

Research Article

## Research Trends on Digital Games and Gamification in Nursing Education

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### Abstract

This study aimed to examine the trends of digital games and gamification in nursing education. The document analysis method was carried out by adapting the PRISMA for the bibliometric analysis. 20 articles published on digital games and gamification in nursing education were analyzed. Bibliometric analysis of the metadata of the articles was performed with the Biblioshiny. It is noteworthy that the articles published on digital games and gamification in nursing education have been published mainly in recent years with collaborative work. In the articles, quantitative, qualitative, and mixed design research methods were carried out in different studies. The most related words analysis in the summary section of the publications shows that students, game, and nursing are the most related words. We can conclude that game-based learning and gamification are effective in students' active participation in the course, increasing their satisfaction levels, providing motivation, and teaching skills in nursing education.



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### Introduction

Games have been used in nursing education since the 1980s. Games were seen as entertainment practices rather than nursing education at that time (Royse & Newton, 2007). Nursing education is based on traditional didactic education methods. The current rise of experiential learning challenges traditional, didactic forms of presentation, encouraging more active learning strategies such as playing games (Boctor, 2013). Encouraging active learning in nursing education allows students to develop critical thinking, maintain fun and excitement in learning, and imitate real life. However, active learning has essential effects on students, such as stimulating interest, increasing motivation, associating topics with real-life scenarios, and improving problem-solving skills (Royse & Newton, 2007).

In recent years, game-based learning has been used in different disciplines as a teaching strategy to increase students' motivation to learn and contribute to their knowledge

and skills (Gu et al., 2022). Game-based learning is also applied in many areas of nursing education. For example, in a study conducted with nursing students, one group was given Cardiopulmonary resuscitation (CPR) with traditional simulation training, and another was trained with a game application on a smartphone platform. The result of the study stated that there was an increase in the skills and knowledge of the group that trained with the game application on the smartphone platform (Farsi, Yazdani, Butler, Nezamzadeh & Mirlashari, 2021). Similarly, a virtual reality mobile application was developed to teach psychomotor skills in nursing education and designed to teach nursing students how to effectively perform tracheostomy aspiration skills in a short time (Bayram & Caliskan, 2019). In another study, a video-based game and storytelling educational tool was developed to increase the geriatric knowledge of nursing students. The result of the study stated that the program used increased the geriatric knowledge of nursing students (Habes, Jepma, Parlevliet, Bakker, & Buurman, 2020). In addition, it is stated that game-based learning positively affects student satisfaction. The study conducted by Johnsen, Briseid, Brodtkorb, Slettebø and Fossum (2021) concluded that video-based learning increases the satisfaction of nursing students. Gamification, which is based on game-based learning, has been defined as the use of game-based mechanics, aesthetics, and game thinking to connect people, motivate them, and improve learning and problem-solving (Kapp, 2012). Gamification provides an environment where nursing students can practice clinical reasoning and decision-making realistically and safely. Using gamification as a part of nursing education increases satisfaction, creative thinking, and control (García-Viola, Garrido-Molina, Márquez-Hernández, Granados-Gámez, Aguilera-Manrique & Gutiérrez-Puertas, 2019).

Considering the above-mentioned advantages of game-based learning in nursing education, it is predicted that examining the research in nursing education will guide new research in terms of content and method. Therefore, this study aimed to examine the trends in published research on digital games and gamification in nursing education. Following this purpose, the articles published between 2000-2022 in journals indexed by the Web of Science database were examined. The purpose of the research is to find answers to the following research questions:

1. What is the descriptive information of the published research on digital games and gamification in nursing education?

2. What is the distribution of published research on digital games and gamification in nursing education by years, authors, journals, and countries of authors?
3. What is the level of cooperation between the authors of published research on digital games and gamification in nursing education?
4. What are the most relevant words of published research on digital games and gamification in nursing education?
5. What is the distribution of published research on digital games and gamification in nursing education in terms of research design?
6. What is the sample size of the published research on digital games and gamification in nursing education?
7. What are the types of data analysis in published research on digital games and gamification in nursing education?
8. What are the indexes of the journals in which research on digital games and gamification in nursing education are conducted?
9. What are the results of published research on digital games and gamification in nursing education?

