applications), capable of providing an effective response and at a low cost.

In smart cities, the game has traditionally been perceived as a mere element of leisure. However, this vision is changing thanks to gamification, which transforms playful dynamics into effective tools to solve specific social problems. Various researchers propose gamification as an effective system to solve social problems (Turan *et al.*, 2016). However, in the literature, gamification is commonly confused with traditional games, serious games (Çeker & Özdamlı, 2017) and with some marketing processes. Nonetheless, gamification differs from traditional games, serious games, and marketing (Conaway & Garay, 2014) since it builds loyalty based on psychology and game design (González *et al.*, 2016).

Therefore, according to Lucassen & Jansen (2014), gamification may be related to some marketing concepts (commitment, loyalty and recognition), but they differ in their design and in the way they motivate and engage participants. Hence, gamification is defined as the implementation of game strategies in non-playful environments (Deterding *et al.*, 2011), to influence behavioral change toward a specific objective (Romero-Rodríguez *et al.*, 2017), using a design framework, for example: MDA (in Spanish MDE): mechanics, dynamics and aesthetics, proposed by Hunicke *et al.* (2004), suggested by Kim & Lee (2015), and psychological theories for its application.

It is essential to distinguish gamification from serious games. While serious games are full-fledged apps designed with a purpose beyond entertainment, gamification incorporates gaming elements into non-playful contexts without creating a full-fledged game. In other words, a serious game is a game with an educational or formative purpose, whereas gamification applies game elements in a context that is not a game *per se*.

2. Theoretical Framework

Gamification is based on a socio-technological framework on which there is no consensus regarding its historical background. According to de-Marcos *et al.*, (2016) although the system is relatively new, its application bases date back to the development of video games in the early 80s. It should be noted that gamification has different forms of application, depending on the field of knowledge where it is used. In the educational field, it can be described as a teacher's approach that merges the principles of teaching with motivation theory (Arkun Kocadere & Çağlar, 2018). In the field of Business, it is implemented as a system used for customer loyalty (Levy, 2012): improving the experience and participation of users in default applications (Korn & Schmidt, 2015). In health psychology, it is used to train the medical group and patients in the management of treatments for an illness. In addition, it is used to promote a healthy lifestyle (Pesare *et al.*, 2016). In the environment, it is conceived as a tool to engage people to take socially sustainable actions through social influence, promoting participation.

2.1. Gamification Design: Relationship between Player types and Game Mechanics, converted into Tools

The design of gamification is based on two pillars: (1) the player types, who are the ones who receive the motivation; and (2) the game mechanics, which constitute the means to develop intrinsic and extrinsic motivation through the game components. The integration of both pillars is materialized in specific tools for participants. The player types are an important aspect to be able to analyze the variability in motivation and immersion when applying gamified experience. For that reason, participants must be identified from the beginning of the intervention (Arkun Kocadere & Çağlar, 2018). In that sense Müller *et al.* (2016), they recommend personality tests to divide players. On a general level, the player types come to life from the point of view of Bartle (1996), being one of the pioneers in classifying players by their behavior (Caglar & Kocadere, 2016; Hamari & Tuunanen, 2012). In addition, he is one of the most recognized authors in this field; for that reason, he is one of the most accepted and referenced (Hamari & Tuunanen, 2012), being recommended by Werbach & Hunter (2012) for its use in gamification. Bartle (1996) uses four categories of classification: Assassin, Achiever, Explorer and Socializer.

Within gamification, Tondello *et al.* (2016) they propose a classification (Marczewski's hexagon) with new nuances: Disruptor, Free Spirit, Winner, Player, Social, Philanthropist; taking elements from Bartle, and adding the motivation theory (RAMP) and personality to break them down. (That is, Marczewski's typology takes into account motivation and immersion more forcefully).

Authors such as Arkün Kocadere & Çağlar (2018) and Taspınar *et al.* (2016), with regard to game mechanics to improve motivation and engagement, start from the taxonomy of Bartle (1996), in which four types are defined: (a) leaderboards, progress bars, statuses, achievements, combos, and points for assassins; (b) badges, bonuses, combos, levels, progress bars, and rewards program for achievers; (c) quest, rewards, and story elements for explorers, and (d) quest, customization, and story for socializers.

