Syntax Literate: Jurnal Ilmiah Indonesia p–ISSN: 2541-0849 e-ISSN: 2548-1398
Vol. 7, No. 11, November 2022

A BIBLIOMETRIC ANALYSIS OF HEALTH GAMIFICATION RESEARCH USING VOSVIEWER

Stefanus Andika Setyawan, Siswono Akuan Rokanta
BINUS Graduate Program – Master of Management Information Systems (MMSI), Jakarta, Indonesia
E-mail: stefanus.setyawan@binus.ac.id, siswono@binus.ac.id

Abstract

Changes in people's lifestyles are suspected to be one of the causes of a shift in disease patterns (known as epidemiological transition) in the last 30 years. In the 1990s, infectious diseases such as Upper Respiratory Tract Infection (ARI), Tuberculosis (TBC), and Diarrhea were the leading causes of death. To prevent the worsening of this shift in disease patterns, media that can provide information is necessary to guide people towards healthier lifestyles. Gamification is one of the interactive learning concepts that can be implemented to promote Health education. Gamification can be implemented on mobile platforms, making it accessible for anyone to get health education in a fun way, no matter where they are. To obtain information about Health Gamification studies, we used the Google Scholar database. We used topic areas with titles, keywords, and abstract criteria in Health Gamification studies as a reference for extracting search results. We used VOSviewer to extract search results. After that, the results of bibliometric mapping were analyzed further. We found a total of 1000 articles in the Google Scholar database accessed on February 24, 2023. We analyzed how many articles have been published about Health Gamification and its relationships to topic areas using VOSViewer. This review can provide a reference point for further research related to promoting Health Education.

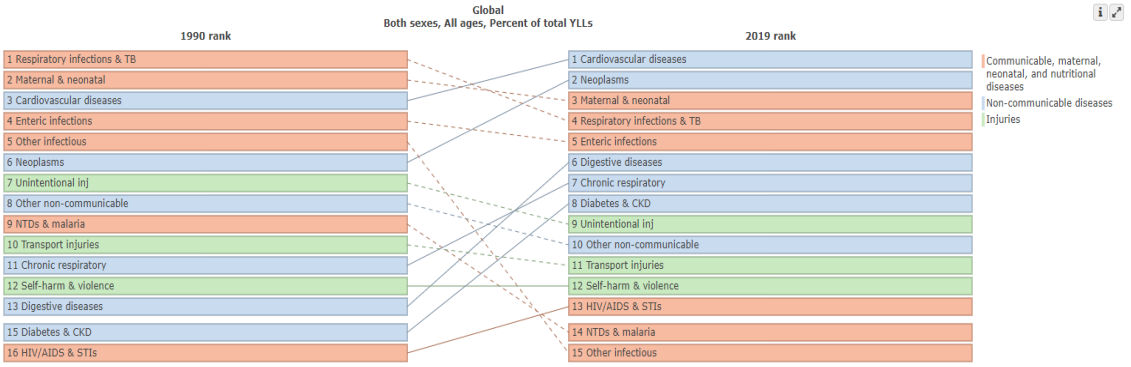
Keywords: Gamification, Healthy lifestyle, Health education, Interactive learning.

Introduction

Changes in people's lifestyles are suspected to be one of the causes of a shift in disease patterns (epidemiological transition) in the last 30 years. In the era of the 1990s, the biggest cause of death was infectious diseases such as Upper Respiratory Tract Infection (ARI), Tuberculosis (TBC), and Diarrhea (Habibi et al., 2021).

How to cite:	Stefanus Andika Setyawan, Siswono Akuan Rokanta (2022) A Bibliometric Analysis of Health Gamification Research Using Vosviewer, (7) 11, http://dx.doi.org/10.36418/syntax-literate.v7i11.11908
E-ISSN:	2548-1398
Published by:	Ridwan Institute

Figure 1
Disease patterns in the last 30 years



Source: (Roma et al., 2009)

Changes in disease patterns occur due to a lack of public awareness of the importance of protecting themselves from metabolic and behavioral risks by implementing a healthy lifestyle (Arena et al., 2015). Furthermore, many people believe that these risks only apply to non-productive age groups (Grilli et al., 2016). However, research Ng, Oon-Hui (2021) shows that these risks also occur in productive ages, specifically in the 25-49 age range. Therefore, it is essential to promote health education so that people understand how crucial it is to implement a healthy lifestyle to prevent non-communicable diseases such as stroke, heart disease, and diabetes.

