REVISTA DE ESTUDOS INTERDISCIPLINARES

PUBLICATIONS ABOUT GAMIFICATION FROM 2011 TO 2020: A BIBLIOMETRIC STUDY ON THE WEB OF SCIENCE DATABASE

PUBLICAÇÕES SOBRE GAMIFICAÇÃO NO PERÍODO DE 2011 A 2020: UM ESTUDO BIBLIOMÉTRICO NA BASE DE DADOS WEB OF SCIENCE

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Anderson Amaral de Oliveira[1]
Liane Beatriz Rotili[2]
Josei Fernandes Pereira[3]

Abstract: This article aimed to analyze the panorama of publications on gamification in the international context in the last decade (2011-2020). To do so, a bibliometric study was carried out making possible to verify the publications' characteristics. The results indicate that scientific production on gamification is greater in the areas of Education and Educational Research and Computer Science. Regarding language, publications in English prevailed, representing approximately 93.43% of published articles, following a worldwide trend. The results make it possible to outline productivity patterns on the gamification theme, encouraging the construction of multidisciplinary knowledge and pointing out possible research gaps.

Keywords: Gamification. Bibliometric study. Game-based learning. ICT. Technology in Education.

Resumo: O objetivo deste artigo foi analisar o panorama das publicações sobre gamificação no contexto internacional, compreendendo a última década (2011-2020). Para isso, foi realizado um estudo bibliométrico que possibilitou verificar as características das publicações. Os resultados indicam que a produção científica sobre gamificação é maior nas áreas de Education Educational Research (Pesquisa Educacional e em Educação) e Computer Science (Ciência da Computação). No que tange ao idioma, predominam as publicações em inglês representando aproximadamente 93.43% dos artigos publicados, seguindo uma tendência mundial. Os resultados, possibilitam traçar padrões de produtividade sobre o tema gamificação possibilitando fomentar a construção do conhecimento multidisciplinar, e apontar possíveis a lacunas de pesquisa.

Palavras-chave: Gamificação. Estudo Bibliométrico. Aprendizagem baseada em jogos. TIC. Tecnolgia na educação.

INTRODUCTION

Games and humanity have been together for millennia. They are rooted in human culture, influencing people and societies. On an unprecedented scale, digital games increased this influence by emerging as a tool for entertainment, social construction and learning (MCGONIGAL, 2011; SEABORN; FELS, 2015). Internet popularization worldwide as the

[1]Doutor em Letras. Professor do curso de Letras Português e Inglês-UNIJUÍ. E-mail: anderson.amaral@unijui.edu.br
[2]Doutoranda em Desenvolvimento Regional, UNIJUÍ. E-mail: liane.rotili@sou.unijui.edu.br
[3] Doutorando em História, UPF. E-mail: josei.pereira@unijui.edu.br

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information and communication technologies (ICTs), brought changes in society, influencing the way people socialize, communicate, work, and learn. Video games are popular with younger generations, which are called 'digital natives' (PRENSKY, 2001; SIMÕES; DÍAZ; FERNÁNDEZ VILAS, 2013).

In this sense, gamification emerges as a concept that involves design elements and game mechanics (DOMINGUEZ et al, 2013; SEABORN; FELS, 2015) in non-game contexts (DETERDING, DIXON, KHALED, 2011; DOMINGUEZ et al, 2013, HANUS; FOX, 2015). Seaborn and Fels (2015) add that gamification has emerged as a trend in recent years, emerging from business and marketing sectors and recently being useful for academic, educational, and professional purposes in a variety of domains.

Gamification has interdisciplinary production elements with contributions from the marketing area, such as associating cards with points and rewards for productivity and goal achievement. Likewise, it presents structures that are characteristic of educational environments such as (school) levels, grades, badges, certificates and diplomas (NELSON, 2012; SEABORN; FELS, 2015). However, it is in education that academic publications gain strength, attempting to differentiate this term from other themes that converge with its limits and are often studied as the same concept, only using another word: tailored gamification or personalized gamification, storyfication, serious games, game-based learning, role-play games, among other less popular terms. It is worth mentioning the choice and restriction of the term gamification, as it is an object of interest only to its concept and not to other associated methods.

Analyzing this context, we propose the problematization: how do academic research work on the gamification theme? Therefore, this article aims to analyze the panorama of publications on gamification, in the international context, in the Web of Science database (WOS). In sequence, a review of the literature on the subject is presented. In the following sections, it is presented the research methods and the analysis of the results found in WOS and, in the last part, the final considerations of the research are highlighted.

METHODOLOGY

The bibliometric study has the recurrent function of investigating the production of articles and knowledge in certain areas, mapping academic communities and identifying

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researchers' networks and their motivations (NEDERHOF, 2006; CHUEKE; AMATUCCI, 2015; VASCONCELOS, 2016).

The statistical studies that longitudinally analyze the characteristics of publications are usually guided by three laws: Lotka's Law (inverse square law), Brandford's Law (dispersion law) and Zipf's Law (minimum effort law) (CORRÊA et al., 2016).

It is important to highlight that the present study obtained results related to three bibliometric laws. This way, being aware of the numerous contributions that this type of research provides in the construction of a theoretical framework that leads to the evolution of knowledge, we opted for the bibliometric analysis on gamification, encompassing publications from 2011 to 2020 in the Web of Science database of the Institute for Scientific Information (ISI).

The Web of Science database is characterized by indexing the most cited journals in their respective areas, being considered a multidisciplinary database. It is an index of citations on the Web that creates rankings by various parameters, identifying received citations, used references and related records (CAPES, 2015). Thus, data collection was carried out through search engines in the WOS database using the expression "gamification*", considering only publications from 2011 to 2020. This period is justified because there were no articles on this theme in the years prior this cut.