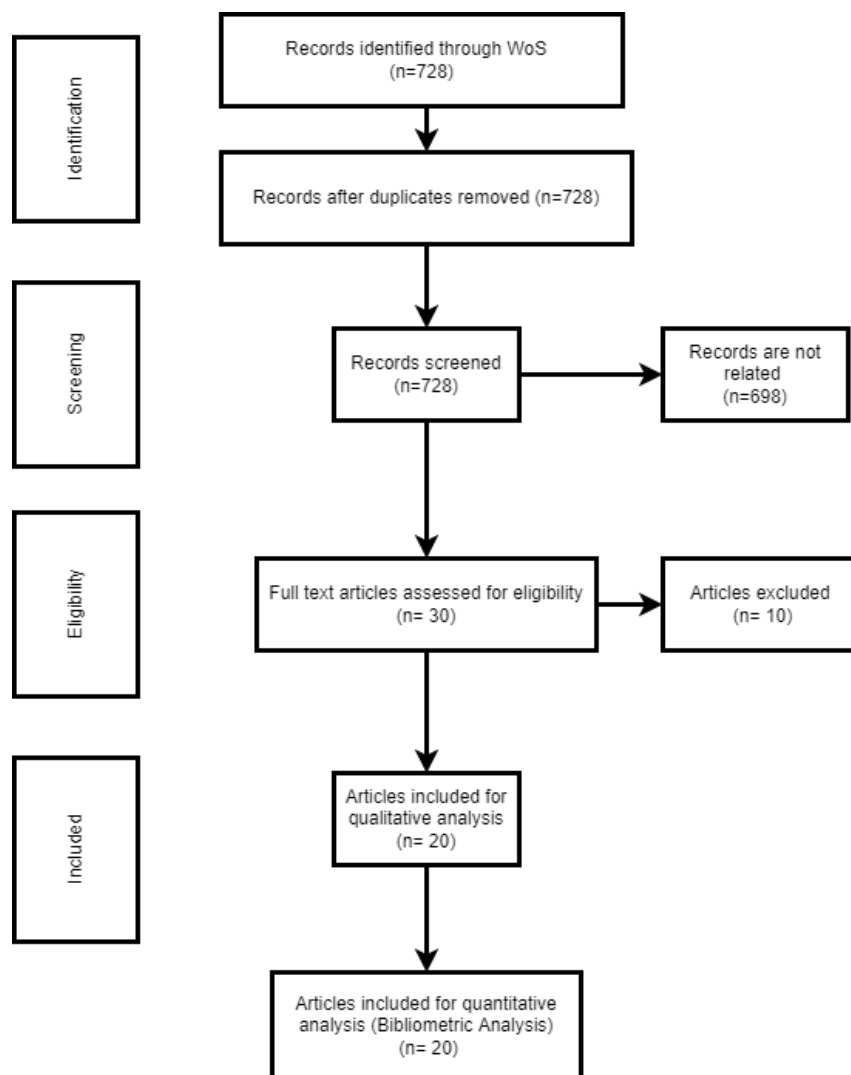
## Method

The study was conducted with the document analysis method, one of the qualitative research methods. Document analysis is a kind of qualitative research method that can be employed alone (Şimşek, Özdamar, Becit, Kılıçer, Akbulut & Yıldırım, 2008) and employed to analyze written documents meticulously and systematically (Kıral, 2020) when in-depth interviews and comprehensive observation are not possible. In line with the purpose of the study, published research articles on digital games and gamification in nursing education constitute the scope of the document analysis of this study. The articles in the scope of this study were analyzed by bibliometric analysis and publication classification form.

Scientists use different approaches to examine the literature in line with quantitative and qualitative paradigms to understand and organize the findings of previous researches (Aria & Cuccurullo, 2017). At this point, the bibliometric analysis provides a qualitative analysis of the topics, trends of the topics, and the relationships among these topics of published studies in a particular research area (Ellegaard & Wallin, 2015; Li, Antonenko & Wang, 2019). Bibliometric analysis is used to describe the relevant research area by taking meta-information such as words, citations, and references from authors, keywords, titles, and abstracts (Li et al., 2019).

### Data and Data Collection Tools

This study was carried out by adapting the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) directive to the bibliometric analysis process (Moher, 2009). The data of the study consists of articles published between 2000 and 2022 as of 15 June 2022 in journals indexed by the Web of Science (WoS) database. The data records from WoS include information about the titles, authors, years, keywords and abstracts of the articles (Li et al., 2019). Within the scope of the study, the data of the articles from WoS were downloaded with the "Full Record and Cited References" option.



**Figure 1:** Research process according to the PRISMA guidelines

In the first stage of the study, the WoS database on digital games and gamification in nursing education was searched with the keywords "nursing education, game, gamification". The following query was used to search the WoS database: ((ALL=(nursing education) AND (ALL=(game) OR ALL=(gami\*))) AND LA=(English)). As a result of this search, a total of

"728" articles were found. In line with the purpose of the research, applied research (compilation, non-literature review etc. were excluded), articles that take game or gamification as the subject of the research, which is not conference papers and conducted with nursing students, were included in the data set. Articles that did not meet these qualifications were excluded from the data set due to exclusion criteria. In addition, these exclusion criteria, which constitute criteria for eligibility, ensured that the purpose of the research was served. Therefore, qualitative, and quantitative syntheses of 20 articles suitable for the research were included in the analysis process. The meta information of these articles has been downloaded from the WoS database in bib (BibTeX) format for bibliometric analysis.

