Science for Education Today

2019, том 9, № 3 http://sciforedu.ru ISSN 2658-6762

DOI: 10.15293/2658-6762.1903.13

УДК 378+159+314

Активные методологии здоровья: научная продукция по геймификации в науках о здоровье

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Проблема и цель. *Геймификация основана на использовании игровых элементов, конструкций и моделей в недосуговых контекстах. Несмотря на то что есть много научных работ, в которых исследуется эффективность этой методологии, она не была исследована, проанализирована или организована как научная продукция в области здравоохранения (что и предлагает данная статья авторов). Цель исследования: проанализировать научные статьи по геймификации и здоровью, используя методологии наукометрии и контент-анализа.*

Методология. *Был проведен анализ статей из базы данных Web of Science, содержащих слова gamification и health, с использованием наукометрических методов и расширенного анализа текста посредством оценки контента. Кроме того, был проведен анализ литературы среди наиболее цитируемых статей по этой теме, чтобы извлечь самые актуальные проблемы, получившие признание в научном сообществе.*

Результаты. *Основной анализ проведен на основе 309 полученных статей. Результаты показывают накопление работ в данной области в различных престижных научных журналах и растущий интерес конкретных авторов. Подавляющее большинство статей было выполнено на английском языке. Основными темами данных исследований, получивших известность в современной научной литературе являются: использование приложений, изменение привычек и то, как геймификация влияет на процессы образования в области здравоохранения.*

Заключение. *В результате исследования было установлено, что на современном этапе в научной литературе представлен ограниченный круг проблем, связанных с использованием геймификации в образовании в области медицины и здравоохранения. В основном, представлены работы по использованию мобильных приложений. Однако в связи с ростом интереса к данной проблематике её можно рассматривать как область исследований, актуальную для научного сообщества в краткосрочной и среднесрочной перспективах.*

Ключевые слова*: сестринское образование; научная продукция в области здравоохранения; обучение; геймификация, наукометрия.*

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Science for Education Today

2019, Vol. 9, No. 3 http://en.sciforedu.ru/ ISSN 2658-6762

DOI: 10.15293/2658-6762.1903.13

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Active methodologies in health. Scientific production on gamification in health sciences

Abstract

Introduction. *Gamification is based on the use of game elements, designs and structures in non-leisure contexts. Although there are many studies that prove the effectiveness of this methodology, no study has been found that has researched, analysed or organised scientific production on gamification in the sphere of health, which is what this paper offers. The purpose of the study is to analyse research articles on gamification and health, using sciencemetric and content analysis methodologies.*

Materials and Methods. *An analysis was carried out on articles from the Web of Science database containing the words 'gamification' and 'health' using sciencometric methods and advance text analysis via content evaluation. In addition, an analysis of the literature was carried out among the most cited articles on the subject in order to extract the most current topics with the greatest scientific impact.*

Results. *The remaining analysis comes from the 309 articles obtained. It shows the accumulation of different prestigious scientific journals and specific authors as well as the hegemonic predominance of the English language. The analyzed articles mostly presented case studies which focus on use of apps, change of habits and influence of gamification on the health training processes.*

Conclusions. *The results showed a reduced group of topics currently studied, about all the studies of mobile applications, and the growth for the coming years, to which these types of investigations can be considered as a field of study relevant for the scientific community in the short and medium term.*

Keywords

Nursing Education; Games, Health; Teaching; Gamification, Scientometric.

Introduction

Gamification is based on the use of game elements, designs and structures in non-leisure contexts [1–11].

Gamification is a very useful tool for motivating students [12]. Using gaming elements in education is not new [13], as they help develop the imagination, but it has not been until more recently that there has been an emphasis on the use of games as learning tools [14].

It is important to differentiate between a game, understood as a finished product,

something specific, and gamification, which is part of a didactic content, defining it as an activity that contains game elements and spirit [15]. This innovative methodology rewards and values effort, not just achievement, with badges.

It is currently popular to use digital games and videogames to acquire knowledge [16]. It has reached the point where companies are using gamification to improve employee experiences [17]. Therefore, we are witnessing the employment of this methodology in a wide range of fields, such as for example marketing and education, to improve user experience and commitment, given the benefits afforded by its utility [18].

These videogames allow you to play again, consult rankings, and even socialise, given their social element.

Because of its benefits, the application of gamification has also been introduced into the sphere of health. One of the most relevant examples is the development of a mobile application to help children diagnosed with diabetes, according to the design of interviews with children and their carers [19]. This app awards them points, and is based on the frequency of blood sugar level measurements taken. The results showed an average of eight rewards given. They demonstrated that there was a 50 % increase in the daily average for blood sugar levels. Other authors [20] also empirically studied the effects of a mobile diabetes monitoring application and the degree of compliance on the part of diabetics regarding its control.

Furthermore, and in an attempt to involve young cancer patients in the process of writing a pain diary, there is the development, based on the principles of gamification, of an application called *Pain Squad*, where users have to find the pain, represented as an opponent. Users rise in the ranks when they capture or register the pain on twice-daily missions, obtain badges and rewards [21].

Another study [22] had the objective of identifying to what extent gamification is used in health applications, and analysing this along with physical condition as a potential component that influenced the health behaviour of the consumer.

We also find, within this same field, a taxonomy for games and health, which describes how games and gamified processes can help people with dementia, presenting challenges and opportunities for research in this area [23].

Thus, studies on gamification and its application have spread from its application in mental health [24] to alcoholism [25], physical exercise [26] and even cancer [27].

There is also a study on the effects of learning styles and significant learning with regards to Gamification in health education [28].

Despite the term gamification still being used inconsistently, the concept of gamification is increasingly gaining attention, with a standard definition of gamification arising, and initial frameworks based on fundamental psychological theories being proposed, including the theory of self-determination and intrinsic and extrinsic motivation [17].

No study has been found that has researched, analysed or organised scientific production on gamification in the sphere of health, which is what this paper offer. This work puts forward a study of scientific production, presenting a sciencemetric analysis of articles indexed on the Web of Science (WoS) database on Gamification in the sphere of health, with the only prior studies being ones that reviewed literature on the subject matter [29]. This study is the result of this lack of combined sciencemetric-literature analysis investigations.

Methods

The methodology followed was based on three fundamental steps: detecting search terms,

finding available resources and establishing a search and analysis procedure [30]. The search terms used for this study were gamification and health, in both Spanish and English. The main inclusion criterion was document type, and in this case all of those that WoS has on file as articles were selected.

The complete procedure was carried out in two stages, the first being preliminary analysis (with all types of resources) and the second being a filtering stage that excluded all documents that failed to comply with the established criteria, or which were poorly archived by WoS itself.

The study sample was comprised of scientific articles on Gamification in health indexed on WoS from the first production in 2012 up to 2017. This, in short, was comprised of a total of 309 scientific productions recovered from all available WoS databases.

During this study, we sought to provide a response to the following research questions, which were extracted from different investigations of a similar methodological standing [31; 32]

RQ 1: What has the evolution over time been for the works that analyse or show gamified applications in health sciences?

RQ 2: In which journals are these works published?

RQ 3: Which countries show a greater concern for this type of study?

RQ 4: Who are the most productive authors?

RQ 5: What research topics and methodology have been addressed within the sphere of gamification in health in recent years?

For the analysis of research questions 1, 2, 3 and 4 (sciencemetric analysis) we used a matrix of data obtained and filtered from the WoS itself to then carry out the proper analyses using Excel. With this being for the majority of cases the clearest and purest way of presenting the data, as current bibliometric software applications such as VOSviewer and Gephi do not present a satisfactory visual representation of the information [33].

Lastly, we carried out an in-depth meta analysis of the articles with the greatest impact for this time period, with the inclusion criterion being all of those articles with at least one citation in the last 3 years. Following the standard classification [34] of the scientific methodology, the works were divided into two large groups: on the one hand, the empirical studies (case studies or experiments) and, on the other, documental review investigations (literature or conceptual documents). This contribution is one of the most interesting advances regarding classical research being carried out in the sphere of health [35].

Results

We found a total of 309 indexed documents for the 2012-2017 period (Figure 1). The first publication we encountered corresponds to 2012. The mean for the period stood at 51.5 with a standard deviation of 38.96. The years 2012–2013 and 2016–2017 revealed the intervals of least production on the subject matter, having supposed

mere annual increases of 11.11 % and 9 %, respectively. In contrast, the interval showing a huge rise in production can be found from 2013–2014, where it increased by 290 % compared with previous years. The progression shown by the regression line y = 20,429x - 20 (with an adjustment of R^2=0.962) indicates that this trend will be positive for the following years.