The bibliometric analysis proceeded from the identification of the variables, in three stages, as shown in Table 1. At first, the general characteristics of the publications were identified (by year of publication, theme, type of document, authors, titles of sources, institutions, languages, countries and publications with the highest number of citations). In the second moment, the analysis of themes interrelated to gamification was carried out, and, finally, the relations between the authors used in the 500 most cited publications in WOS on gamification were identified.

Table 1- Conceptual model for Bibliometric Analysis

Research Steps	Description	Tools
Identification of the general caracteristics of the publications	Publication year	WOS database
	Theme	
	Type of document	
	Authors	
	Sources' titles	
	Institutions	
	Languages	

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	Countries	
	Publications with the highest number of citations	
Analysis of the 10 themes related to gamification	Keywords map of the publications on the theme	VosViewer software®
	Table with h-index of 10 themes related to gamification	
Construction and analysis of the networks based on bibliography	Map with groupings by co-citation of sources	VosViewer software®
	Clusters identification	

Source: Designed by the authors (2023)

The characteristics of the publications were identified through WOS database search engines in January 2021. The expression “gamification*” was typed in it, observing the years 2011 to 2021, covering the topics. The second step was the analysis of the 10 topics related to gamification. The searches were carried out between (gamification* AND the topics listed in table 1), following the same criteria as in step 1.

From the collected data, the bibliometric treatment involved the construction and analysis of networks based on the bibliography selected from the VOSviewer (Visualization of Similarities Viewer) software, whose emphasis is on the analysis and visualization of large sets of bibliographic data from a distance-based approach (VAN ECK; WALTMAN, 2010). Broadly speaking, the nodes of the bibliographic network are placed in such a way that the distance between them approximately indicates their relationship according to certain aggregation criteria, forming a map.

In this process, the authors Van Eck; Waltman (2010) point out that to ensure that the solution found is optimal and consistent, it is necessary to observe three conditions. 1) translation, that is, the solution must be centered in the origin; 2) rotation, which says that the solution must be found in such a way that the variance in the horizontal axis must be maximized; 3) reflection, according to what is established that if the median is bigger than zero, the solution is reflected on the vertical axis. Once the similarity between the units of analysis is determined, the software distributes each unit in a cluster without overlapping.

RESULTS AND DISCUSSION

The general characteristics of the publications will be presented below, and they are arranged according to the following categories: year of publication; thematic areas according

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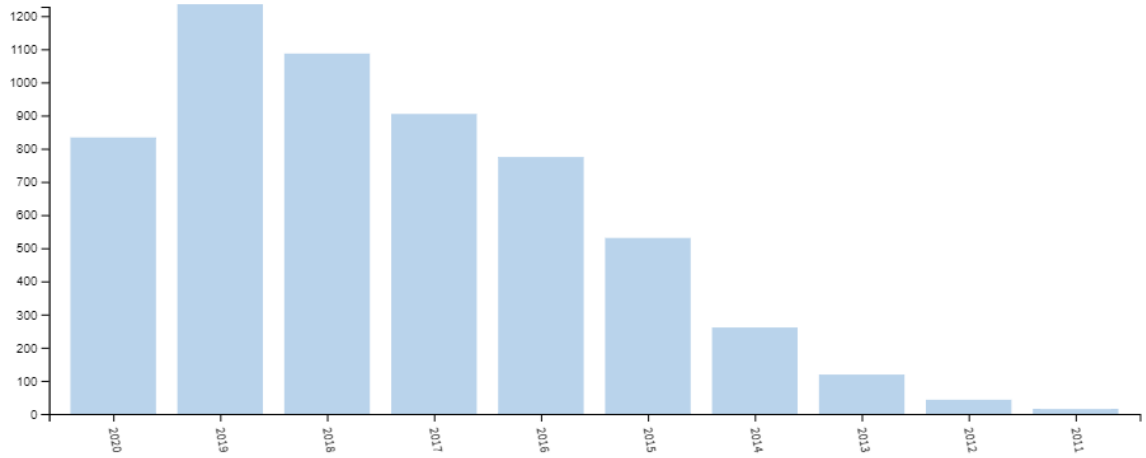
to WOS categories; authors; sources' titles; organizations; language; countries; and most cited publications.

The WOS database search showed, 5,726 publications were found in the period from 2011 to the full year of 2020 with the term "gamification*". As shown in figure 1, there is a growing line in the trend of publications, data corroborated by the evolution in the number of publications from 2011 to 2019. However, in 2020 the number of publications appears to be decreased. This last data is probably because of the efforts in the current world situation, where the focus of the research has become the pandemic, covid-19, the vaccine and all facts related to social isolation, in addition to the practical effects on researchers.

Figure 1 – Publications on Gamification in WOS per year.



Source: Web of Science (2021)

This way, in table 2 it is observed that the publications on the theme gamification in WOS increased from 7 in 2011 to 1079 in 2020, in a continuous increase, and the last three years of publication correspond to 54.72% (3204) of the total of publications on the subject. More than half of what has been published on gamification is recent, demonstrating how incipient and potential this research on the topic is.