Gamification is an interactive learning concept that can be implemented to promote health education. Gamification involves the incorporation of game design elements and principles into a non-game context (Seaborn & Fels, 2015). Various designs can be applied in gamification, such as points-based mechanisms, leaderboards, progress boards, player performances, and avatars, as innovative approaches to foster learning motivation (Vanduhe et al., 2019).

Currently, there are many implementations of gamification in education that are specific to promoting health education. One of the most popular ones in circulation is health applications such as fitness and nutrient apps (Peschke et al., 2022). According to Sarcona (2017), health applications like fitness and nutrition apps can influence people's behavior towards food and a healthier lifestyle. However, the role of family and friends is crucial because their unhealthy lifestyles can be a barrier to approaching a healthy lifestyle based on the wrong understanding of health education. Therefore, a different approach is needed from the popular health applications currently circulating to deliver health education to a wider audience (Creswell et al., 2011).

The purpose of this study was to investigate the development of research related to gamification in the health sector in terms of bibliometric maps and research/publication trends in the Google Scholar database using VOSViewer software. This study aims to provide insights into the current state of health gamification research and identify areas for further research.

The bibliometric map distribution includes the type of publication, the topic area

being studied, the country of origin of the researcher, the journal in which the publication is published, and the language used. Through this bibliometric analysis, we hope to contribute to overcoming the current problems in health gamification research and provide a reference point for future studies.

Literature Review

Gamification

Changes in people's lifestyles are one of the causes of a shift in disease patterns (epidemiological transition) in the last 30 years (Santosa et al., 2014). In the 1990s, the biggest causes of death were infectious diseases such as Upper Respiratory Tract Infections (ARI), Tuberculosis (TBC), and Diarrhea (Kouadio et al., 2012). To prevent the shift in disease patterns from getting worse, the necessary media can provide health education so that lifestyles will slowly change towards a healthier direction (Shao et al., 2017).

Gamification is one of the interactive learning concepts that can be used as a medium to promote Health education in a fun way and Gamification can be applied in mobile applications so that anyone can access it. Gamification itself is the insertion of game design elements and game principles into a non-game context. The designs that can be applied in gamification vary widely but according to Mora (2017) the most common forms of gamification designs are as follows:

1. points (accumulated rewards for certain actions), badges (visual representation of achievements that can be collected)
2. leaderboards (a list of all players, usually ranked by success – based on points or badges awarded)
3. progress bars (information about the current progress of the player to reach the goal)
4. player performance (information about player performance compared to previous performances)
5. avatar (visual representation of the player)

Gamification in education refers to the introduction of game design elements and game play experiences in the design of the learning process to support learning in various contexts and subject areas and to address related attitudes, activities, and behaviors, such as participatory approaches, collaboration, independent study, task completion, making assessment easier and more effective, integration of exploratory approaches to learning, and strengthening creativity and user retention (Prathyusha, 2020).

Most of the current research has proven that the implementation of the concept of gamification in education can increase motivation and interest in the learning process of its users. Here are some of the most popular implementations of Gamification in education today:

1. Minecraft Education Edition, Nkadimeng (2022) Stating that Gamification in the form of the Minecraft Education Edition Game can provide 25 benefits in the learning process of its users.
2. Kahoot (Tan Ai Lin et al., 2018) Stated in his research that Gamification in the form

of the Kahoot Application can create a fun and interactive learning atmosphere, it can be seen from the enthusiasm of the participants seen during the quiz, namely 100% enjoyment.