The articles examined within the scope of the study are Sözbilir et al. (2012), the Publication Classification Form (PCF) was used by adapting it to nursing education. Each article was processed into the publication classification form and prepared for analysis in the spreadsheet program (Microsoft Office Excel). In addition to the data obtained from the PCF, the information obtained through WoS of the publications within the scope of the study constitutes the data of the study. In addition, the conclusion sections of included the articles synthesizing the research results on digital games and gamification in nursing education, constituting another piece of data of this study.

#### *Analysis of Data*

R-based Bibliometrix was used with Biblioshiny to perform a bibliometric analysis of the articles examined within the scope of the study. Bibliographic merging, co-citation analysis, collaboration analysis, and common word analysis (Aria & Cuccurullo, 2017) were performed with the Biblioshiny, which provides a web interface for Bibliometrix. Therefore, unlike other bibliometric applications, Bibliometrix offers many opportunities for bibliometric analysis.

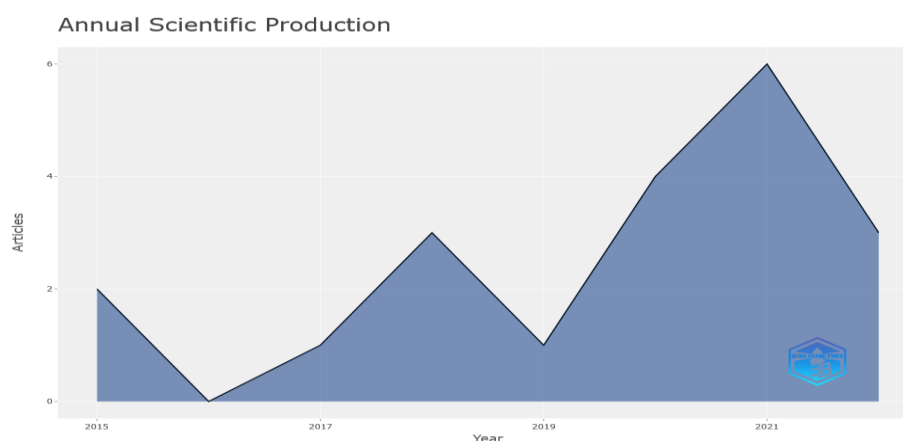
Thanks to the data obtained from the publication classification form within the scope of the study, a descriptive analysis of the articles examined in the study was made. To analyze the research results on digital games and gamification in nursing education, the conclusion sections of the articles included were analyzed with the content analysis (inductive) method, one of the qualitative data analysis methods.

## Finding

Within the scope of this study, 20 articles obtained from journals indexed in the WoS database were analyzed to determine the trends in published research on digital games and gamification in nursing education. Table 1 shows the descriptive findings of this analysis.

**Table 1.** Descriptive findings related to the articles in the research

Description	Results
Main Information About Data	
Timespan	2015 - 2022
Sources (Journals, Books, etc)	15
Documents	20
Annual Growth Rate %	5.96
Document Average Age	2.4
Average citations per doc	8.75
References	702
Document Contents	
Keywords Plus (ID)	64
Author's Keywords (DE)	67
Authors	
Authors	93
Authors of single-authored docs	0
Authors Collaboration	
Single-authored docs	0
Co-Authors per Doc	4.65
International co-authorships %	20



**Figure 2.** Number of articles published annually

It was determined that the articles published on digital games and gamification in nursing education were distributed between 2015 and 2022. It is seen that most of the articles were published in 2021. According to Figure 2, it can be said that studies on digital games and gamification in nursing education have increased in recent years.

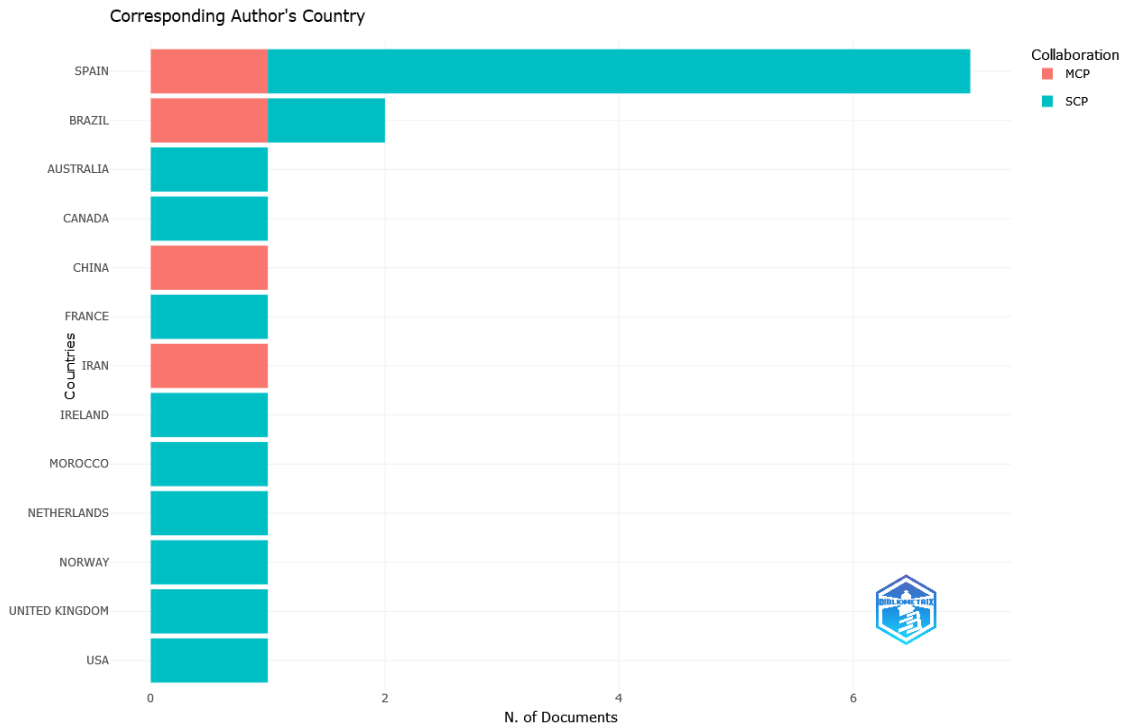


Figure 3. Distribution of authors by country

It has been observed that there is no single-authored article among the articles published on digital games and gamification in nursing education, and the authors work collaboratively (Collaboration Index = 4.65). When Figure 3 is examined, it is seen that the authors from Spain, Brazil, China, and Iran produced collaborative studies on the distribution of authors by country. In addition, it is seen that most publications were made by researchers in Spain (8 publications).

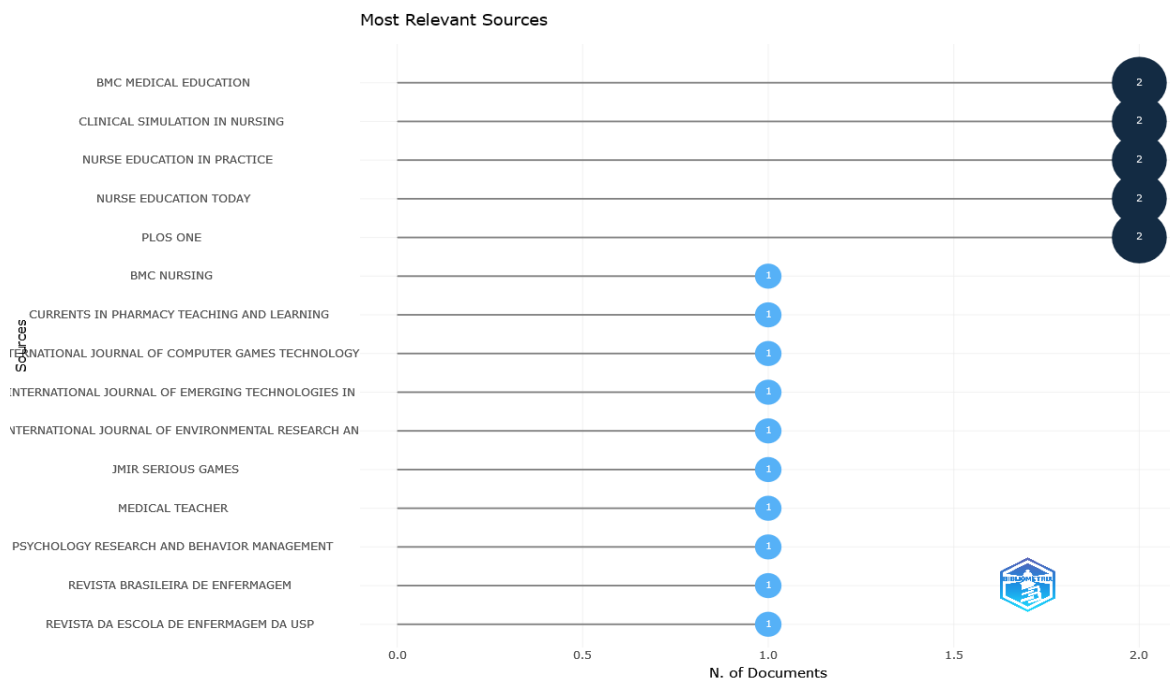


Figure 4. Distribution of published articles by journals

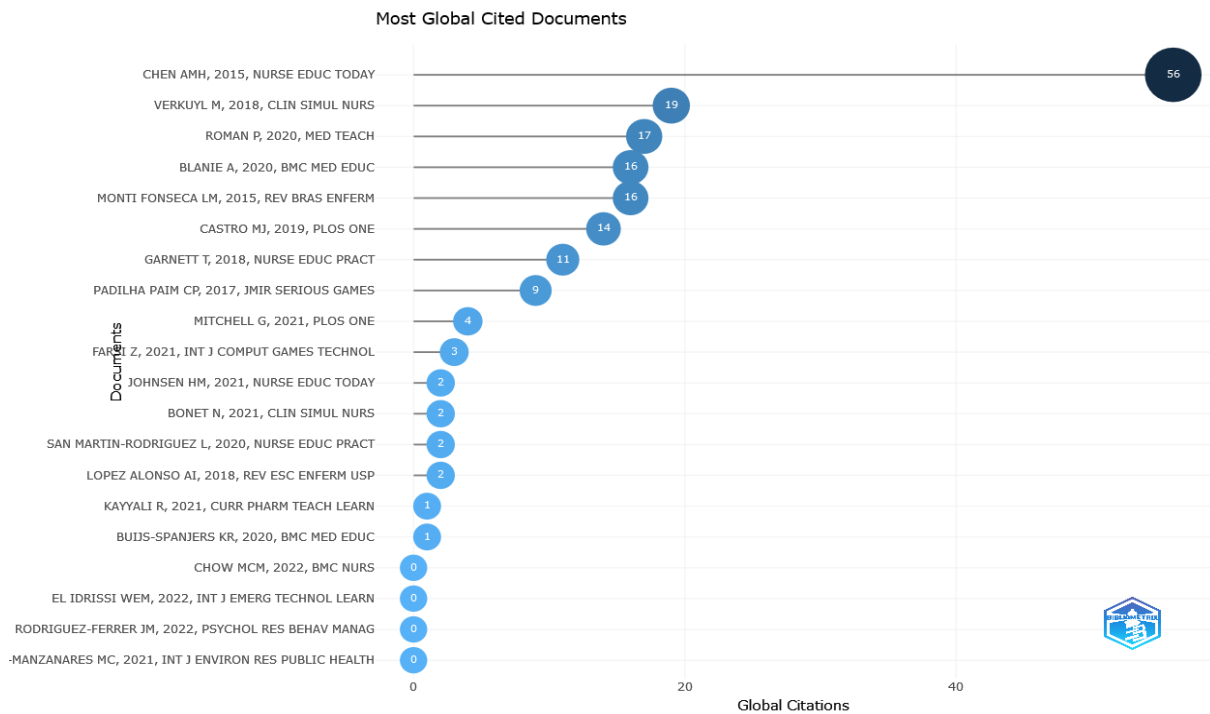


Figure 5. Distribution of published articles by journals

According to the analysis findings bibliometrix analysis, it was seen that 20 articles were published in 15 different journals between the years 2015-2022. When the distribution of the articles published according to Figure 4 is analyzed according to the journals BMC Medical Education (2 publications), Clinical Simulation in Nursing (2 publications), Nurse Education in Practice (2 publications), Nurse Education Today (2 publications) and PLOS One (2 publications) magazines have the most publications. In addition, as can be seen in Figure 5, it was seen that the most cited article was the article published in Nurse Education Today magazine and written by Chen, Kiersma, Yehle & Plake (2015).

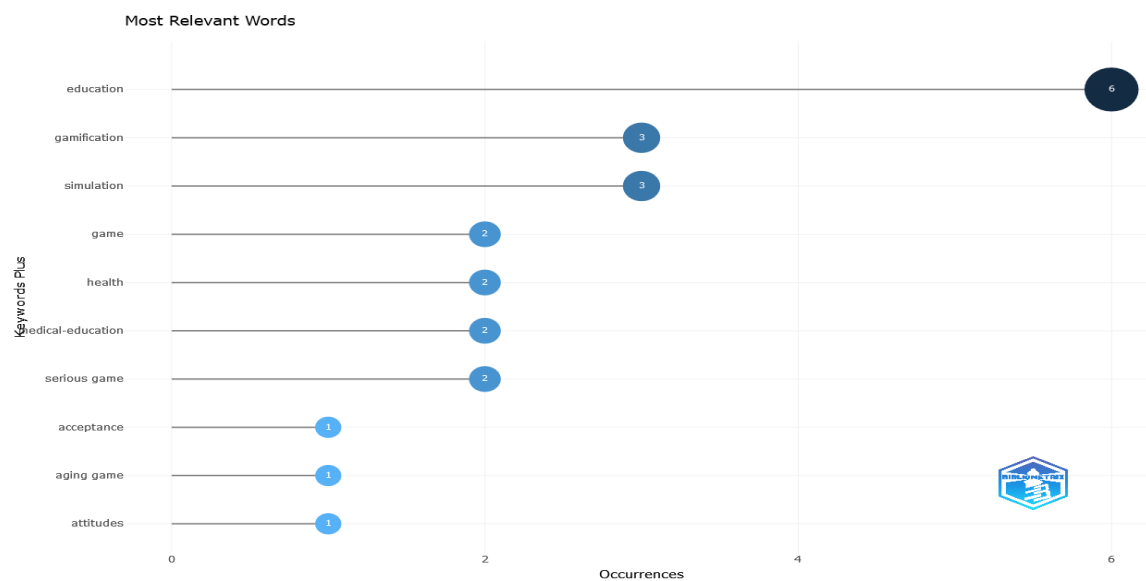
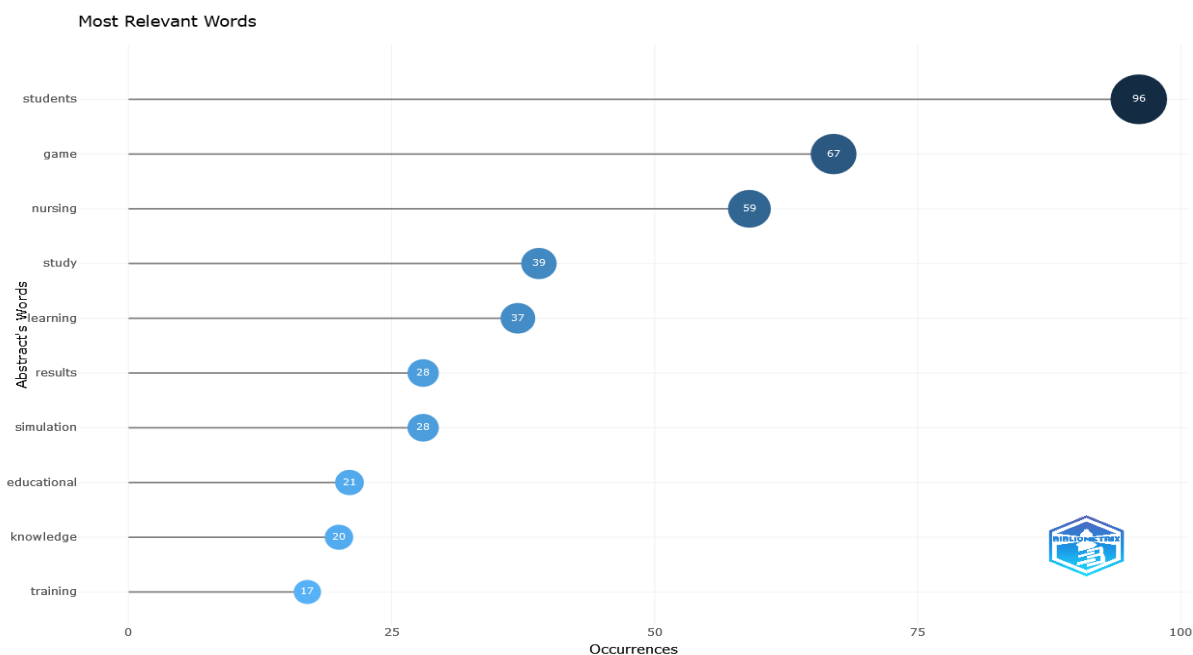


Figure 6. Most frequently used words in keywords of published articles





**Figure 7.** The most frequently used words according to the summary section of the published articles

Since the keywords of 2 of the 20 publications analyzed within the scope of the study were not included, the most relevant words were analyzed through the keywords of the authors. As can be seen in Figure 5, it is seen that the most frequent keywords of the authors are education ( $f=6$ ), gamification ( $f=3$ ), and simulation ( $f=3$ ), respectively. In addition, according to the analysis findings of the most related words in the summary section of the publications, students ( $f=96$ ), game ( $f=67$ ), and nursing ( $f=59$ ) were found to be the most related in the summary section of the publications.

According to the descriptive analysis findings (Table 2) of the data obtained in line with the Publication Classification Form (PCF) developed by Sözbilir, Kutu, and Yaşar (2012), it was determined that the research methods were quantitative (8 publications), qualitative (8 publications) and mixed designs (4 publications). Therefore, it is seen that research is carried out by employing both quantitative and qualitative and mixed design. Considering the number of samples studied based on these designs, it was observed that large sample groups (3 publications) with 300 and fewer samples (17 publications) were less preferred. These articles were conducted with nursing students in line with the purpose of the study. In addition, it was determined that the types of data analysis used in the articles examined varied according to the research method and sample size. Therefore, non-parametric ( $f=3$ ) analysis methods have been used in studies where descriptive analysis is the

most preferred and parametric assumptions cannot be met. In addition, t-tests and ANOVA were preferred as comparison tests. It is noteworthy that content analysis is used in the analysis of qualitative data.

**Table 2.** Research method, sample number, data analysis type and index of the reviewed articles

Category	Value	Number of Articles
Research Method	Quantitative	8
	Qualitative	8
	Mixed	4
Sample Size	11-30	6
	31-100	5
	101-300	6
	301-1000	2
	over 1000	1
Data Analysis Method	Descriptive (f, % etc.)	12
	t-test	5
	Non-parametric tests	3
	ANOVA/ANCOVA	2
	Content Analysis	6
Journals' Index	Emerging Sources Citation Index (ESCI)	4
	Science Citation Index Expanded (SCI-Expanded)	2
	Science Citation Index Expanded (SCI-Expanded) and Social Science Citation Index (SSCI)	13
	Social Science Citation Index (SSCI)	1

According to Table 2, it is seen that they are published in the journals scanned in the ESCI (4 publications), SCI-Expanded (2 publications), SCI-Expanded, and SSCI (13 publications) and SSCI (1 publication) indexes. However, it is seen that most publications are published in journals indexed in both SCI-Expanded and SSCI. Therefore, it can be said that studies on this topic have the potential to be published in journals indexed in top indexes.

Within the scope of the study, the conclusion sections of the publications were also examined in line with the purpose of the study. Castro et al. (2019) found that educational games support competition among students and motivate students to participate actively in learning processes. It is seen that students have an active learning experience with educational games (Castro et al., 2019). The findings of the study conducted by Rodríguez-Ferrer et al. (2022) also showed that students have an enjoyable learning experience and actively participate in the lesson thanks to the educational game. In addition, in the study conducted by Sáiz-Manzanares, Martín, Alonso-Martínez and Almeida (2021), it was seen that game-based learning was effective in learning outcomes. Verkuyl et al. (2018) stated that

virtual simulation game is effective in learning. Therefore, it is seen that game-based learning is effective in students' active participation in nursing education lessons.

In the study conducted by San Martín-Rodríguez, Escalada-Hernández, and Soto-Ruiz (2020), it is seen that educational games are effective in terms of students' satisfaction. The study by Blanié, Amorim, and Benhamou (2020) shows that simulation-supported play is effective on satisfaction and motivation. Similar findings were also found in the study by Johnsen et al. (2021), which affected students' satisfaction. In addition, in the findings of the study conducted by Fonseca, Aredes, Dias, Scochi, Martins and Rodrigues (2015), it was seen that the educational game designed with serious games increased the motivation of the students. Similarly, in the study conducted by El Machtani, El Idrissi, Chems, El Kababi and Radid (2022), it was seen that game-based learning was effective in students' satisfaction and motivation. According to the study by Garnett and Button (2018), it was emphasized that digital badges act as a motivational game-based learning design element and nursing educators and education designers can integrate digital badges into teaching practices as a motivational component. Therefore, it can be said that educational games are effective for students' satisfaction and motivation.

In the study conducted by Farsi et al. (2021), simulation and serious games were found to increase CPR skills. The findings of the study conducted by Paim and Goldmeier (2017) also support this finding. As can be seen in the study conducted by Chow, Hung, Chu and Lam (2022), it is seen that the use of 3D games will improve the field triage skills of the students. The findings of the study by Roman, Rodriguez-Arrastia, Molina-Torres, Márquez-Hernández, Gutiérrez-Puertas and Ropero-Padilla (2020) show that game-based learning promotes the development of nursing skills such as teamwork and communication skills. Therefore, these studies' conclusion shows that both simulations and serious games are effective teaching methods in nursing education.