Table 2 – Publications per year in WOS

Field: Publication Year	Register Count	% of 5.726
2020	826	14.425 %

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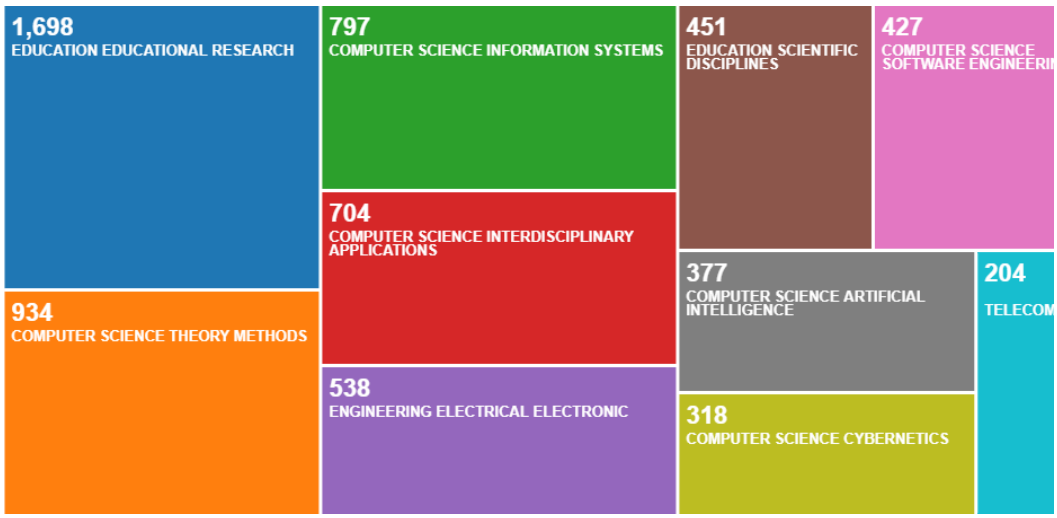
2019	1228	21.446	%
2018	1079	18.844	%
2017	897	15.665	%
2016	767	13.395	%
2015	523	9.134	%
2014	253	4.418	%
2013	111	1.939	%
2012	35	0.611	%
2011	7	0.122	%

Source: Web of Science (2021)

According to the thematic areas category concerning the publications in WOS research database, the ten main thematic areas related to the Gamification are represented in figure 2, with Education and Educational Research corresponding to 29.654% of the publications, that is, at first we could say that it is the area with the highest number of publications, 1698 out of 5726.

Figure 2 - Thematic Areas of Publications according to WOS categories



Source: Web of Science (2021)

However, when we add the Computer Science area, considering the ten main areas, we find a total of 62.12% of the publications divided in six categories (Theory Methods, Information Systems, Interdisciplinary Applications, Software Engineering, Artificial Intelligence, Cybernetics), which is equivalent to 3557 publications out of 5726 on the subject of gamification. This demonstrates that most publications on gamification are related to

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computer science, that is, they are related to digital technologies, to the gamification development process (table 3).

Table 3 - WOS categories according to the publications on Gamification

Field: Web of Science categories	Register count	% of 5.726	
Education Educational Research	1698	29.654	%
Computer Science Theory Methods	934	16.312	%
Computer Science Information Systems	797	13.919	%
Computer Science Interdisciplinary Applications	704	12.295	%
Engineering Electrical Eletronic	538	9.396	%
Education Scientific Disciplines	451	7.876	%
Computer Science Software Engineering	427	7.457	%
Computer Science Cybernetics	318	5.554	%
Telecomunmunications	204	3.563	%
Business	184	3.213	%
Management	177	3.091	%

Source: Web of Science (2021)

Table 4 highlights the authors who published the most on the subject of gamification in WOS in the analyzed period, that is, it appears that Juho Hamari and Marti-Parreno are the authors who have the most publications related to the subject.

Table 4 - Main Authors on gamification in WOS

Field: Authors	Register Count	% of 5,726
Hamari J	38	0.664 %
Marti-Parreno J	22	0.384 %
Isotani S	19	0.332 %
Swacha J	16	0.279 %
Rapp A	15	0.262 %
Antonaci A	14	0.244 %
Dichev C	14	0.244 %
Dicheva D	14	0.244 %
Gasca-Hurtado Gp	14	0.244 %
Kruger A	14	0.244 %

Source: Web of Science (2021)

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Professor Juho Hamari teaches gamification at the Faculty of Information and Communications Technology at the University of Tampere and at the Faculty of Arts at the University of Turku, both located in Finland. Research by Hamari and his multidisciplinary research group the Gamication Group (GG) analyzes elements of game technology (gamefulness), covering various forms of information technology, motivational information systems (e.g., gamification, game-based learning, persuasive technologies), new media (social networking services, online video streaming, and sports), peer-to-peer economies (sharing economy, collaborative consumption, crowd sourcing) and virtual economies (GG, 2021).

The GG, in addition to being present in two universities where Professor Hamari teaches, it is also part of the Center of Excellence in Games Culture Studies and the University Consortium of Pori, as well as the organizers of the annual GamiFIN conference, which in 2021 held its fifth annual meeting in Tampere, Finland (GamiFIN, 2021).

Hamari has 56 articles published in WOS, 38 are studies on gamification, covering topics from the perspective of consumer behavior, human-computer interaction, game studies and information systems science. His most cited seminal studies on this database are Does Gamification Work? - A Literature Review of Empirical Studies on Gamification, 2014, and Challenging games help students learn: An empirical study on engagement, flow and immersion in game-based learning (2016).

Professor José Martí-Parreño is the second in number of publications in WOS, being an associate professor of Marketing at the Universidad Europea de Valencia (Spain), his main areas of research are marketing communication and educational innovation. He was awarded the 2015 David A. Wilson Award for Excellence in Teaching and Learning for a research project on gamification (LINKEDIN, 2021)

With 49 publications from the Web of Science Main Collection, 22 are on the subject of gamification, the most cited articles by the author that stand out are The use of gamification in education: a bibliometric and text mining analysis and Teachers' Attitude towards and Actual Use of Gamification both from 2016.

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Table 5 - Source Titles

Field: Source Titles	Register Count	% of 5,726
Lecture Notes in Computer Science	246	4.296 %
Edulearn Proceedings	203	3.545 %
Inted Proceedings	192	3.353 %
Proceedings if the European Conference on Games Based Learning	168	2.934 %
Iceri Proceedings	156	2.724 %
Communications in Computer and Information Science	86	1.502 %
Advances in Intelligent Systems and Computing	71	1.240 %
Computers in Human Behavior	65	1.135 %
9th International Conference on Education and New Learning Technologies Edulearn17	48	0.838 %
Ieee Global Engineering Education Conference	47	0.821 %

Source: Web of Science (2021)

In journals, Computers in Human Behavior published the most articles on gamification, a total of 2,539% (60 of 2,363), followed by Sustainability 1,735% (41), Computers Education 1,481% (35) and International Journal of Emerging Technologies In Learning 1,354% (32). It is noteworthy that the journal Computers in Human Behavior has published articles with the theme of gamification since 2013, with the author Hamari having published 6 publications and in volume 71 dedicated a special section on gamification: design, research and game applications with guest editors Lennart Nacke and Sebastian Deterding.