Currently there are many implementations of Gamification in education that are specific to the promotion of Health education, one of the most popular in circulation is Health Applications such as Fitness Apps and Nutrient Apps (Sañudo-Corrales et al., 2019). (Samoggia & Riedel, 2020) states that Health Applications such as Fitness Apps and Nutrient Apps can influence people's behavior to approach food and a healthier lifestyle but the role of family and friends has a big role in this, because of the behavior of friends and family who have an unhealthy lifestyle. healthy based on the understanding of health education wrong will be a barrier and influence users to approach healthy food and lifestyle. Because of this, a different approach method is needed from the popular Health Applications currently circulating, so that Health Education can be delivered to a wider audience

Healthy Apps

The rapid advancement of technology has dramatically changed the lifestyle in developed countries. During the Industrial Revolution, machine labor replaced human power, enabling the production and transportation of goods on a greatly increased scale. Recently, changes in the way we obtain, manipulate, and share information led to the Digital Revolution, which began before the turn of the century with the proliferation of digital computers and computer networks.

Although new technologies have the potential to improve health, technological advances can be said to have some negative effects on health, in part by reducing opportunities for physical activity at home and at work, by diverting leisure activities from sports and other physically active pastimes. for more sedentary activities such as television and videogames, and with the proliferation of inexpensive, calorie-dense foods. These and other environmental changes have contributed in part to the overweight and obesity epidemic, each of which affects about a third of the U.S., with rates similarly increasing in other developed and developing countries. The adverse effects of overweight and obesity on disease risk, psychological well-being, economic productivity, and health care burdens are well documented (Massie et al., 2022).

Therefore, there is a tremendous need for effective treatments to prevent excess weight gain and treat overweight and obesity. Behavioral lifestyle interventions for weight control have been refined and researched for more than 30 years, and are now quite effective in producing weight loss and/or preventing weight gain through the development of healthy eating habits and physical activity resulting in an application that users can use via mobile devices in promoting a healthy lifestyle, namely Healthy Apps.

Bibliometric Analysis

Bibliometric analysis is a quantitative method for analyzing bibliographic data in articles/journals. This analysis is usually used to investigate references to scientific articles cited in a journal, to map the scientific field of a journal, and to classify scientific articles according to a research field. This method can be used in the fields of sociology,

humanities, communication, marketing, and other social groups.

In recent years Bibliometrics is popularly used in research that helps business needs with the help of software such as Gephi, Leximancer, VosViewer and scientific databases such as Scopus and Web of Science (Donthu et al., 2021). Bibliometric analysis is used for various reasons, such as to: uncover emerging trends in articles or journals and to intellectually explore the structure of certain domains in the existing literature.

VOSviewer

VOSviewer is software that can be used to build and visualize bibliometric networks such as journals, titles, authors, authors, publications and so on. In addition, VOSviewer is also capable of mapping various types of bibliometric analysis, generating major bibliographic databases, advanced visualizations with visual labeling (Al Husaeni & Al Husaeni, 2022).

Types of bibliometric mapping that Vosviewer is capable of :

1. Co-authorship maps, consisting of: author, organization, country
2. Citation maps, consisting of: publications, journals, organizations, countries
3. Co-citation maps, consisting of: publications, journals, authors (first author only)
4. Bibliographic coupling maps, consisting of: publications, journals, authors, organizations and countries
5. Subject / keyword mapping (Co-occurrence maps), consisting of keywords and terms from the title and abstract

Research Method

All articles analyzed in this study were taken from the Google Scholar database. This study was conducted by online search on February 24, 2023, with the keyword "Health Gamification Healthy Behavior" with the title "Gamification" and the period used is 2015-2022 so that the data presented still relevant to be used as a reference for further research.

Sample articles are downloaded in *.ris format through the help of the "Publish or Perish" application with a total of 1000 samples, then the data is processed through the "VOSviewer" application to visualize and analyze trends in the form of bibliometric maps (Katikala & Duffy, 2021). Vosviewer can create publication maps, country maps or journals based on the network (co citiation) or create keyword maps based on network shares.

Results and Discussion

Visualization topic area using VOSviewer

The minimum number of similar relationships between VOSviewer keywords has been set to 9 term. After being analyzed using VOSviewer, there are 6 clusters (red, green, blue, yellow, purple, and light blue), which show the relationship between one topic and another. VOSviewer can display bibliometric mappings in three different visualizations;

Network Visualization (Figure 2), Overlay Visualization (Figure 3), and Dentisy Visualization (Figure 4).