2.2. Levels of Innovation in Gamification

In the social sciences, mastering innovative processes becomes an essential part of gamification, as it allows people to be kept motivated and committed to performing predefined actions. According to Ekol (2008) and Majumdar (2005), based on the typology proposed by UNESCO (2002), there are four levels to communicate innovation: (1) emerging level (ICT knowledge): it is the initial stage of ICT development, characterized by the acquisition of computer equipment and resources; (2) application level (application in specific scenarios) where the tools begin to adapt to the application context, and users use them as a way to solve the problems raised; (3) level of implementation (integration and dissemination of its operation) in which ICT is incorporated into the fields of intervention, and changes in strategies are observed to continue managing its use; and (4) level of transformation (the benefits of the intervention are perceived and propagated to other areas) where ICTs become an integral part of the program or project in the context in which they are introduced.

The theoretical conceptualizations presented evidence the complexity and multidisciplinary nature of gamification in social sciences. However, gaps persist in the systematic understanding of how these systems are implemented in practice. Therefore, a systematic review is necessary to identify patterns, trends and gaps in the application of gamification.

This research focuses exclusively on open access publications for three fundamental reasons: (1) to guarantee the replicability of this systematic review by allowing other researchers to access the same sources; (2) promoting scientific transparency in an emerging field where empirical validation is

scarce; and (3) to analyze scientific production that is truly accessible to the global academic community, especially in contexts with limited resources for database subscriptions. Although this reduces the sample size (from 1541 to 155 publications), it provides greater methodological rigor and facilitates the reproducibility of the study.

Consequently, the main objective of this research is to systematically describe and analyze gamification studies in the domain of social sciences available in open access, presenting a contextual approach to application.

The specific objectives are: (i) to collect, analyze and methodically sinter existing studies in open access to identify the fields of knowledge where gamification is most used; (ii) characterize the components, player types and tools used in these studies; (iii) determine the levels of innovation achieved in each field of knowledge; and (iv) identify conceptual and methodological gaps that require future research. To respond to these objectives, the following research questions were designed:

Table 1. *Classification of research questions*

Dimensions	Analysis subcategories	Research Questions	Type of study/ Analysis
1. Overview (References)	(1) Quartiles; (2) type of article: book, journal or conference section; (3) years; (4) sources; (5) Countries of publication	[Descriptive]	Frequency analysis
2. Aspects of gamification	(1) Components; (2) Tools (support); (3) Player Types	RQ1. How is the process of applying gamification characterized (components; player types; tools) in the studies reviewed? RQ2. In relation to one of the components of gamification, (motivation) is there any association between the motivators (extrinsic and intrinsic) with respect to the fields of knowledge?	Frequency analysis Chi Square

3. Levels of innovation in gamification	(1) Emerging phase, (2) application phase, (3) implementation phase, (4) transformation phase	RQ3. What is the level of gamification innovation in each of the fields of knowledge, and is there any association between them with respect to the fields of knowledge?	Frequency analysis Chi Square
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Source: Author's own elaboration.

In order to achieve and communicate the results in an accurate and systematic manner, the methodological guidelines proposed by Kitchenham (2007) were adopted, establishing a protocol that includes inclusion and exclusion criteria, data extraction and analysis of results. In conclusion, the objective is to offer the reader a comprehensive view of the relationship between the components, player types, and gamification tools, as well as the levels of innovation achieved in social sciences.

3. Methodology

This study was conducted based on a *Systematic Literature Review* (SLR). This method documents the most far-reaching publications in a specific area following a defined protocol (Balaid *et al.*, 2016). The present study adheres to the guidelines proposed by Kitchenham & Charters (2007) and by Ramírez Montoya & García Peñalvo (2018): (a) develop a review protocol; (b) identify and refine the inclusion and exclusion criteria; (c) outline the search strategy process; (d) identify the selection process; (e) use data mining and synthesis.

3.1. Review Protocol

The review protocol helps to increase scientific rigor for sample extraction and, in addition, reduces the bias of researchers; these factors show an excellent differentiation between an SLR and a traditional overhaul (Rickinson & May, 2009). This systematic search began with the formulation of a rigorous review protocol, based on the principles, characteristics and procedures of systematic literature review. This protocol identifies the steps of the review, the strategic definition of the search, the research questions, the data extraction, the criteria for the selection of the studies and the synthesis of data. The research questions are noted in the introductory part (see table 1), in the following subsections more details are provided on other components of this research.