As for the organizations that publish the most articles on the subject of gamification, eight of the top ten are Universities located in Spain, University of Granada, Polytechnic University of Madrid, University of Complutense Madrid, University of Alicante, University of Seville, University of Salamanca, University of Valencia and University of Zaragoza. In this list there is a university from Brazil: University of São Paulo and one from Finland: University of Turku (table 6).

Table 6 - Main Institutions

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Field: Institutions	Register Count	% of 5,726
Univ Granada	55	0.961 %
Univ Politecn Madrid	43	0.751 %
Univ Complutense Madrid	36	0.629 %
Univ Alicante	35	0.611 %
Univ Sao Paulo	34	0.594 %
Univ Seville	33	0.576 %
Univ Salamanca	31	0.541 %
Univ Valencia	31	0.541 %
Univ Turku	30	0.524 %
Univ Zaragoza	29	0.506 %

Source: Web of Science (2021)

Regarding language, publications in English are predominant in the WOS database with 5,350 articles published on the gamification theme, representing approximately 93,433% of the published articles, a worldwide trend. Sixty-two articles in Portuguese were published from 2014 onwards, containing 169 authors, 30,645% (19) in the area of Research in Education, containing 60 authors. These data demonstrate that there is still no reference author on the gamification theme in Brazil.

Figure 3 shows the main countries that publish articles on the subject, with Spain standing out with 14.076% (806), followed by the United States with 14.006% (802), Germany 7.335% (420), England 7.160% (410) and Brazil with 4.471%0 (256) of publications. It should be highlighted that 114 countries have publications on these topics, which demonstrates how widespread the gamification theme is across the planet.

Figure 3 – Main countries

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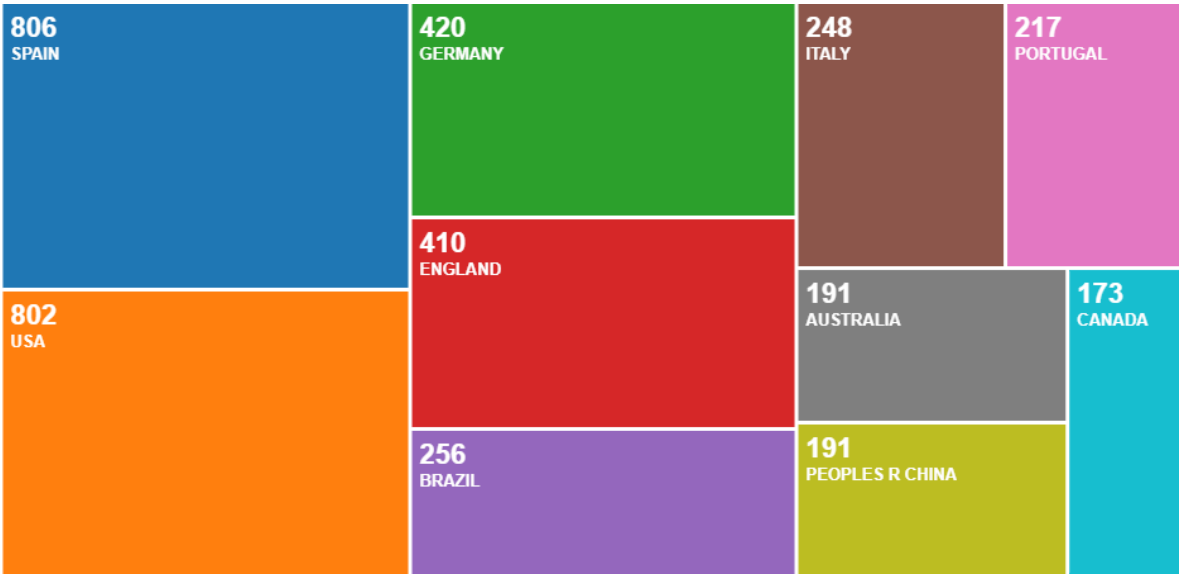

Source: Web of Science (2021)

The list of the 10 publications with the highest number of citations in all databases indexed in the Web of Science with the gamification theme starts with Does Gamification Work? - A Literature Review of Empirical Studies on Gamification, a work done by the most published author, Juho Hamari, published in 2014 at the 47th Hawaii International Conference On System Sciences (HICSS) with 113.25 citations per year (table 7).

Table 7 - Studies with the highest number of citations

Title	Authors	Source Title	Publication year	Total number of citations	Average per year
Does Gamification Work? - A Literature Review of Empirical Studies on Gamification	Hamari, Juho; Koivisto, Jonna; Sarsa, Harri	2014 47th Hawaii International Conference On System Sciences (Hicss)	2014	906	113,25
Gamifying learning experiences: Practical implications and outcomes	Dominguez, Adrian; Saenz-de-Navarrete, Joseba; de-Marcos, Luis; Fernandez-Sanz, Luis; Pages, Carmen; Martinez-Herraiz, Jose-Javier	Computers & Education	2013	562	62,44
Gamification in theory and action: A survey	Seaborn, Katie; Fels, Deborah I.	International Journal Of Human-Computer Studies	2015	518	74