Keywords are labeled with colored circles. The size of the circle is positively correlated with the appearance of keywords in the title and abstract. Therefore, the size of letters and circles is determined by the frequency with which they occur. The more often the word appears, the larger the size of the letters and circles.

Figure 2
(Network Visualization)

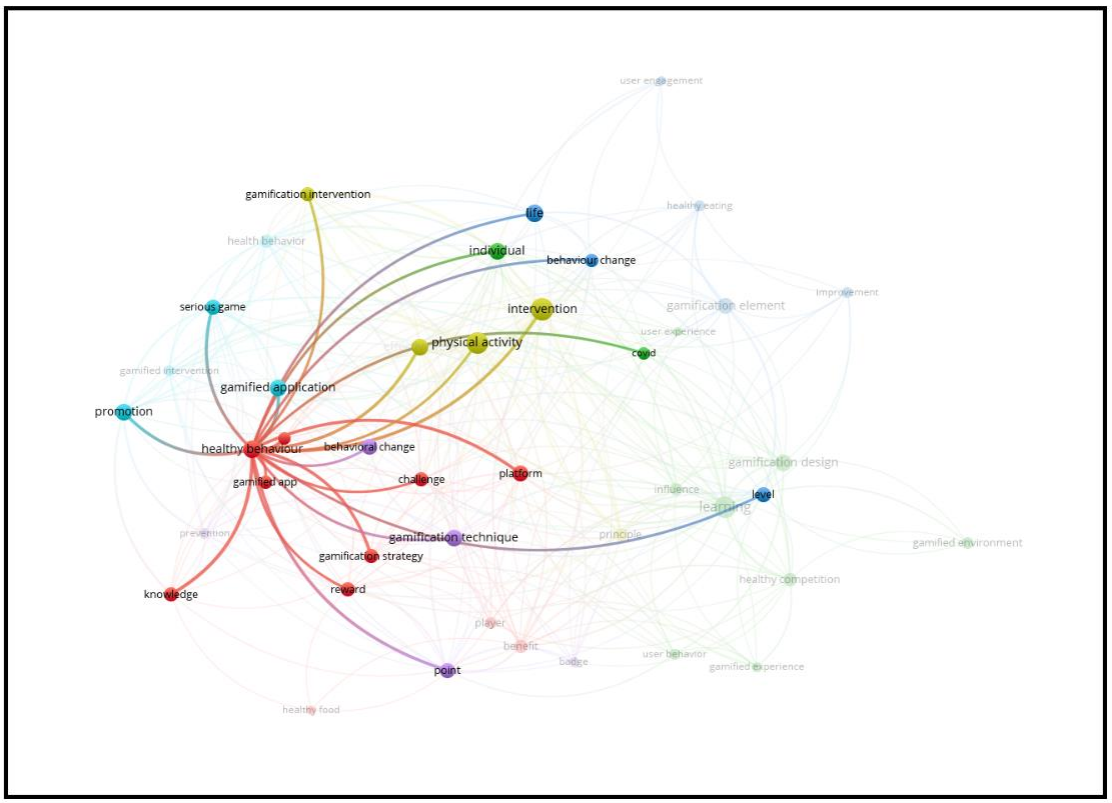


Figure 2 The bibliometric map generated through VOSViewer shows clusters in each of the topic areas studied. It can be observed that the keywords "healthy behavior", "knowledge", "gamified app", "reward", "gamification strategy", "platform", and "challenge" are in the same cluster (red area), indicating a close relationship between these concepts. Furthermore, "healthy behavior" is also related to other clusters such as "promotion", "serious game", "gamification intervention", "life", "behavioral change", "physical activity", and "COVID", which suggests that these factors significantly influence healthy behavior.