3.2. Inclusion and Exclusion Criteria

The inclusion and exclusion criteria were established with the purpose of ensuring that only relevant research was considered for the present systematic review of the literature. After the protocol was predefined, the following criteria were considered: (1) journal articles, conference proceedings and book chapters in all languages; (2) that were published from January 2012 to September 2022; (3) that belonged strictly to the domain of knowledge in social sciences, according to the classification by research areas of the Organization for Economic Cooperation and Development and methodologically collected by Web of Science in the section (OECD, 2007) (WOS, 2019) "incites help", where the social sciences are in point 5, and is made up of 9 branches, which include: psychology (including health psychology); 5.2. economy and business (business); 5.3. educational sciences (education); 5.7. social and economic geography (environmental sciences); (4) that the publications were in open access; Finally, (5) we removed the articles that were not directly related to the objectives of the research.

This fourth criterion is essential to guarantee the replicability of the study and equitable access to primary sources. As will be seen in the results section, of the 1541 studies initially identified, only 204 (13.24%) were available in open access, which shows the importance of making this accessible scientific production visible. In addition, if there are several versions of the same publication, we exclude all versions found in book chapters or in a conference, keeping the complete version of the article.

3.3. Search Strategy

As recommended by Kitchenham (2007) and Rickinson & May (2009), the search strategy was obtained from an automatic stage. During this research stage, the following databases were consulted: ISI Web of Science (WOS) and Scopus. These databases were used because they were considered to be the most important and prestigious in the literature (Cañedo *et al.*, 2010; Romani & Macedo, 2024). In these databases, 14.19% of the research was in the first quartile, 23.23% in the second, 21.94% in the third, 6.45% in the fourth, and the remaining 34.19% did not belong to any quartile, thus covering the conference proceedings.

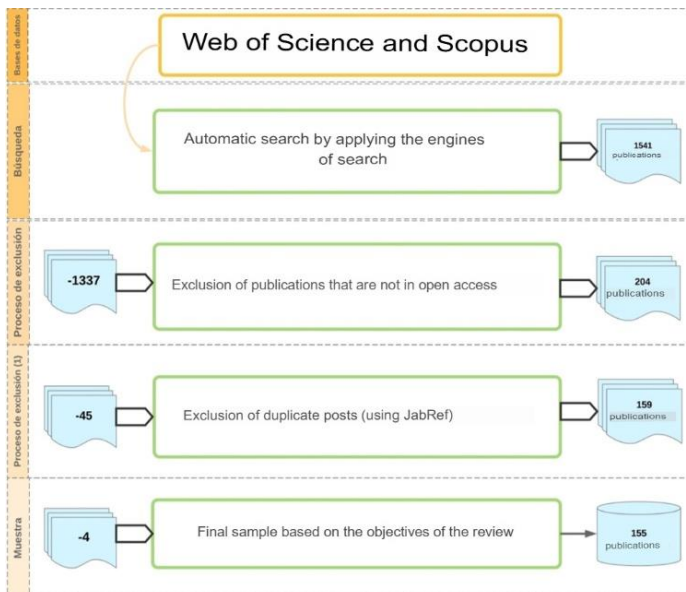
In relation to the research questions and the structure of this review, the word "gamification" was used as a keyword in the search, with the aim of identifying the largest number of publications on gamification in the social sciences available in open journals. Once the initial data were obtained, the publications

were analysed in order to consider their relevance in relation to the inclusion and exclusion criteria; then JabRef (version 3.8.2) was used to remove duplicates and Mendeley (version 1.19.3) to maintain and manage results; subsequently, the results were imported into a Microsoft Excel spreadsheet (version 16.16.6), being used in the data extraction stage. Finally, the studies obtained were added to Mendeley (version 1.19.3), giving rise to the primary studies (sample).