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Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance	Hanus, Michael D.; Fox, Jesse	Computers & Education	2015	452	64,57
Gamification in Education: A Systematic Mapping Study	Dicheva, Darina; Dichev, Christo; Agre, Gennady; Angelova, Galia	Educational Technology & Society	2015	374	53,43
Challenging games help students learn: An empirical study on engagement, flow and immersion in game-based learning	Hamari, Juho; Shernoff, David J.; Rowe, Elizabeth; Coller, Brianno; Asbell-Clarke, Jodi; Edwards, Teon	Computers In Human Behavior	2016	361	60,17
A social gamification framework for a K-6 learning platform	Simoes, Jorge; Diaz Redondo, Rebeca; Fernandez Vilas, Ana	Computers In Human Behavior	2013	294	32,67
Design of an mHealth App for the Self-management of Adolescent Type 1 Diabetes: A Pilot Study	Cafazzo, Joseph A.; Casselman, Mark; Hamming, Nathaniel; Katzman, Debra K.; Palmert, Mark R.	Journal Of Medical Internet Research	2012	291	29,1
Demographic differences in perceived benefits from gamification	Koivisto, Jonna; Hamari, Juho	Computers In Human Behavior	2014	249	31,13
Transforming homo economicus into homo ludens: A field experiment on gamification in a utilitarian peer-to-peer trading service	Hamari, Juho	Electronic Commerce Research And Applications	2013	240	26,67

Source: Web of Science (2021)

The results indicate that scientific production on gamification has been intensified in the last three years, which correspond to 54.72% (3204) of the publications on the subject. Most publications are in the areas of Education Educational Research corresponding to 29.654% (1698) and 62.12% (3557) are from the top ten areas of Computer Science divided in six categories (Theory Methods, Information Systems, Interdisciplinary Applications, Software Engineering, Artificial Intelligencer, Cybernetics).

The most cited author is the Finnish Juho Hamari, who is the head of the multidisciplinary research group Gamication Group (GG), which in turn organizes the largest gamification meeting, the GamiFIN Conference. Regarding language, publications in English predominate, representing approximately 93,433% of published articles, a worldwide trend.

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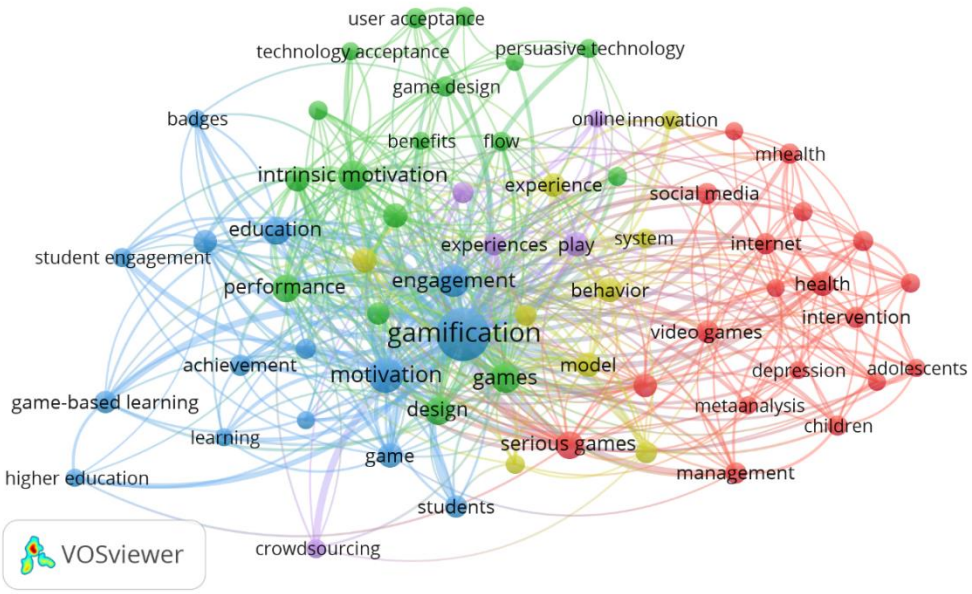
This way, some findings among those who publish the most have focus on the academic community in Spain, as it is the country that publishes the most (Spain), it has the organizations that publish the most (eight of the top ten) and it has one of the two authors that publish the most on the subject (José Martí-Parreño). Another focus could be on Finland, where the most published author (Juho Hamari) and the largest Gamification meeting (GamiFIN Conference) can be found.

When analyzing in VOSviewer the keywords of the 500 most cited articles in our research, using as parameters the co-occurrence1 of all keywords, at least 10 occurrences, motivation (85), engagement (62), intrinsic motivation (49), education (43), serious games (41) are on the top of the list, which forms a total of six clusters (figure 4).

Figure 4 – Authors Keywords Map



Source: Designed by the authors (2021)

Research shows that motivation is one of the key elements of gamification with intrinsic motivation, awakened by emotional or psychological reasons, being a determining factor for learning (RYAN; DECI, 2000; BLOHM; LEIMEISTER, 2013; NICHOLSON, 2012, SAKAMOTO et al, 2012; HAMARI; KOIVISTO; SARSA, 2014; SEABORN; FE LS, 2015). Another theme related to gamification is engagement, which is being studied in this field according to the authors Jonna Koivisto and Juho Hamari (2019).

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Education corresponds to 29.654% of gamification publications, while the education theme gains strength in an attempt to differentiate this term from other themes that converge with its limits and are often studied as the same concept; however, using another word: tailored gamification or personalized gamification, storification, serious games, game-based learning, role-play games, among other less popular ones.

Another way to find out the relevance of themes with the gamification theme is to search for them in WOS and analyze the number of publications, H-index and number of citations (table 8).