Figure 3
(Overlay Visualization)

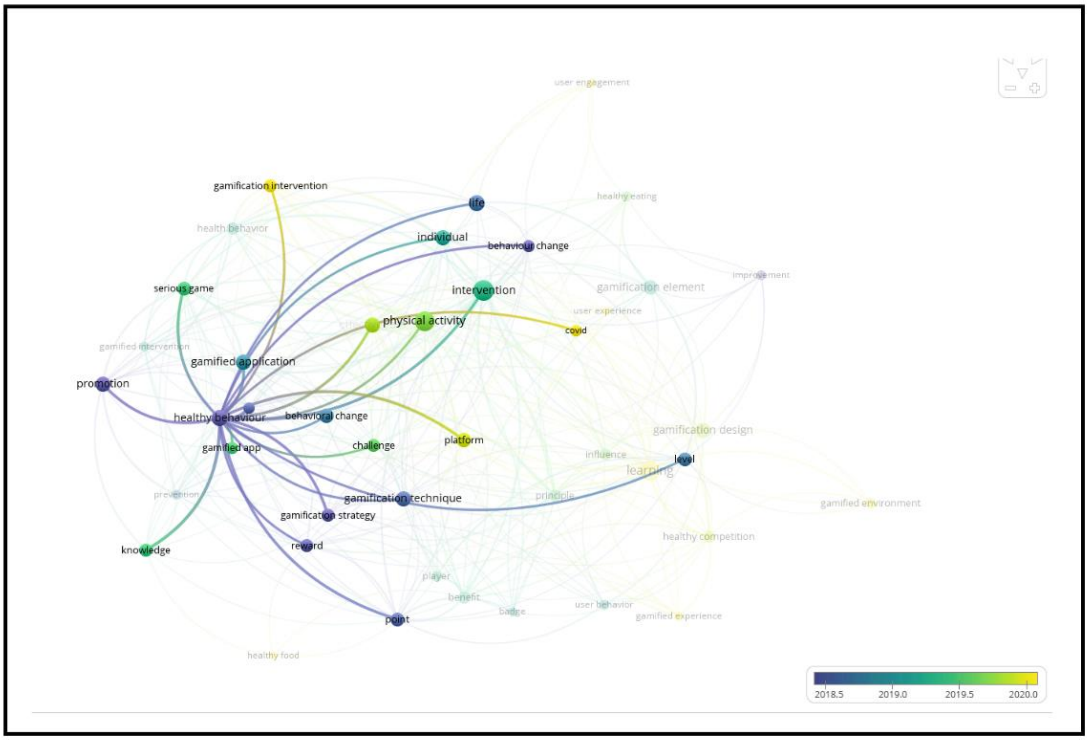


Figure 3 The graph depicts the trend in research related to Gamification in the health sector from early 2015 to the end of the study. It shows that there has been a shift in research focus on healthy behavior. Prior to 2019, the research mainly focused on gamification with level and point models. However, in 2019 and beyond, the research has shifted towards more serious gamification models that involve physical activity. Moreover, COVID-19 has emerged as one of the significant factors influencing research in this area.

Figure 4
(Dentisy Visualization)