In addition, according to the research conducted by San Martín-Rodríguez, Escalada-Hernández, and Soto-Ruiz (2020), it was revealed that the educational game prepared for learning nursing theories and models is effective in students' acquiring knowledge. Similar findings were obtained in the study conducted by Kayyali et al. (2021), and it was seen that game-based learning was effective in students' acquisition of knowledge. In support of these findings, in the study conducted by Mitchell, Leonard, Carter, Santin and Brown Wilson (2021), it was seen that students can be aware of flu knowledge and that nursing students

can be encouraged to get a flu vaccine. In line with these findings, it can be said that game-based learning has an important place in the development of students' knowledge levels in nursing education. In addition, studies by Chen et al. (2015), Buijs-Spanjers, Harmsen, Hegge, Spook, de Rooij and Jaarsma, (2020), and Alonso, Martínez, Presa, Casares and González (2018) were found to be effective in nursing students' developing empathetic behavior in patient care. It can be said that game-based teaching is effective in helping students understand patients in nursing care and gain empathic behavior.

### Discussion and Conclusion

In this study, which was conducted to determine the general trend in articles published on digital games and gamification in nursing education, 20 articles published in 15 journals in the WoS database were examined within the scope of the study. It is noteworthy that the articles published on digital games and gamification in nursing education have mainly been published in recent years. It can be considered a general opinion that the authors work collaboratively in different countries and institutions. Therefore, it can be said that producing publications in nursing education requires collaborative work.

In the research, quantitative, qualitative, and mixed design research methods were carried out. Therefore, it can be considered that similar studies can be carried out within the framework of these paradigms. The research design was preferred because of the purpose of the research. In addition, it is seen that the sample groups used in the research are mostly carried out in small groups in line with the purpose of the research. It is seen that the journals in which these publications are published are indexed in ESCI, SCI-Expanded, and SSCI, and studies in this topic are in the top indexes. In the systematic review article of Min, Min & Kim (2022) evaluating the effectiveness of game in nursing education, it is seen that the articles published similar to our study were published by the SCI.

It has been determined that game-based learning has a positive effect on students' satisfaction with the lesson. In addition, it has been revealed that games are also effective on students' motivation. It should not be overlooked that digital badges can be used as an effective game element to motivate students. White and Shellenbarger (2018) stated that game-based applications developed with digital badges offer an innovative approach to gamifying nursing education by involving nursing students in learning. However, digital badges are designed to be visible indicators of success and skill, as online assessment and accreditation mechanisms are available (White & Shellenbarger, 2018). In a game-based

study by Gu et al. (2022) on venous catheter care with nursing students, they used digital badges to increase students' motivation. As a result of the research, it is seen that there is an increase in the skill and motivation levels of the students (Gu et al., 2022).

It is seen in the studies that game-based learning provides active participation of the students in the lesson and effectively increases the students' knowledge level. It is concluded that game-based learning is effective in acquiring the knowledge and skills of students both in nursing and patient care. According to the studies, it is seen that teaching with games in nursing education is effective in the development of nursing skills (Paim & Goldmeier, 2017). For this reason, the practice of game-based teaching can be developed for nursing students to gain professional skills and thus contribute to the development of such skills for the students (Chang et al., 2022). However, nursing is an applied science that combines knowledge and skills. In this context, it can be said that the importance of teaching strategies that will increase knowledge and skills in nursing education has increased.

In the published studies, it is noteworthy that educational games support competition among students (Castro et al., 2019; Elmas et al., 2015). This finding is consistent with the study of Wingo et al. (2019). The study stated that learning with team competition has significantly positive results in learning educational materials in nursing students (Wingo et al., 2019). In addition, it cannot be ignored that educational games motivate students to participate actively in learning processes (Castro et al., 2019).

As explained by Johnsen et al. (2021), it is predicted that game-based learning will be beneficial for designing future teaching strategies in Bachelor of Nursing programs. The importance of game-based learning cannot be ignored in nursing education. Sáiz-Manzanas et al. (2021) stated that gamification, which is effective in clinical practice, should be included in health sciences curricula. Therefore, as a result of the studies, it can be concluded that game-based learning and gamification are useful in ensuring active participation of students in the course, increasing their satisfaction levels, providing motivation, teaching skills in nursing education, and students' understanding and empathic behavior in nursing education.

#### *Acknowledgement*

*Due to the scope and method of the study, ethics committee permission was not required.*

*Author Contribution Statement*

**Sevinç MEŞE:** Literature review, determination of the problem situation, determining the method, selection of the studies for the research, collecting data, creating conclusion and discussion sections.

**Can MEŞE:** Literature review, collecting data, analyzing data, reporting, and writing, auditing, and editing processes.

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