Table 8- Publications on gamification and other themes

Themes	Number Public	H-index	Number Citation	Most cited Publications
Learning TS=(gamif* AND learning)	3174	42	13796	Dominguez, Adrian; Saenz-de-Navarrete, Joseba; de-Marcos, Luis; et al. (2013) Hanus, Michael D.; Fox, Jesse (2015) Hamari, Juho; Shernoff, David J.; Rowe, Elizabeth; et al.(2016)
Education TS=(gamif* AND education)	2317	42	11659	Dominguez, Adrian; Saenz-de-Navarrete, Joseba; de-Marcos, Luis; et al.(2013); Seaborn, Katie; Fels, Deborah I. (2015); Dicheva, Darina; Dichev, Christo; Agre, Gennady; et al. (2015)
Motivation TS=(gamif* AND motivation)	1910	49	14967	Hamari, Juho; Koivisto, Jonna; Sarsa, Harri (2014) Dominguez, Adrian; Saenz-de-Navarrete, Joseba; de-Marcos, Luis; et al. (2013) Seaborn, Katie; Fels, Deborah I. (2015)
Work and work environment TS = (gamif* AND work*)	1720	35	8694	Hamari, Juho; Koivisto, Jonna; Sarsa, Harri (2014); Seaborn, Katie; Fels, Deborah I.(2015); Dicheva, Darina; Dichev, Christo; Agre, Gennady; et al.(2015)
Engagement TS=(gamif* AND engagement)	1487	47	11675	Dominguez, Adrian; Saenz-de-Navarrete, Joseba; de-Marcos, Luis; et al. (2013) Hanus, Michael D.; Fox, Jesse (2015) Hamari, Juho; Shernoff, David J.; Rowe, Elizabeth; et al. (2016)
Teaching TS=(gamif* AND teaching)	1359	26	4505	Hanus, Michael D.; Fox, Jesse(2015); Simoes, Jorge; Diaz Redondo, Rebeca; Fernandez Vilas, Ana (2013); Su, C-H.; Cheng, C-H.(2015)
Behavior TS=(gamif* AND behavior)	1123	43	9004	Cafazzo, Joseph A.; Casselman, Mark; Hamming, Nathaniel; et al.(2012); Koivisto, Jonna; Hamari, Juho (2014); Robson, Karen; Plangger, Kirk; Kietzmann, Jan H.; et al. (2015)
Management TS = (gamif* and management*)	840	30	4851	Dicheva, Darina; Dichev, Christo; Agre, Gennady; et al.(2015)

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				Cafazzo, Joseph A.; Casselman, Mark; Hamming, Nathaniel; et al.(2012); Marcos, Luis; Dominguez, Adrian; Saenz-de-Navarrete, Joseba; et al.(2014)
Serious Games TS=(gamif* AND (serious games)	817	29	4206	Hamari, Juho; Shernoff, David J.; Rowe, Elizabeth; et al. (2016) (Sardi, Lamyae; Idri, Ali; Luis Fernandez-Aleman, Jose (2017) Pedreira, Oscar; Garcia, Felix; Brisaboa, Nieves; et al.(2015)
Health TS=(gamif* AND health)	789	42	7023	Seaborn, Katie; Fels, Deborah I. (2015); Cafazzo, Joseph A.; Casselman, Mark; Hamming, Nathaniel; et al (2012); Koivisto, Jonna; Hamari, Juho (2014)
Exercises TS=(gamif* AND exercises)	385	25	2354	Koivisto, Jonna; Hamari, Juho (2014); Sardi, Lamyae; Idri, Ali; Luis Fernandez-Aleman, Jose(2017); Hamari, Juho; Koivisto, Jonna(2015)
Marketing TS=(gamif* AND marketing)	377	25	3222	Dicheva, Darina; Dichev, Christo; Agre, Gennady; et al.(2015); Hamari, Juho (2013); Kaplon, Helene; Reichert, Janice M. (2019)
***Crowdsourcing* TS=(gamif* AND crowdsourcing)**	167	20	1434	Albarqouni, Shadi; Baur, Christoph; Achilles, Felix; et al. (2016); Koivisto, Jonna; Hamari, Juho (2019); Morschheuser, Benedikt; Hamari, Juho; Koivisto, Jonna; et al. (2017)
Sustainability TS=(gamif* AND Sustainabi*)	137	14	666	Negrusa, Adina Letitia; Toader, Valentin; Sofica, Aurelian; et al.(2015); Poslad, Stefan; Ma, Athen; Wang, Zhenchen; et al. (2015); Kasurinen, Jussi; Knutas, Antti (2018)
Well-being TS=(gamif* AND (welfare OR well-being))	90	14	747	Luthans, Fred; Youssef-Morgan, Carolyn M.(2017); Morris, Bradley J.; Croker, Steve; Zimmerman, Corinne; et a (2013) Coorey, Genevieve M.; Neubeck, Lis; Mulley, John; et al.(2018)

Source: Designed by the authors (2021)

Another way to find out the relevance of themes with the gamification theme is to search for them in WOS and analyze the number of publications, H-index and number of citations (table 5). In this survey, it is observed that motivation has a greater number of indexed articles, followed by engagement, confirming the findings in the map (figure 4).

The themes that call the attention because of their high number of publications are learning with 3174 and teaching with 2317, both have H-index 42, while teaching has only 1359 and H-index 26. These data is on figure 5, where it is clearly observed that the processes of learning and education (focus on the student) are more studied than the teaching process (focus on the teacher). Some authors such as Mcgonigal (2011) and Seaborn and Fels (2015) state that

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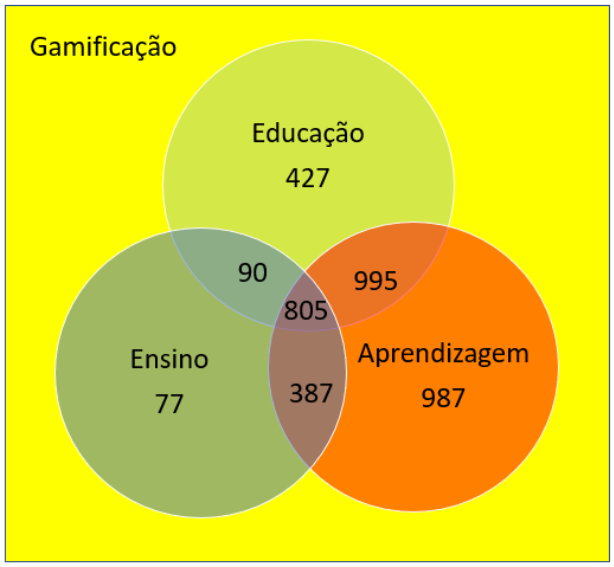
it appears as a tool for entertainment, social construction and learning when the elements of gamification are analyzed.