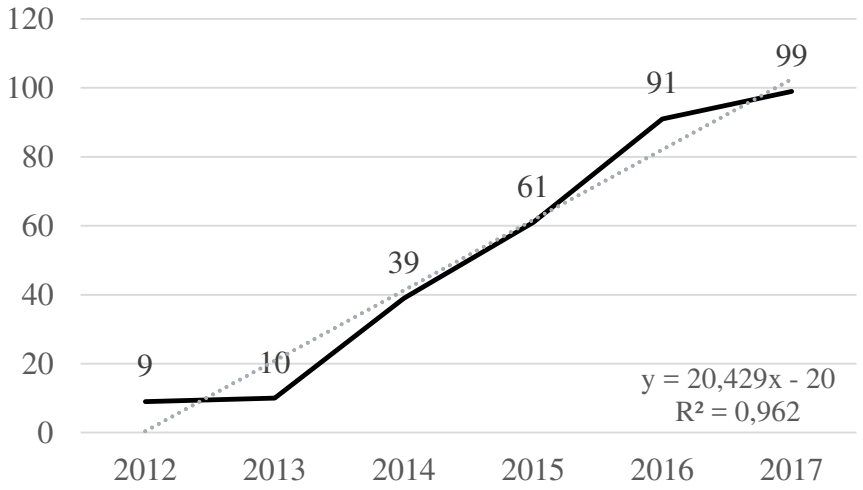

Figure 1. Distribution of documents depending on year of publication

Table 1 shows the number of articles published according to the journal publishing them. In this case, only articles published in journals (191) were used as it makes little sense to take into consideration those compilations published in specific conferences. As can be observed, the journal with the highest number of articles published on the subject matter that concerns us was Jmir Serious Games, with 14, equivalent to 7.33 % of the total. In contrast, those journals with fewer than 4 documents corresponded to 68.39 % of the total number of documents published.

Table 1.

Contributions made according to the journal

Title	No.*	%†
Jmir Serious Games	14	7.33
Studies in health technology and informatics	13	6.8
Computers in human Behaviour	8	4.18
Games for Health Journal	8	4.18
Jmir Mhealth and Uhealth	6	3.14
Jmir Research Protocols	4	2.09
Journal of Medical Internet Research	4	2.09
Trials	4	2.09
Otras	132	68.39

*No.= Number of articles; †%= Percentage of correspondence with regards to the total.

Regarding the countries producing studies related to the subject matter and, taking into account the first author, 40 countries produced papers on gamification and health (see table 2). We found that the most productive country was the United States with 52 documents, representing 27.22 % of the total. Far behind it were England, Australia, Spain, the Netherlands, Canada and Germany, all with less than half of the publications produced by the former.

Table 2

Contributions made by country and language used

Countries	**No.***	**%†**	**Countries**	**No.***	**%†**
USA	52	27.22	New Zealand	3	1.57
England	20	10.47	Norway	3	1.57
Australia	14	7.33	Singapore	3	1.57
Spain	13	6.80	Sweden	3	1.57
Netherlands	12	6.28	Taiwan	3	1.57
Canada	11	5.75	Austria	2	1.04
Germany	11	5.75	Columbia	2	1.04
Finland	8	4.18	France	2	1.04
Italy	8	4.18	Israel	2	1.04
Switzerland	7	3.66	China	2	1.04
Belgium	4	2.09	Poland	2	1.04
Portugal	4	2.09	Romania	2	1.04
Greece	3	1.571	Scotland	2	1.04
Ireland	3	1.571	Others	11	5.72
Language‡					
English	178	93.19	Korean	10	5.23
Spanish	3	1.57	French	2	1.04
Portuguese	1	0.52	Others	2	1.04

*No.=Number of articles; †%= Percentage of correspondence with regards to the total;
‡Language= language of the publications analysed.

Following this we then gathered the most productive authors, that is, those in a dominant position regarding the topic in hand. A total of 1317 authors took part in the publications analysed. Particular attention may be drawn to those authors with a single work to their name (1258), and against this we find that only 4 authors appear as prolific producers: Reinout W Wiers with 8 works and Theresa Fleming, Lisa B. Hightow-Weidman and Ho Ming Lau, all with 6 works (see Table 3).

Science for Education Today

2019, Vol. 9, No. 3 http://en.sciforedu.ru/ ISSN 2658-6762

Table 3

Number of works per most productive author

Works*	Authors†
1	1258
2	33
3	10
4	12
6	3
8	1
Most productive authors ‡	**Works**
Reinout W Wiers	8
Theresa Fleming	6
Lisa B. Hightow-Weidman	6
Ho Ming Lau	6

*Works= Number of works published;

†Authors= Number of authors with that number of publications;

‡Most productive authors= authors with the greatest production on the subject matter studied.

The total number of articles reviewed for this analysis stood at 99, and they were articles with at least one citation in the last 3 years. Those empirical publications particularly stood out that used case studies during their methodology (70), followed by those using questionnaires (41) and, to a lesser extent, those focusing on specific experiments (28). It must be taken into consideration that a single publication can situate itself in different categories, and a case study can use questionnaires during its development. Regarding the type of methodology employed, particular attention can be drawn to those studies with a qualitative methodological perspective (48) versus those that were quantitative (20) or which had a mixed methodology.

For the topics studied in these articles we can point to the fact that the majority of resources analysed (25) focused on studying how the use of mobile apps influences the different processes in the field of health, followed by those whose core thematic concept was the analysis and change of habits (19), and how gamification influenced Teaching and Learning processes (19).

Table 4

Methodological and thematic analysis of the journals cited in last 3 years

Scientific methodology*		
		No.†
Empirical	Case study	122
	Questionnaires	41
	Experiments	28
Reviews		14
Type of investigation‡		
	No.	**%§**
Qualitative	58	44.61%
Quantitative	30	23.07%
Mixed	42	32.30%
By investigation topic‖		
		No.
Use of APPs		25
Change of habits		19
Effect on the Teaching and Learning process		19
Physical activity		11
Mental health		8
Diabetes		6

*Scientific methodology= scientific methodology employed;

†No.=Number of resources with this characteristic;

‡Type of research= Type of research used in the study;

‖By research topic= Classification according to the subject matter used.

Discussion

In relation to productivity on gamification and health according to its diachronic progression we observe that there is a linear progression that demonstrates the relevance of this type of study within the field of health sciences. The first publication, dating from 2012, shows the capacity of adaptation for scientific health research to new working approaches, as the first indexed publication on gamification appears just one year prior to this. Furthermore, the trend line, being positive, is a clear indication of the increase in this type of publication in the coming years.

Within the entire scientific field, we find a core group of journals that accumulate the majority of knowledge on this subject matter [36-38]. In our case, 8 journals form this group. Although this theory can appear obsolete, in reality the most current investigations on bibliometrics are based upon it and it is a framework reference for databases such as WoS.

English-speaking countries stand out from the rest, as is normally the case for scientific literature. Despite the appearance of non-English speaking producer countries such as Spain and Germany, the majority of the articles are published in English. This is due to the constant penalisation by the large databases of those that attempt to generate scientific knowledge solely in their own language [39; 40].

The phenomenon of the accumulation of knowledge in specific entities or authors is not new, rather as in the case of journals, the majority of publications are concentrated amongst a reduced number of authors [41].

In health, as for the other specialised subjects, there is the existence of so-called hot topics, which refer to those being studied or researched in the present day. Discovering subjects and trends from a large number of electronic references is essential for scientific research [42]. For the case that concerns us, we find that three hot topics stand out: the use of apps in different areas of health; the study and analysis of the modification of healthy habits, and the effects of gamified experiences on teaching and learning processes. These results are in line with current studies that show the increase in apps within health processes [43], the change in habits [44], and how gamified processes have a positive influence on health teaching and learning processes [45].

Conclusions

The conclusions that come out of our study following the research questions we initially considered are as follows:

Regarding the temporal evolution of the works that analyse or show gamified applications in health sciences, we found a linear progression that demonstrates the relevance of this type of investigation and the positive trend line leads us to be able to affirm the possibility of research and therefore publication on the subject matter.

In terms of the journals in which these works are published, researchers can have are clear vision of how and where they should publish when gamified health processes are studied, with the study of these journals being a good starting point when constructing a similar investigation.

The countries most interested in this type of study and, as such, those that publish more are English-speaking, to which the publications in this language, it would seem, are more well received by scientific journals and are a channel for disseminating the investigations focusing on this subject matter to the scientific community.

Lastly, to offer researchers an idea about which topics are the most published within the sphere of gamification in health, we have found that three central topics stand out: the use of health applications; the study and analysis of the modification of healthy habits, and the effects of gamification on learning.

With this study having analysed and structured the scientific production, we have detected that this is on the increase, to which it is a door wide open to study for the whole scientific community.

As well as being a growth area within health teaching methods, and as a fundamental contribution in the field of nursing, it is shown that there are still a multitude of approaches that can be analysed and studied within the sphere of new technologies, education and their relationship with health sciences.

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Submitted: 28 January 2019 Accepted: 06 May 2019 Published: 30 June 2019