3.4. Study Selection Process

Following the recommendations of Kitchenham (2007), the selection process was carried out through a sequential stage approach. It is important to emphasize that at this stage studies that were not clearly related to the domain of knowledge communication of the Social Sciences were excluded, establishing the initial exploration and identifying 1541 publications in the automatic search —criteria 1, 2 and 3—. Of these 1541 studies, 1337 (86.76%) were not open access —criterion 4— and 45 (2.92%) were duplicates. The remaining 159 studies were verified according to the research objectives, and 4 (0.26%) were excluded —criterion 5—, for a sample of 155 (10.06%) publications (see fig. 1).

Figure 1. Search strategy and sample selection process



Source: Author's own elaboration.

In the distribution of the studies in the sample, among the different databases, before and after the selection process, it was distributed as follows: Web of Science 1040 (67.49%), with 192 (94.12%) open publications, being the one with the highest number in the sample, and Scopus 501 (32.51%), with 12 (5.88%) open publications —most of them being excluded because they were duplicates—.

3.5. Data Extraction and Synthesis

The data extraction and synthesis phase was carried out by reading each of the 155 publications and extracting the predefined data using a form, detailed in columns 1 and 2 of table 1, and being managed in Microsoft Excel (version 16.16.6) and in Atlas.ti (version 8.4.2). The main objective of this phase was to obtain the form for data extraction that would allow methodologically recording the information acquired in the publications of the exhibition. Consequently, when researching the full texts of the articles in the sample, the required data were extracted and synthesized, in order to include the analysis of each of the dimensions: fields and subfields of research and the main contributions in the empirical articles: the components, typologies and tools most used by gamification, as well as the levels of innovation that gamification has in each of the fields of knowledge (see the inclusion and exclusion criteria). Once the form was completed with the data from the sample's investigations, the analysis stage was carried out by using contingency tables and applying the Chi-square test in questions 2 and 3 to determine if there were associations. The results of the research will be detailed in the following sections.

4. SLR Results

This section provides some statistical results necessary to present our analysis: overview (source and temporal view) and a detailed answer to each of the research questions:

4.1. Overview

In the distribution of primary studies (January 2012 - September 2022), there is a gradual increase in publications and contributions of open gamification, in the domain of research in social sciences. Most of the primary studies were published in journal articles (n=135; 87.10%), followed by (n=16; 10.32%) conference proceedings, while only articles (n=4; 2.58%) were published in book sections. The journals with the highest number of publications were: International Journal of Emerging Technologies in Learning (n=7), followed by *the Journal of*

E-Learning and Knowledge Society and by *Frontiers in Psychology* with (n=5); then by *Electronic Journal of E-Learning* and *Ried-Ibero-American Journal of Distance Education* (n=4); finally, *Educational Technology & Society* and *Eurasia Journal of Mathematics Science and Technology Education* with (n=3). The countries with the highest number of publications are: Spain (n=30; 19.39%), the United Kingdom (n=12; 7.74%), the United States (n=10; 6.45%) and China (n=8; 5.16%).

4.2. Results of the Research Questions

From each study, the data needed to answer the research questions were selected and grouped into similar groups. The following subsections provide the results for each of the predefined research questions in section 2.

RQ1. How is the process of applying gamification characterized (components; player types; tools) in the studies reviewed, and is there any association between motivators (extrinsic and intrinsic) with respect to fields of knowledge?

An intensive review of primary studies was conducted to identify the relationship between gamification components (see table 2), player types (see table 3), and the resulting tools (see table 4). This relationship is essential because an appropriate combination between components and player types allows for the creation of effective and innovative tools that increase the motivation of the participants.

The analysis revealed that "education" was the field of knowledge with the greatest application of the gamification system, registering 144 components (66.67%), of which the majority correspond to extrinsic motivation (81.25%) and 36 tools (66.67%). The second field with the highest application of gamification was "environment" with 30 (13.89%) components, 76.70% corresponded to extrinsic motivation, and 7 (12.96%) tools. The third field of knowledge was "health psychology" with 22 (10.18%) components, 81.80% corresponded to extrinsic motivation, with 7 (12.96%) tools. The fourth field was "business" with 15 (6.94%) components, 73.30% extrinsic motivators, and 3 (5.55%) tools. The remaining 5 components (2.32%) and 1 tool (1.86%) belong to the "multiple" category which covers several fields of knowledge mentioned above.