Figure 5 – Publications on the gamification and education/teaching/learning

WOS search	Number Publications	% of 3768 Publications
TS = (gamif* AND learning AND teaching AND education)	805	21,36%
TS = (gamif* and learning and teaching) not ts=education	387	10,27%
TS = (gamif* and learning and education) not ts=teaching	995	26,41%
TS = (gamif* and teaching and education) not ts=learning	90	2,39%
TS = (gamif* and teaching) NOT TS=(education OR learning)	77	2,04%
TS = (gamif* and education) NOT TS=(teaching OR learning)	427	11,33%
TS = (gamif* and learning) NOT TS=(education OR teaching)	987	26,19%



Source: Designed by the authors (2021)

Another point that we can observe on Figure 5 is the existence of a gap in research on gamification and teaching (focus on teacher), the two themes only have 2.04% (77) of the publications found. However, there is a lack of research involving gamification, teacher and student because in a research carried out until 2020, only 2.39% (90) were about teaching and education gamification; and 10.27% (387) about gamification, teaching and learning. Percentage considering the 3768 gamification publications with the three themes.

After generating a WOS file with the complete records and cited references of the five hundred most cited publications on the gamification theme, the data was analyzed in VOSviewer. Co-citations were used as the type of analysis and cited references from all countries were used as the unit of analysis.

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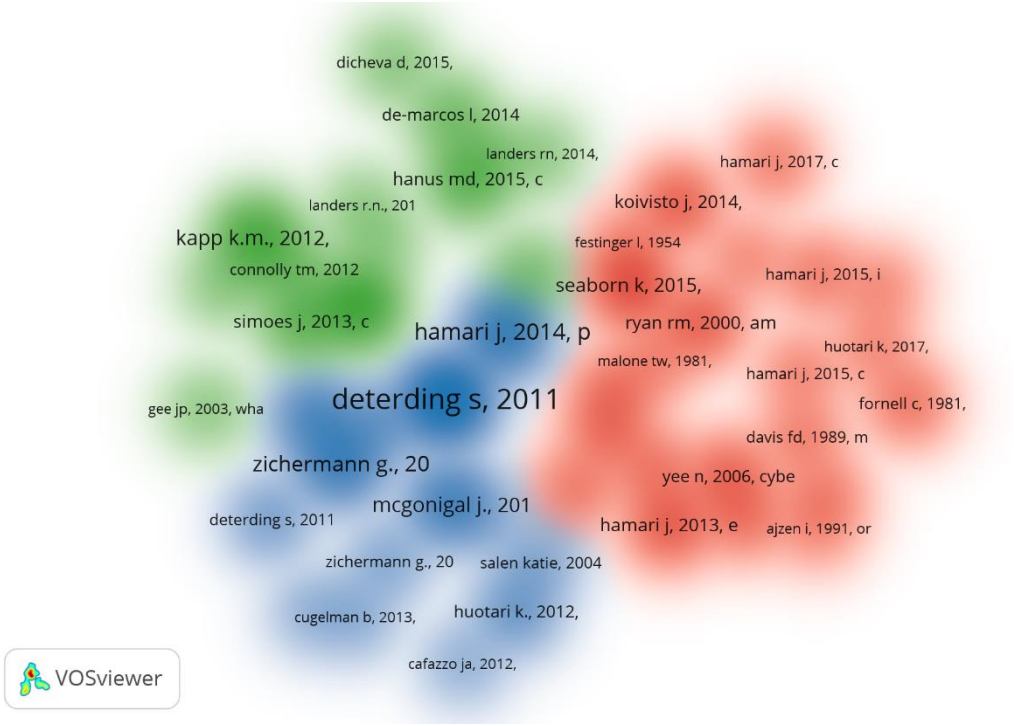
Figure 6 - Groupings by coupling authors' co-citation (2011-2020)



*Designed on VOSviewer, from the 500 most cited articles with the gamification theme between the years 2011 and 2020. Source: Designed by the authors (2021)

When considering co-citations as a criterion, the authors are taken as the unit of analysis, figure 6. It is worth mentioning that if an author (or group of authors) has more than one text referenced by the database, they are grouped in the map composition, bringing it closer to an author (or group of authors) whose texts, also grouped, appear cited together.

Furthermore, since the authors are arranged as they are cited together with the texts about gamification, they are not necessarily part of them. In short, it is not necessary for the author to have indexed publications, but rather to appear cited along with others by texts internal to the database. The analysis, at that moment, therefore, takes on a more general character and is able to indicate seminal authors; these, including, possibly not indexed in the WOS database.

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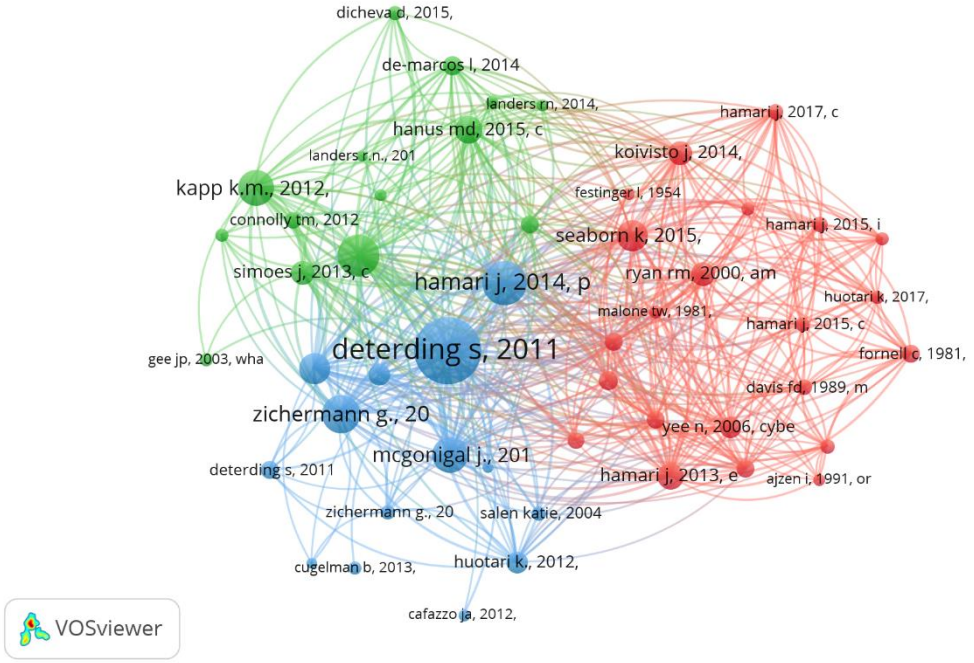
Figure 7 - Groupings by coupling authors' co-citation (2011-2020)



* Designed on VOSviewer, from the 500 most cited articles with the gamification theme between the years 2011 and 2020. Source: Designed by the authors (2021)

As it can be seen in Figure 7, following this criterion, three groups were identified:

Red Cluster (22 itens): Ajzen I, 1991; Csikszentmihalyi M., 1990; Davis Fd, 1989; Deci E.L., 1985; Deci El, 1999; Deci El, 2000; Deterding S, 2015; Festinger L, 1954; Fornell C, 1981; Hamari J, 2013; Hamari J; Hamari J, 2015; Hamari J, 2017; Huotari K, 2017; Jung Jh, 2010; Koivisto J, 2014; Malone Tw, 1981; Ryan Rm, 2000; Ryan Rm, 2006; Seaborn K, 2015; Van Der Heijden H, 2004; Yee N, 2006. This cluster focuses on one of the most cited authors, Seaborn K from the area of Computer Science; Engineering and Psychology, and authors such as Ryan Rm who do not have publications in the Web of Science appear.

Green Cluster (14 items): connolly tm, 2012; de-marcos l, 2014; denny p., 2013; dicheva d, 2015; dominguez a, 2013; garris r., 2002; gee jp, 2003; hanus md, 2015; kapp k.m., 2012; landers r.n., 2011; landers rn, 2014; landers rn, 2014; lee j. j., 2011; simoes j, 2013. This cluster brings together authors from the areas of Computer Science; Education and Educational Research.

Blue Cluster (14 items): composed by the authors: cafazzo ja, 2012; cugelman b, 2013; deterding s, 2011; deterding s, 2011; hamari j, 2014; huotari k., 2012; mcgonigal j., 2011; reeves

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byron, 2009; robson k, 2015; ryan rm, 2000; salen katie, 2004; werbach k., 2012; zichermann g., 2010; zichermann g., 2011. This cluster is composed of authors from the area of Computer Science, Information System and has authors of seminal and seminal works, such as Hamari, 2014 and Deterdings, s, 2011.

FINAL CONSIDERATIONS

This study allowed us to verify that the scientific production related to spirituality at work in the period between 1998 and 2017 increased gradually, reaching its peak in 2017 (57). This theme is a recurrent subject in publications of the last two decades. However, in the last four years, 2014, 2015, 2016 and 2017, there were 139 publications, corresponding to 65% of the total productions in the last 20 years, making it possible to infer that the theme is contemporary and on the rise, being recurrently inserted in new scientific research.

Regarding publications, most are related to two thematic areas: Administration (Management) and Business (Business) with 60.56% (129) of the total number of publications, which demonstrates the interest on the field of organizational studies in the subject. Regarding the type of document, the article was the one with the highest number of registers with 83.56%. The authors who lead the number of publications related to the topic are Louis W. "Jody" Fry, who also authored the most cited article in WOS, Toward a theory of spiritual leadership (2003), and Professor Badrinarayan Shankar Pawar, both with 2.81% (6) of publications. Regarding the journals with the highest number of publications, the Journal of Business Ethics stands out with 11.26% (24) of publications in 20 years, being a journal that publishes only original articles from a wide variety of methodological and disciplinary perspectives on ethical issues related to business that bring new or unique contributions to the discourse in their field.

Considering the main institutions responsible for the largest number of publications, the autonomous business school, the Indian Institute of Administration Kozhikode (IIMK) and the Florida State University (SUS) public system stand out, being responsible for 3.28% (7) of the registers. The spirituality at work theme also has authors linked to another 249 institutions, according to the Web of Science survey. The United States of America has the highest number of publications with 36.62% (78) of publications related to spirituality at work and the most used language of productions in general was English with 97.65% of registers (208).

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Regarding the hot topics, it was found that the main themes related to spirituality at work were: values (m=6.5), religion (m=6.0), leadership (m=6.0), performance (m=5.5), development (m=5.5) and purpose (m=4.9), and even emerging themes such as well-being, engagement, burnout and flourishing appear in the hot topics.

The results obtained in this bibliometric study on spirituality at work are useful to outline productivity patterns on the referred topic. As limitations of the study, we highlight its performance using only a specific database and the fact of disregarding the methodological characteristics of the articles and characteristics of their bibliographic references, which was not the objective of this work, focusing only on the characteristics of authorship. It is recommended that future studies expand the database, including national and international academic events.

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