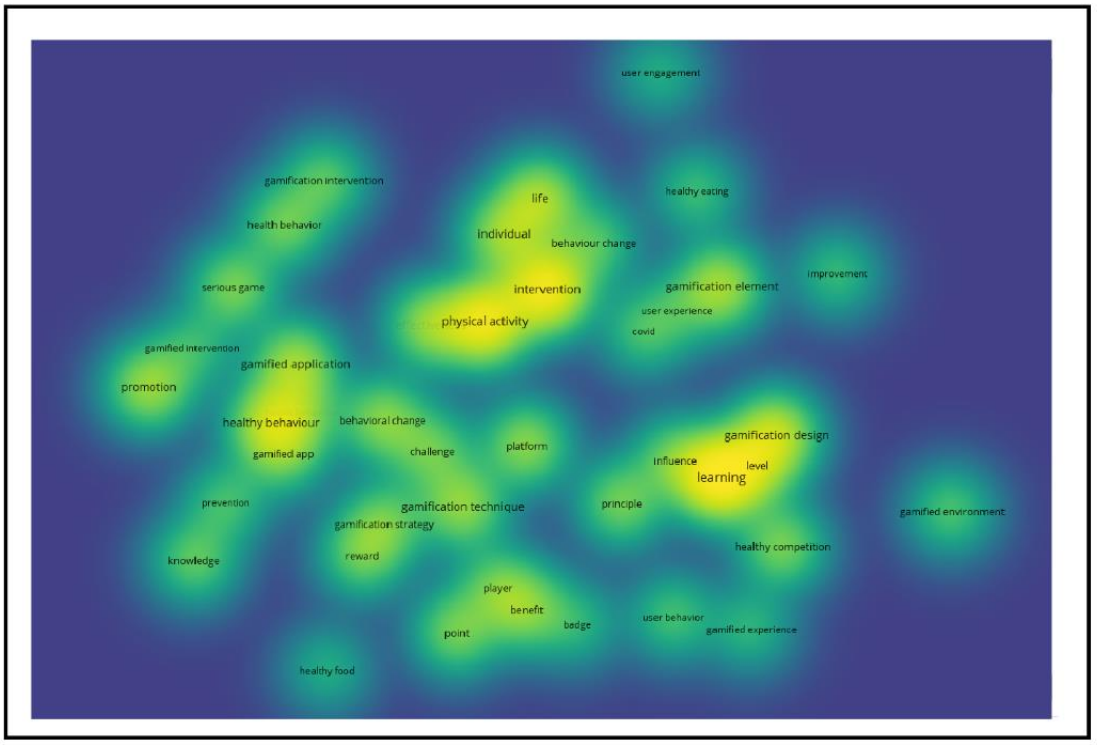


Figure 4, The visualization shows the depth of research, indicating that the more concentrated the colors that appear, the more research has been conducted. However, there are still very few topics related to healthy food, user behavior, user engagement, and healthy eating. Figures 2-3 illustrate that several factors must be considered, such as gamification strategies, gamification techniques, gamified applications, and promotions that can affect behavior change, in order to create healthy behavior through gamification.

Furthermore, there has been a shift in the trend of the gamification model from relying more on points and levels between 2015 and 2019 to relying more on physical activity in 2019 and beyond. Additionally, it is important to note that COVID-19 is related to gamification and health because adopting a healthy lifestyle is one way to stay healthy during the pandemic. Therefore, now is the perfect time to promote mobile-based applications that can provide health education to the wider community by combining gamified elements that include healthy food and a healthy lifestyle in a fun way.

Visualization top citiation

Table 1
Top 10 Citiation Health Gamification 2021

Cities	Authors	Title	Year	Publication	Publishers
1791	S Nicholson (2015)	A RECIPE for Meaningful Gamification	2015	Gamification in education and business	Springer
1051	J Koivisto, J Hamari (2019)	The rise of motivational information systems: A review of gamification research	2019	International Journal Of Information Management	Elsevier
1042	D Johnson, S Deterding, KA Kuhn, A Staneva (2016)	Gamification for health and wellbeing: A systematic review of the literature	2016	Internet Interventions	Elsevier
703	L Sardi, A Idri, JL Fernández-Alemán (2017)	A systematic review of gamification in e-Health	2017	Journal of biomedical informatics	Elsevier
485	J Hamari, J Koivisto (2015)	“Working out for likes”: An empirical study on social influence in exercise gamification	2015	Computers in Human Behavior	Elsevier
480	CF Hofacker, K De Ruyter, NH Lurie (2016)	Gamification and mobile marketing effectiveness	2016	Journal of Interactive Marketing	Sage Journal

405	EA Edwards, J Lumsden, C Rivas, L Steed (2016)	Gamification for health promotion: systematic review of behaviour change techniques in smartphone apps	2016	BMJ Open	BMJ
401	J Lumsden, EA Edwards, NS Lawrence (2016)	Gamification of cognitive assessment and cognitive training: a systematic review of applications and efficacy	2016	JMIR Serious	JMIR.org
348	J Looyestyn, J Kernot, K Boshoff, J Ryan, S Edney (2017)	Does gamification increase engagement with online programs? A systematic review	2017	PloS one	Plos.org

In addition to bibliometric analysis in the topic area, the following are the top 10 citations of papers from topics related to health gamification which contain the name of the author, journal, title of study, and the publishers used in writing. Specifically for the study country, the bibliometric analysis is shown in Table 2.

Conclusion

The promotion of health education is currently very necessary, especially with the Covid-19 outbreak, as our bodies are vulnerable to dangerous diseases. Gamification is one of the best methods to promote health education to the wider community by increasing motivation through fun and entertaining methods.