Table 2. Number of papers using gamification components by field of knowledge

Components	Fields					
	Education	Business	Health Psychology	Environment	Multiple	Total
	F(%)	F(%)	F(%)	F(%)	F(%)	F(%)
1) Points	32 (22.22%)	3 (20.00%)	3 (13.64%)	7 (23.33%)	1 (20.00%)	46 (21.30%)
2) Levels	18 (12.50%)	3 (20.00%)	3 (13.64%)	4 (13.33%)	1 (20.00%)	29 (13.43%)
3) Badges	16 (11.11%)	2 (13.33%)	3 (13.64%)	4 (13.33%)	1 (20.00%)	26 (12.04%)
4) Avatars	6 (4.17%)	0 (0.00%)	0 (0.00%)	1 (3.33%)	0 (0.00%)	7 (3.24%)
5) Leaderboard	23 (15.97%)	3 (20.00%)	3 (13.64%)	6 (20.00%)	1 (20.00%)	36 (16.67%)
6) Content Unlocking	1 (0.69%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.46%)
7) Gifts	4 (2.78%)	0 (0.00%)	1 (4.55%)	0 (0.00%)	0 (0.00%)	5 (2.31%)
8) Progress Bars	7 (4.86%)	0 (0.00%)	1 (4.55%)	0 (0.00%)	0 (0.00%)	8 (3.70%)
9) Challenge and obstacles	5 (3.47%)	0 (0.00%)	2 (9.09%)	0 (0.00%)	0 (0.00%)	7 (3.24%)
10) Missions	1 (0.69%)	0 (0.00%)	1 (4.55%)	1 (3.33%)	0 (0.00%)	3 (1.39%)
11) Roles	4 (2.78%)	0 (0.00%)	1 (4.55%)	0 (0.00%)	0 (0.00%)	5 (2.31%)
12) Feedback	8 (5.56%)	0 (0.00%)	2 (9.09%)	2 (6.67%)	1 (20.00%)	13 (6.02%)
13) Collaboration	8 (5.56%)	1 (6.67%)	1 (4.55%)	1 (3.33%)	0 (0.00%)	11 (5.09%)
14) Social Media	2 (1.39%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (0.93%)
15) Autonomy	2 (1.39%)	1 (6.67%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	3 (1.39%)
16) Curiosity	2 (1.39%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (0.93%)

17) Status	1 (0.69%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.46%)
18) Social recognition	1 (0.69%)	1 (6.67%)	0 (0.00%)	2 (6.67%)	0 (0.00%)	4 (1.85%)
19) Competition	3 (2.08%)	1 (6.67%)	1 (4.55%)	2 (6.67%)	0 (0.00%)	7 (3.24%)
Total	144 (100%)	15 (100%)	22 (100%)	30 (100%)	5 (100%)	216 (100%)

Source: Author's own elaboration.

19 gamification components used in the tools in Table 4 were identified and classified by fields of knowledge. The most used component was *the Points System* (n=46; 21.30%), maintaining a homogeneous trend of over 20% in all fields, except *Health Psychology* with 13.64%; the second most frequent component was *the Classification Table* (n=36; 16.67%), with percentages above 10%; the third and fourth places were occupied by *Insignias* (n=29; 13.43%) and *Avatars* (n=26; 12.04%). As can be visualized in Table 2, the most frequent components used in the social science research domain come from extrinsic motivators.

Table 3 shows that the studies lack empirical evidence (n=98; 63.23%), compared to the studies that have applied the gamification system (n=57; 36.77%).

Table 3. Implementation of the player types by type of study and by field of knowledge

Type of study	Fields of knowledge	Does not refer to	Refers	He describes them	Total
		F(%)	F(%)	F(%)	F(%)
Empirical	Education	28 (25,00%)	6 (18,75%)	5 (45,45%)	39 (25,16%)
	Business	2 (1,79%)	2 (6,25%)	0 (0,00%)	4 (2,58%)
	Health Psychology	5 (4,46%)	0 (0,00%)	1 (9,09%)	6 (3,87%)
	Environment	5 (4,46%)	1 (3,13%)	1 (9,09%)	7 (4,57%)
	Multiple	1 (0,89%)	0 (0,00%)	0 (0,00%)	1 (0,65%)
	Subtotal	41 (36,61%)	9 (28,13)	7 (63,64%)	57 (36,77%)
Theoretical	Education	41 (36,61)	13 (40,63%)	1 (9,09%)	55

					(35,48%)
	Business	14 (12,50%)	5 (15,63%)	2 (18,18%)	21 (13,55%)
	Health Psychology	8 (7,14%)	1 (3,13%)	0 (0,00%)	9 (5,81%)
	Environment	4 (3,57%)	3 (9,38%)	0 (0,00%)	7 (4,52%)
	Multiple	4 (3,57%)	1 (3,13%)	1 (9,09%)	6 (3,87%)
	Subtotal	71 (63,39%)	23 (71,88%)	4 (36,36%)	98 (63,23%)
	Total	112 (100,00%)	32 (100,00%)	11 (100,00%)	155 (100,00%)

Source: Author's own elaboration.

Within the studies that have applied the gamification system, 41 (71.93%) of the articles do not refer to the player types, while 9 (15.79%) of the articles refer to the player types, but do not classify them, and 7 (12.28%) publications classify them by type of players, with Bartle's typology being the most referenced (Hamari & Tuunanen, 2012), a similar situation with articles that lack empirical evidence. 71 (72.45%) of the articles do not refer to the player types in the literature presented, while 32 (23.47%) publications refer to but do not explain the classification, and only 11 (4.08%) describe them, also highlighting the taxonomy of Bartle (1996).

Table 4. Number of gamification tools used per field of knowledge

Fields of knowledge						
Tools	Education	Business	Health Psychology	Environment	Multiple	Total
Q-Learning-G	1	0	0	0	0	1
KAIZEN-IM	1	0	0	0	0	1
Cogent	1	0	0	0	0	1
Unity3D	1	0	0	0	0	1
Play the Game	1	0	0	0	0	1
FORESEE	1	0	0	0	0	1

Learning Scenario	1	0	0	0	0	1
Gamified MOOC'S	1	0	0	0	0	1
Minecraftedu	1	0	0	0	0	1
Kahoot!	2	0	0	0	0	2
fMRI	1	0	0	0	0	1
CERTIFY	1	0	0	0	0	1
Bootstrap	1	0	0	0	0	1
EDF	1	0	0	0	0	1
ACE TEAM Question	1	1	0	0	0	2
Co-op games	2	0	1	0	0	3
Class dojo	1	0	0	0	0	1
TalentLMS	1	0	0	0	0	1
Go and Ask Questions (GAQ)	1	0	0	0	0	1
CDIO + Gamification	1	0	0	0		1
Game Maps (creating a game design based on questions)	1	0	0	0	0	1
DentLit	1	0	0	0	0	1
SCRUMBAN	0	1	0	0	0	1
The Protégé	1	0	0	0	0	1
Fireproof games	1	0	0	0	0	1
Custom gamification structure	9	1	0	0	0	10
Various platforms on the Web	1	0	1	0	0	2
Beat the Street	0	0	1	0	0	1
NFP	0	0	1	0	0	1
Medieval Warrior Simulator	0	0	1	0	0	1
TimePlay	0	0	1	0	0	1
Fraserhealth	0	0	1	0	0	1
Quibox	0		0	1	0	1

PHESS (People Help Energy Savings and Sustainability)	0	0	0	1	0	1
The Island	0	0	0	1	0	1
GAFU	0	0	0	1	0	1
PATH	0	0	0	1	0	1
APP RATE	0	0	0	1	0	1
SmartH02	0	0	0	1	0	1
Punkte	0	0	0	0	1	1
Total	36	3	7	7	1	54

Source: Author's own elaboration.

Table 4 shows little homogeneity in the use of tools in empirical studies, in each of the fields of knowledge. Although there are many pre-established applications capable of improving the motivation and commitment of the participants, the use of personalized tools (n=10; 18.52%), cooperative games (n=3; 5.55%), and web platforms, the "ACE TEAM" Questionnaire and Kahoot! (n=2; 3.70%).

RQ2. Is there any association between motivators (extrinsic and intrinsic) with respect to fields of knowledge?

According to the theory of self-determination, proposed by Ryan & Deci (2000), the components can be grouped according to the type of motivation they promote: extrinsic (Table 2: components 1-11) and intrinsic (Table 2: components 12-19). Both extrinsic and intrinsic motivation promote performance improvements, but only intrinsic motivation has been associated with better psychological well-being, increased innovation, and engagement-derived outcomes. (Mekler *et al.*, 2015). Extrinsic motivation components have a greater applicability in the social science research domain with more than 80%, in almost all fields of knowledge, compared to 19.9% of intrinsic motivation components. Apparently, extrinsic motivation has a greater inclination for health psychology (81.8%), education (81.3%) and multiple (80.0%); while intrinsic motivation has a greater predilection in business (26.7%) and in the environment (23.3%). However, a non-parametric test was done with the Chi-square test to find out if these differences were statistically significant. That is, wanting to know if there was an association between the types of motivation and the fields of knowledge. With a $\chi^2 = 8.13$, $df = 4$, $p = 0.93$. We can conclude that, with a significance level error of 5%, there is no significant association between the types of motivation and the fields of knowledge.

RQ3. What is the level of gamification innovation (emerging, application, innovation, transformation) in each of the fields of knowledge, and is there any association between in regard to the fields of knowledge?

The results by levels of innovation show a small number of studies in the transformation phases (n=1; 1.8%), the implementation phase (n=13; 22.8%) and the application phase (n=14; 24.6%), and just over half of the studies in the emerging phase (n=29; 50.9%), as shown in Table 5.

Table 5. Levels of gamification innovation by fields of knowledge

Levels of innovation in gamification	Fields of knowledge					Total F(%)
	Educa-tion F(%)	Business F(%)	Health Psy-chology F(%)	Environ-ment F(%)	Multiple F(%)	
Emergent phase	20 (51.3%)	2 (50.0%)	2 (33.3%)	4 (57.1%)	1 (100%)	29 (50.9%)
Application phase	9 (21.3%)	0 (0.0%)	4 (66.7%)	1 (14.3%)	0 (0.0%)	14 (24.6%)
Implementa-tion phase	9 (21.3%)	2 (50.0%)	0 (0.0%)	2 (28.6%)	0 (0.0%)	13 (22.8%)
Transfor-mation phase	1 (2.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.8%)
Total	39 (100%)	4 (100%)	6 (100%)	7 (100%)	1 (100%)	57 (100%)

Source: Author's own elaboration.

Regarding the classification of innovation results by field of knowledge, 68.4% of the research is in the field of education; followed by *the* environment (12.3%), health psychology (10.5%), business (7.2%) and only 1.7% for research that was carried out in several of the aforementioned fields. It should be noted that the emerging phase predominated over the rest of the phases: multiple (100%), environment (57.1%), education (51.3%), business (50.0%), except health psychology (33.33%). In health psychology, 66.7% of the studies are in the application phase. In addition, a non-parametric test was done with the Chi-square test to find out if these differences were statistically significant. $\chi^2 = 10.246$, $df = 12$, $p = 0.59$. In this sense, it is noted that there is no statistically significant relationship between levels of innovation and fields of knowledge.

5. Discussion and Conclusions

This paper presents an SLR that analyzes the application of gamification in social sciences, with an emphasis on open access publications. Based on the analysis of 155 articles published between January 2012 and September 2022, the objectives set are met and trends, gaps and opportunities for future research are identified.

As far as descriptive data is concerned, there is a clear growth in gamification in recent years (Caponetto *et al.*, 2014; Byl, 2013; Dicheva *et al.*, 2015; Gopinath Bharathi *et al.*, 2016; Maican *et al.*, 2016). On the other hand, almost two-thirds (n=98; 63.23%) of the studies are theoretical, compared to almost a third (n=57; 36.77%) that showed empirical evidence. This absence of empirical work has already been highlighted by authors such as Attali & Arieli-Attali (2015) and Bista *et al.* (2014) who point out that there is little empirical evidence regarding the practical effectiveness of gamification.

A worrying finding is that 71.93% of empirical studies do not refer to the player types, and only 12.28% classify them before the intervention, as pointed out by Ferro *et al.* (2013). This suggests a poorly personalized design that could explain the variability in the effectiveness of gamified interventions. Although Bartle's typology is still the most widely used, his traditional approach could be enriched by more contemporary models, such as Marczewski's hexagon, which allow the intrinsic motivation of players to be more fully integrated.

It is observed that gamification in social sciences, available in open access, is predominantly concentrated in the educational field (66.67% of the components, 68.40% of the studies according to the levels of innovation). 19 gamification components were identified, with the most frequent being the points system (21.30%) but without reaching "Pointsification" (Sigala, 2015), leaderboards (16.67%) and badges (13.43%). A similar distribution is found in Tan & Hew (2016); however, it has been shown that the excessive utilization of "Pointsification" points can have negative impacts on engagement (Koivisto & Hamari, 2014), innovation and participation (Hew & Cheung, 2014), because it is an element excessively related to extrinsic motivation.

The analysis confirmed four main fields of application in order of frequency: education (144 components, 36 tools), environment (30 components, 7 tools), health psychology (22 components, 7 tools) and business (15 components, 3 tools). This distribution reflects the growing concern to improve motivation and engagement in educational contexts, followed by the interest in promoting sustainable and healthy behaviours.

It could be thought that education and business have a greater inclination to apply extrinsic components in gamification design, and that health and environmental psychology focus on intrinsic components (Cordero-Brito & Mena, 2018), but this was not the case, since in all fields of knowledge the components were mostly extrinsic (80%), suggesting a pragmatic approach focused on tangible rewards.

With regard to the tools, there is a tendency to build personalized resources (n=10; 18.52%) and cooperative (n=3; 5.55%) in which, as they state, the game components are combined with each type of player to adjust to the needs of the user and facilitate a better gamification experience. For this reason, it is necessary to define the components that the tools to be used must contain, to keep the participants motivated (Antonaci *et al.*, 2015); in any case, they should take into account the component-player type relationship, since many empirical studies only add game elements to existing services.

Regarding innovation, this study shows that 75.43% of the publications come from initial phases (emerging and application) and only 24.56% belong to more integrative innovation stages (implementation phase and transformation phase). There are studies that show that innovation substantially improves gamification processes (Roth *et al.*, 2015). However, it is true that the gamification system in the social sciences is still too young to observe success stories (Shpakowa *et al.*, 2016). According to Shpakowa *et al.* (2016), education is the most interested sector in showing examples of innovation in gamification. Similarly, in this research, education had the largest number of studies (n=39; 68.42%) applying innovation, more than half in the emerging phase, but with a low level in the implementation and transformation phases. The productive sector will always be concerned about involving great gamified innovations in its processes (Zuckerman & Gal-Oz, 2014); For this reason, half of business studies are in an integrative phase, being the most advanced field of knowledge in this regard.

Finally, this SLR identifies four main gaps that require future research: (a) an empirical gap: 63.23% of the studies are theoretical, evidencing a clear need for more applied research to validate the effectiveness of gamified interventions; (b) personalization gap: the low consideration of player types (only 12.28% classify them) limits the ability to design truly personalized and effective experiences; (c) motivational gap: the overwhelming predominance of extrinsic components (80.10%) over intrinsic ones (19.90%) contradicts the evidence suggesting that only intrinsic motivation is associated with sustainable psychological well-being and greater innovation; and (d) innovation gap: the

concentration in initial phases (emergent and application phases, 75.43%) indicates that gamification has not yet demonstrated its capacity for systemic transformation in most countries.

It is important to recognize that this review was limited to open access publications, which accounted for only 10.06% of the studies initially identified (155 out of 1541). Although this guarantees the replicability and transparency of the study, it is possible that there are relevant contributions in restricted access publications that were not considered. However, this limitation also constitutes a methodological strength by promoting open science and facilitating the reproducibility of the study.

Ethics and transparency

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Contributions from authors

Function	Author 1	Author 2	Author 3	Author 4
Conceptualization	X			
Data curation	X			
Formal analysis	X			
Acquisition of financing	X			
Research	X			
Methodology	X			
Project Management	X			



Resources	X			
Software	X			
Supervision	X			
Validation	X			
Visualization	X			
Writing - original draft	X			
Writing - proofreading and editing	X			

Data availability

This work is a review of the literature; therefore, no primary data has been generated, but rather previously published studies have been analysed and synthesised.

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