Based on the results of bibliometric analysis, it has been found that there is currently a change in the trend of gamification that promotes healthy behavior, shifting from a focus on points and levels to a focus on physical activity. However, one of the

challenges is the lack of research related to how to increase user engagement in gamification that promotes healthy behavior.

The bibliometric approach is useful for identifying key themes in each study or scope of knowledge or research that has been carried out so far, and it can help determine the novelty in conducting further research.

BIBLIOGRAFI

Al Husaeni, D. F., & Al Husaeni, D. N. (2022). Computational bibliometric analysis of research on science and islam with VOSviewer: Scopus database in 2012 to 2022. *ASEAN Journal of Religion, Education, and Society*, *1*(1), 39–48.

Arena, R., Guazzi, M., Lianov, L., Whitsel, L., Berra, K., Lavie, C. J., Kaminsky, L., Williams, M., Hivert, M.-F., & Cherie Franklin, N. (2015). Healthy lifestyle interventions to combat noncommunicable disease—a novel nonhierarchical connectivity model for key stakeholders: a policy statement from the American Heart Association, European Society of Cardiology, European Association for Cardiovascular Prevention and Rehabilitation, and American College of Preventive Medicine. *European Heart Journal*, *36*(31), 2097–2109.

Creswell, J. W., Klassen, A. C., Plano Clark, V. L., & Smith, K. C. (2011). Best practices for mixed methods research in the health sciences. *Bethesda (Maryland): National Institutes of Health*, *2013*, 541–545.

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, *133*, 285–296.

Edwards, E. A., Lumsden, J., Rivas, C., Steed, L., Edwards, L. A., Thiyagarajan, A., Sohanpal, R., Caton, H., Griffiths, C. J., & Munafò, M. R. (2016). Gamification for health promotion: systematic review of behaviour change techniques in smartphone apps. *BMJ Open*, *6*(10), e012447.

Grilli, G., Jonkisz, J., Ciolli, M., & Lesinski, J. (2016). Mixed forests and ecosystem services: Investigating stakeholders' perceptions in a case study in the Polish Carpathians. *Forest Policy and Economics*, *66*, 11–17.

Habibi, M., Priadana, A., Saputra, A. B., & Cahyo, P. W. (2021). Topic modelling of germas related content on Instagram using Latent Dirichlet Allocation (LDA). *International Conference on Health and Medical Sciences (AHMS 2020)*, 260–264.

Hamari, J., & Koivisto, J. (2015). "Working out for likes": An empirical study on social influence in exercise gamification. *Computers in Human Behavior*, *50*, 333–347.

Hofacker, C. F., De Ruyter, K., Lurie, N. H., Manchanda, P., & Donaldson, J. (2016). Gamification and mobile marketing effectiveness. *Journal of Interactive Marketing*, *34*(1), 25–36.

Johnson, D., Deterding, S., Kuhn, K.-A., Staneva, A., Stoyanov, S., & Hides, L. (2016). Gamification for health and wellbeing: A systematic review of the literature. *Internet Interventions*, *6*, 89–106.

Katikala, J., & Duffy, V. G. (2021). A Systematic Literature Review on Injury Prevention in Transportation Sector. *HCI International 2021-Late Breaking Papers: HCI*

Applications in Health, Transport, and Industry: 23rd HCI International Conference, HCII 2021, Virtual Event, July 24–29, 2021 Proceedings 23, 261–277.

Koivisto, J., & Hamari, J. (2019). The rise of motivational information systems: A review of gamification research. *International Journal of Information Management*, *45*, 191–210.

Kouadio, I. K., Aljunid, S., Kamigaki, T., Hammad, K., & Oshitani, H. (2012). Infectious diseases following natural disasters: prevention and control measures. *Expert Review of Anti-Infective Therapy*, *10*(1), 95–104.

Looyestyn, J., Kernot, J., Boshoff, K., Ryan, J., Edney, S., & Maher, C. (2017). Does gamification increase engagement with online programs? A systematic review. *PloS One*, *12*(3), e0173403.

Lumsden, J., Edwards, E. A., Lawrence, N. S., Coyle, D., & Munafò, M. R. (2016). Gamification of cognitive assessment and cognitive training: a systematic review of applications and efficacy. *JMIR Serious Games*, *4*(2), e5888.

Massie, D. C., Amaro, A., & Kaplan, M. (2022). Patient well-being and the clinical and economic burdens associated with obesity in the United States. *American Journal of Managed Care*, *28*.

Mora, A., Riera, D., González, C., & Arnedo-Moreno, J. (2017). Gamification: a systematic review of design frameworks. *Journal of Computing in Higher Education*, *29*, 516–548.

Ng, O., Lunevicius, R., & Arthur, J. D. (2021). Rising incidence of colorectal cancer in individuals younger than 50 years and increasing mortality from rectosigmoid cancer in England. *Colorectal Disease*, *23*(10), 2637–2646.

Nicholson, S. (2015). A recipe for meaningful gamification. *Gamification in Education and Business*, 1–20.

Nkadimeng, M., & Ankiewicz, P. (2022). The Affordances of Minecraft Education as a Game-Based Learning Tool for Atomic Structure in Junior High School Science Education. *Journal of Science Education and Technology*, *31*(5), 605–620.

Peschke, L., PESCHKE, S. G., AĞCA, Y. G., SEYFAFJEHİ, S., Dündar, I., & Aydoğdu, Y. (2022). Reward mechanisms in COVID-19 tracking apps and its impact on the voluntary participation of the public in sustainable innovation processes. *Türkiye İletişim Araştırmaları Dergisi*, *39*, 54–72.

Prathyusha, N. (2020). Role of gamification in language learning. *International Journal of Research and Analytical Reviews (IJRAR)*, *7*(2), 577–583.

Roma, E., Panayiotou, J., Karantana, H., Constantinidou, C., Siakavellas, S. I., Krini, M., Syriopoulou, V. P., & Bamias, G. (2009). Changing pattern in the clinical

presentation of pediatric celiac disease: a 30-year study. *Digestion*, *80*(3), 185–191.

Samoggia, A., & Riedel, B. (2020). Assessment of nutrition-focused mobile apps' influence on consumers' healthy food behaviour and nutrition knowledge. *Food Research International*, *128*, 108766.

Santosa, A., Wall, S., Fottrell, E., Högberg, U., & Byass, P. (2014). The development and experience of epidemiological transition theory over four decades: a systematic review. *Global Health Action*, *7*(1), 23574.

Sañudo-Corrales, B., Sánchez-Oliver, A. J., & del Río-Rama, M. de la C. (2019). Gamification and new technologies to promote healthy lifestyles and its role in creative industries. *Cultural and Creative Industries: A Path to Entrepreneurship and Innovation*, 137–153.

Sarcona, A., Kovacs, L., Wright, J., & Williams, C. (2017). Differences in eating behavior, physical activity, and health-related lifestyle choices between users and nonusers of mobile health apps. *American Journal of Health Education*, *48*(5), 298–305.

Sardi, L., Idri, A., & Fernández-Alemán, J. L. (2017). A systematic review of gamification in e-Health. *Journal of Biomedical Informatics*, *71*, 31–48.

Seaborn, K., & Fels, D. I. (2015). Gamification in theory and action: A survey. *International Journal of Human-Computer Studies*, *74*, 14–31.

Shao, A., Drewnowski, A., Willcox, D. C., Krämer, L., Lausted, C., Eggersdorfer, M., Mathers, J., Bell, J. D., Randolph, R. K., & Witkamp, R. (2017). Optimal nutrition and the ever-changing dietary landscape: a conference report. *European Journal of Nutrition*, *56*(1), 1–21.

Tan Ai Lin, D., Ganapathy, M., & Kaur, M. (2018). Kahoot! It: Gamification in higher education. *Pertanika Journal of Social Sciences & Humanities*, *26*(1).

Vanduhe, V. Z., Hassan, H. F., Oluwajana, D., Nat, M., Idowu, A., Agbo, J. J., & Okunlola, L. (2019). Students' evidential increase in learning using gamified learning environment. *Proceedings of the Future Technologies Conference (FTC) 2018: Volume 1*, 1109–1122.

Copyright holder:
Stefanus Andika Setyawan, Siswono Akuan Rokanta (2022)

First publication right:
Syntax Literate: Jurnal Ilmiah Indonesia

This article is licensed under:

