BIBLIOMETRIC ANALYSIS OF RESEARCH ON "GAMIFICATION IN NURSING" VIA VISUAL MAPPING TECHNIQUE

ANÁLISE BIBLIOMÉTRICA DA PESQUISA SOBRE "GAMIFICAÇÃO NA ENFERMAGEM" VIA TÉCNICA DE MAPA VISUAL

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Abstract. This research employs bibliometric analysis and visual mapping techniques to evaluate academic studies on "gamification in nursing" within the health sciences literature. Gamification utilizes game elements in non-game contexts to motivate individuals, enhance interaction, and promote behavioral changes. This strategy has been increasingly adopted in the health sector, particularly in nursing, demonstrating various positive outcomes for both healthcare professionals and patients. This study aims to conduct a bibliometric review of gamification in nursing, exploring its integration into healthcare systems and the associated challenges. Utilizing data from the Web of Science database and analyzed with VOSviewer software, this study visualizes the trends in "gamification in nursing" research over time, identifies key research themes, and examines academic collaborations between countries. Findings indicate that the United States and Spain are at the forefront of this research area, having made substantial contributions to the literature. Co-authorship analysis reveals the most cited authors and scholars with extensive collaborations in the field. Furthermore, the study identifies frequently used keywords, highlighting the diverse applications of gamification within nursing. In conclusion, this research elucidates the current status of "gamification in nursing" in the academic literature and provides a strategic perspective for future research.

Keywords: Nursing, gamification, health sciences, visual mapping, bibliometric analysis

Resumo. Esta pesquisa emprega técnicas de análise bibliométrica e mapeamento visual para avaliar estudos acadêmicos sobre "gamificação em enfermagem" na literatura de ciências da saúde. A gamificação utiliza elementos de jogos em contextos não relacionados a jogos para motivar indivíduos, melhorar a interação e promover mudanças comportamentais. Essa estratégia tem sido cada vez mais adotada no setor de saúde, particularmente na enfermagem, demonstrando vários resultados positivos para profissionais de saúde e pacientes. Este estudo tem como objetivo conduzir uma revisão bibliométrica da gamificação em enfermagem, explorando sua integração em sistemas de saúde e os desafios associados. Utilizando dados do banco de dados Web of Science e analisados com o software VOSviewer, este estudo visualiza as tendências na pesquisa sobre "gamificação em enfermagem" ao longo do tempo, identifica os principais temas de pesquisa e examina as colaborações acadêmicas entre países. As descobertas indicam que os Estados Unidos e a Espanha estão na vanguarda desta área de pesquisa, tendo feito contribuições substanciais para a literatura. A análise de coautoria revela os autores e acadêmicos mais citados com extensas colaborações no campo. Além disso, o estudo identifica palavras-chave frequentemente usadas, destacando as diversas aplicações da gamificação na enfermagem. Concluindo, esta pesquisa elucida o status atual da "gamificação na enfermagem" na literatura acadêmica e fornece uma perspectiva estratégica para pesquisas futuras.

Palavras-chave: Enfermagem, gamificação, ciências da saúde, mapeamento visual, análise bibliométrica

1. INTRODUCTION

Gamification has emerged as an effective strategy across various sectors in recent years, driving significant transformation within healthcare. By utilizing game elements in non-game contexts, gamification aims to motivate individuals, enhance interaction, and encourage behavioral changes. Its application in the health sector, particularly in nursing, has steadily increased, demonstrating numerous positive outcomes for both healthcare professionals and patients. This study aims to conduct a bibliometric review of gamification in nursing, examining its integration into healthcare systems and the associated challenges.

Employing gamification in healthcare is considered an important innovation for increasing user motivation, improving educational outcomes, and promoting positive behavioral changes. A systematic review by Al-Rayes et al. (2022) demonstrated the effectiveness of game-like elements, such as points, leaderboards, feedback loops, and rewards, in improving health behaviors. These elements have the potential to enhance individual engagement in health processes and contribute to the education of healthcare professionals. As a tool that empowers individuals to assume a more active role in their health management, gamification also facilitates greater patient inclusion in the care process.

The effectiveness of gamification in nursing education is demonstrated through its capacity to enhance student motivation, engagement, and learning outcomes. John and Thomas (2024) substantiate that implementing gamification strategies in nursing education yields improved learning outcomes and heightened student motivation. Through gamified educational content, nursing students can develop advanced problem-solving and critical thinking skills, thereby strengthening their preparedness for clinical practice. The success of this educational model, however, depends on carefully aligning game mechanics with specific pedagogical objectives.

Berglund et al. (2022) note the growing prevalence and efficacy of gamification in digital health programs for promoting positive behavioral changes. The integration of gamification elements in digital health platforms facilitates increased patient engagement in treatment processes and leads to improved health outcomes. Nevertheless, implementation challenges persist. A notable obstacle to maintaining sustainable motivation is the gradual decline in user engagement with gamification elements over extended periods.

Hammedi et al. (2017) emphasize that individual factors, including age and medical predispositions, significantly influence gamification efficacy. This finding indicates that gamification strategies require customization to accommodate diverse user needs rather than applying a uniform approach. In the nursing context, optimizing gamification applications necessitates careful consideration of demographic and psychological characteristics among both patients and healthcare professionals, thereby enhancing outcomes in nursing education and patient care.

The implementation of gamification extends beyond nursing education into clinical practice. Hamdi et al. (2022) demonstrate that gamification enhances knowledge retention and learning outcomes among medical personnel. These strategies serve as instruments for nurses' professional development while fostering more effective workplace learning environments. Furthermore, gamification contributes to healthcare cost reduction through increased patient compliance, decreased emergency department utilization, and lower hospital readmission rates.

However, successful gamification implementation in nursing requires addressing several ethical and practical challenges. Ouanes (2024) identifies key obstacles, including development costs, data privacy concerns, and the need for personalized learning experiences. Data privacy holds particular significance in healthcare settings due to the imperative of protecting sensitive patient information. Consequently, incorporating these considerations into gamification application development is crucial for ensuring strategic sustainability.

While the existing literature suggests the potential of gamification in nursing, it also highlights the limited scope of research in this area and the need for more comprehensive investigations. The lack of clear differentiation between gamification and serious games in the literature hinders the interpretation of research findings and introduces uncertainty in evaluating the effects of gamification (Doğan et al., 2009; Akman & İmamoğlu Akman, 2017; Uygun & Aribas, 2020; Eduard Ivashkevych & Simko, 2023; Demirtaş & Üstün, 2023). Consequently, future studies should adopt a more systematic and detailed approach to defining and delineating the application areas of gamification in nursing.

This study's significance lies in its contribution to addressing these knowledge gaps by comprehensively exploring the potential of gamification in nursing across a broad spectrum,

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from education to clinical practice. Emerging evidence suggests that gamification can positively influence nursing education and patient care processes, underscoring the importance of integrating this strategy into healthcare systems. Effective and sustainable implementation of gamification within nursing is crucial for the professional development of healthcare professionals and the enhancement of patient care outcomes. Gamification serves as a powerful tool for both motivating individuals and improving the quality of health services. Therefore, the findings of this study offer valuable guidance for the more effective utilization of gamification in nursing practice.

2. METHOD

This study employs bibliometric analysis to identify and evaluate the extant literature. Bibliometric analysis constitutes a quantitative methodology for assessing publication trends, impact, and scientific productivity within academic literature.

Through examination of quantitative indicators in scientific publications—including articles, books, and conference proceedings—this method illuminates research concentration patterns, identifies prominent contributors, and determines influential journals within specific research domains. The approach enables temporal tracking of research evolution and identification of key research centers and collaborative networks.

This methodological framework facilitates researchers' comprehensive understanding of the literature's current state and enables strategic planning of future research directions. The analysis utilizes key metrics, including publication quantity, citation frequency, H-index, and journal impact factors, which serve as critical indicators for evaluating academic impact at both researcher and institutional levels.

As Donthu et al. (2021) assert, bibliometric analysis functions as an essential tool for mapping collaborative networks and research themes, thereby enabling a more holistic assessment of academic literature.

Data Collection Process

Data for this study were collected from reputable international academic databases, primarily the Web of Science (WoS). A comprehensive literature review was conducted to identify relevant studies on gamification in nursing.

Utilizing the keyword "gamification in nursing," a range of publications, including articles, books, and conference proceedings, were screened. The resulting literature list was meticulously examined and refined for bibliometric analysis.

Duplicate or irrelevant studies were excluded during this stage, ensuring a focused and valid dataset for subsequent analysis.

Data Analysis

In the data analysis phase, bibliometric analysis was conducted using VOSviewer software. VOSviewer is widely employed in academic research for mapping and visualizing scientific literature networks.

This software analyzes various aspects of selected studies, such as authorship, keywords, citations, and co-citation networks, and generates visual representations of these data. This study utilized the software package VOSviewer to examine author collaboration networks, prominent research themes, keyword density, and the most cited publications (Chiarello et al., 2023).

Network maps and clusters generated through VOSviewer were utilized to visualize the structural composition and trends in nursing gamification research.

Specifically, author collaboration networks and topical clusters facilitated enhanced comprehension of scientific productivity and collaborative patterns within the field. The

bibliometric analysis results were interpreted to identify principal research themes in the literature, particularly focusing on studies examining the intersection of gamification and nursing practice.

A systematic search was conducted in the WOS database on August 23, 2024, employing the search term "gamification in nursing." The search yielded 364 records published between 2013 and 2024, comprising 271 research articles, 47 review articles, 39 full-text papers, 14 early appearance studies, 5 abstracts, 1 book review, and 1 editorial article.

To maintain focus on peer-reviewed research, the analysis was restricted to research and review articles, resulting in 318 publications. Following the application of English-language criteria, 313 articles were deemed suitable for bibliometric analysis.

3. RESULTS AND DISCUSSION

This section provides a concise overview of the studies focused on the concept of "gamification in nursing."

Table 1. Basic Information

Data	Results	Authors	Results
Time Interval	2013-2024	**Authors (at least 1 publication and 5 citations)**	539
Key words (used at least 5 times)	32	**Author appearances**	931
Average Annual Number of Publications	26.08	**Number of authors per document**	0.58
References	9488	**Number of documents per author**	1.72
Number of Publications (Documents)	313		

The bibliometric analysis, summarized in Table 1, examined gamification studies in nursing published between 1994 and 2024. This analysis identified 313 publications, averaging 26.08 publications per year. Within these publications, 32 keywords appeared at least 5 times. Authorship analysis revealed an average of 0.58 authors per document and 1.72 documents per author.

While 931 authors contributed to this body of work, 539 authors had at least one publication and five citations. Furthermore, these publications collectively cited 9,488 references. These findings offer valuable insights into the scope of gamification research in nursing, including publication trends, keyword usage, and author contributions, which can be used to inform future research and encourage collaborations within this field.

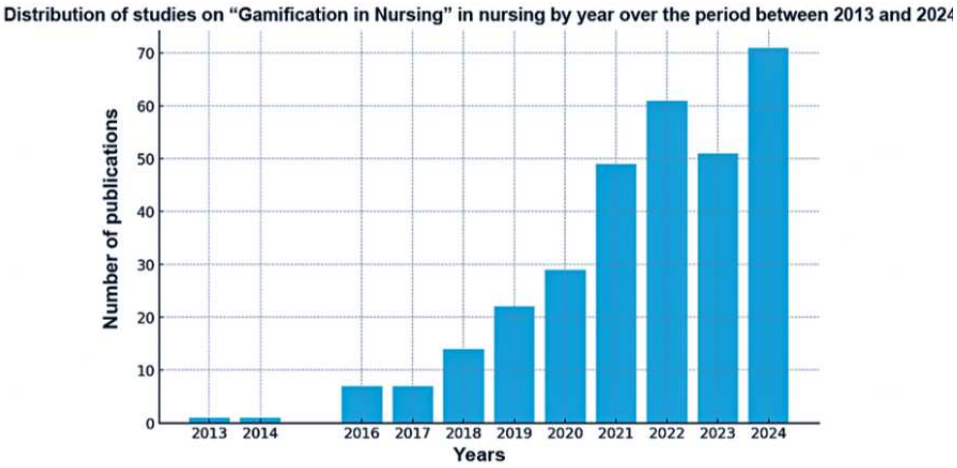

Figure 1. Number of Publications by Year

Figure 1 illustrates the distribution of publications on gamification in nursing between 2013 and 2024. The data indicate a substantial increase in research activity from 2016 onwards. Of particular note, 2024 emerges as the year with the highest number of publications, followed by 2022 and 2023. While 2013 and 2014 saw limited research output, a significant rise in publications is evident from 2016 onwards.

This trend suggests a growing interest in gamification within nursing, reflected in the increasing volume of academic research in recent years. These findings underscore the evolving nature of this field and highlight the increasing prominence of gamification in nursing literature.

Co-Authorship Analysis

A co-authorship analysis was conducted to investigate collaboration patterns among authors publishing on gamification in nursing. The analysis included authors with at least one publication and five citations, resulting in a network map comprising 25 authors across 4 clusters, with 111 links and a total link strength of 118. While Luis Albendin Garcia, Guillermo Canadas de la Fuente, and Maria Correa Rodriguez emerged as the most cited authors (147 citations), Lorena Gutierrez-Puertas, Veronica Marquez Hernandez, and Miguel Rodriguez Arrastia were identified as the most relevant and productive authors in this field.

This discrepancy between citation count and relevance suggests that while some authors may be widely cited within the broader field, others may have a more focused and impactful contribution specifically to the application of gamification in nursing. This highlights the importance of considering both citation metrics and topical relevance when assessing author influence. The visual representation of the co-authorship analysis (Figure 1) provides an overview of collaborative networks and key contributors within this research area.

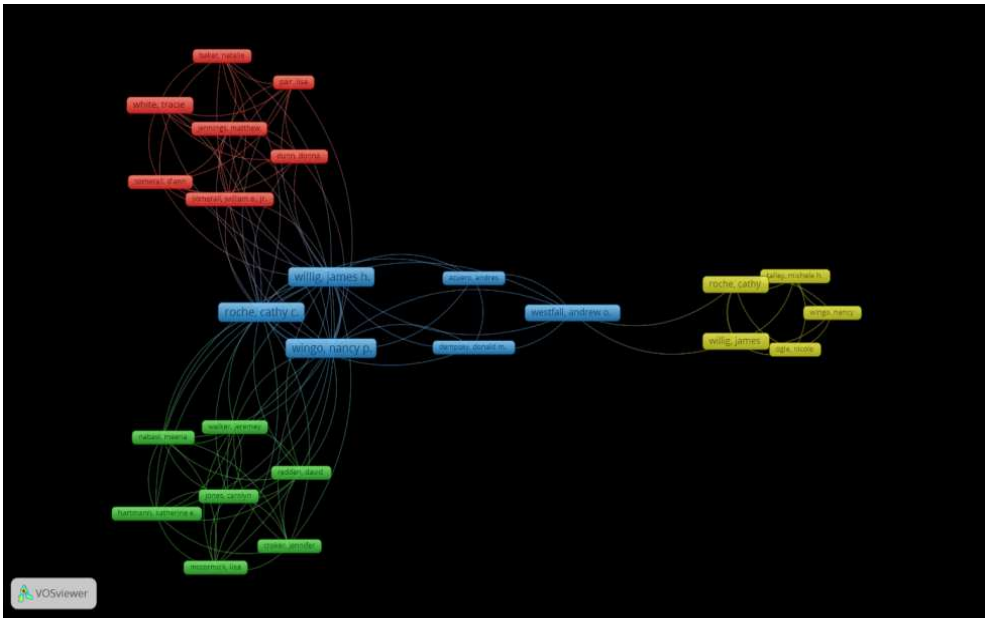

Figure 2. Co-Author Networks Indicating Collaborations between Authors

Citation Analysis by Authors

The authors' citation analysis, conducted to examine citation relationships and networks, employed threshold criteria of a minimum of three publications and three citations to generate the network map.

The analysis revealed three distinct clusters across 12 interconnected units, comprising 38 links with a cumulative link strength of 122. Citation frequency analysis identified Lorena Gutierrez-Puertas (122 citations) and Veronica Marquez Hernandez (122 citations) as the most frequently cited authors, followed by Carmen Ropero Padilla (74 citations).

In terms of total link strength, indicating the robustness of collaborative networks, Cathy Roche emerged as the leading author, followed by James Willig and Nancy Wingo, respectively. A visualization of the authors' citation analysis network is presented below.

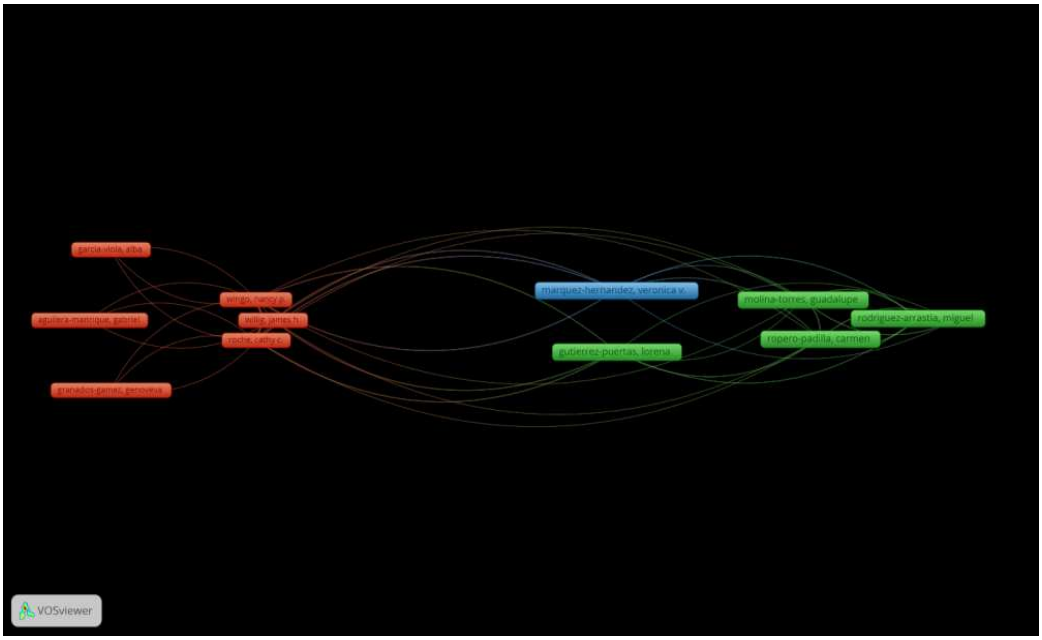

Figure 3. Authors' Citation Networks

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Citation Analysis by Country

The geographic distribution of citations is visualized through a network map (Figure 4), analyzing countries' publication and citation patterns. The analysis incorporated 24 countries meeting the threshold criteria of minimum one publication and five citations. Bibliometric analysis revealed eight distinct clusters interconnected by 51 links, with a cumulative link strength of 146.

Citation analysis demonstrates the United States' predominance with 858 citations, followed by Spain (600 citations) and Ecuador (147 citations). Publication volume analysis similarly positions the United States as the leading contributor with 79 publications, followed by Spain (47 publications) and the People's Republic of China (19 publications). A network map illustrating inter-country citation relationships is presented below.

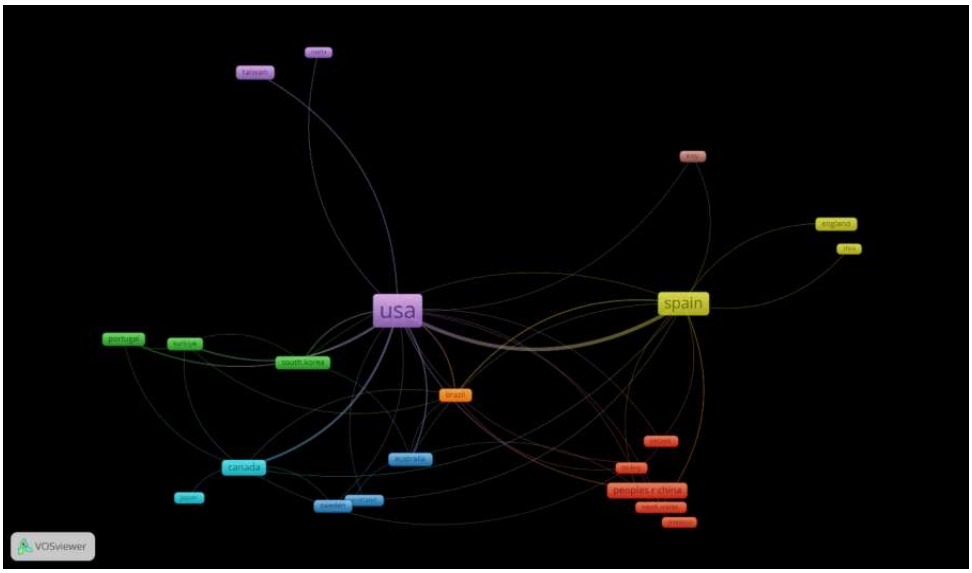

Figure 4. Citation networks showing collaboration between countries

Citation Analysis by Institution

Figure 5 presents a network map illustrating the citation patterns of institutions contributing to research on gamification in nursing. The analysis included institutions with at least one publication and five citations, resulting in a network comprising 95 institutions across 12 clusters, with 268 connections and a total network breadth of 342. Almeria University leads in terms of publication count with 12 publications, followed by British Columbia University (8 publications) and Penn University (7 publications).

However, in terms of citation impact, Granada University ranks first with 186 citations, followed by Almeria University (170 citations) and Huelva University (156 citations). Interestingly, when considering total network breadth, which reflects the extent of an institution's connections within the research network, Mercy Medical Center, Almeria University, and Jaume I University emerge as the top-ranking institutions.

This suggests that these institutions have a broader reach and influence within the field of gamification in nursing, extending beyond their publication and citation counts.

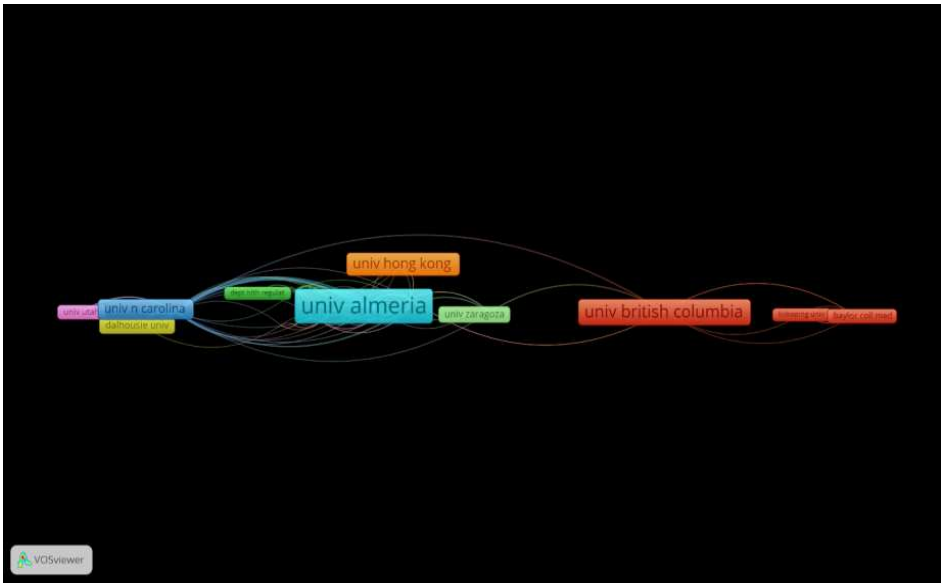

Figure 5. Citation networks between different institutions

Keyword Analysis

Keyword analysis was performed to identify the prominent themes and concepts associated with gamification in nursing. Figure 6 provides a visual representation of the keyword network, illustrating the frequency, intensity, and interrelationships of these keywords. "Gamification" emerged as the most frequently used keyword (132 occurrences), followed by "education" (24 occurrences) and "nursing" (14 occurrences).

The network map encompasses 32 keywords organized into 6 clusters, with 149 links and a total link strength of 352. This analysis highlights the central focus on gamification within nursing research and suggests a strong emphasis on educational applications.

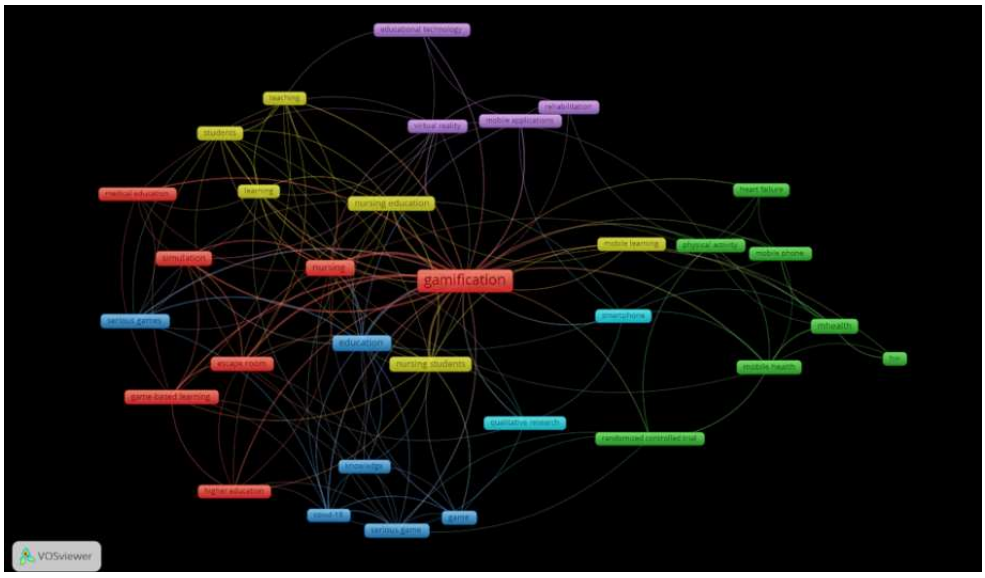

Figure 6. Network Visualization of the Most Frequently Used Keywords

Bibliographic Coupling Analysis

Bibliographic coupling represents the intellectual linkage established when two or more academic works cite common sources. This methodological approach identifies publications sharing references to the same works, thereby establishing a bibliographic relationship. Such analysis proves particularly effective in mapping thematic relationships between publications

and delineating significant contributions within a research domain. As Kleminski et al. (2022) note, bibliographic coupling serves as a crucial tool for mapping research fields and identifying seminal studies and influential scholars.

The present analysis examined 108 works from a pool of 110 publications meeting the minimum threshold of five citations. The bibliometric analysis revealed eight distinct clusters interconnected by 1,243 links, yielding a cumulative link strength of 2,188. Citation analysis identified Gomez-Urquiza (2019) as the most frequently cited work (147 citations), followed by Gonzalez et al. (2016) with 95 citations, and Brull and Finlayson (2016) with 70 citations. Analysis of total link strength positioned Gutierrez-Puertas et al. (2020) as the most extensively coupled work, followed by Garcia-Viola et al. (2019) and Molina-Torres et al. (2021). The bibliographic coupling network is visualized in Figure 7.

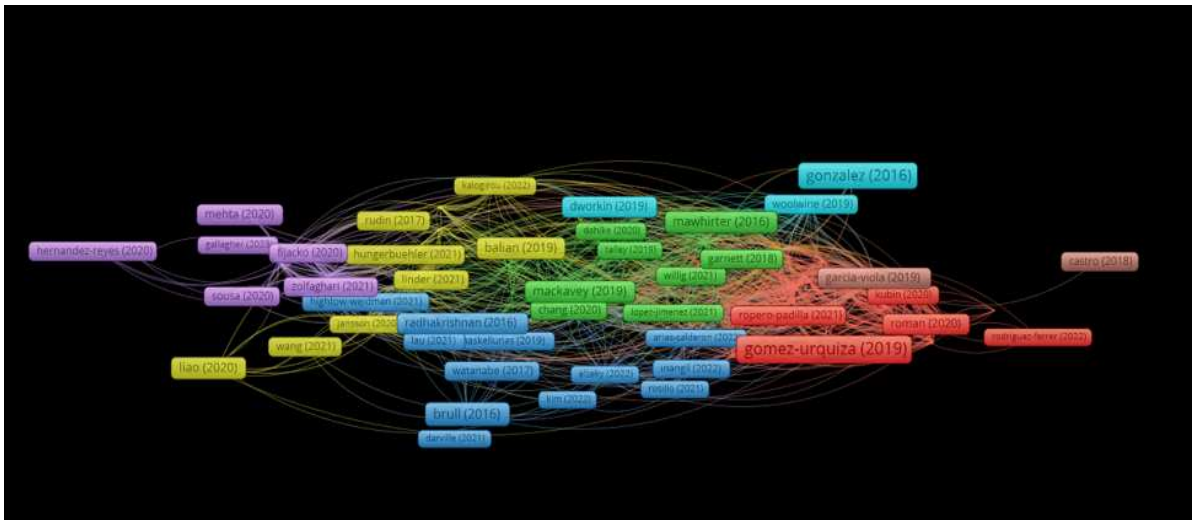

Figure 7. Network Visualization of Bibliographic Coupling Among Scholarly Works

4. CONCLUSION

This study presents a comprehensive bibliometric analysis of academic literature examining gamification applications within nursing. Gamification, defined as the implementation of game elements in non-gaming contexts to enhance motivation, facilitate learning processes, and increase user engagement (Hamari et al., 2023), has emerged as an innovative methodology across nursing education and patient care domains (Malicki et al., 2020). This investigation aimed to evaluate the structural composition of nursing gamification research, identifying principal research themes, author collaborations, and metrics of scientific productivity within the field.

Bibliometric analysis reveals a substantial temporal increase in nursing gamification publications. Examination of the literature between 2013 and 2024 demonstrates a marked acceleration in research output beginning in 2016, with 2024 emerging as the peak year for publications in this domain. This progressive increase in scholarly output indicates growing recognition of gamification's significance in nursing practice and research. The mean annual publication rate of 26.08 underscores the field's expanding presence in academic discourse.

The bibliometric analysis provided valuable insights into author collaborations within the field of gamification in nursing. Co-authorship analysis revealed strong collaborative networks among certain groups of authors, highlighting their significant contributions and influence within this research area. Specifically, Lorena Gutierrez-Puertas, Veronica Marquez Hernandez, and Miguel Rodriguez Arrastia emerged as both highly prolific and frequently cited researchers. This suggests that these authors not only actively publish in this field but also produce impactful work that is widely recognized by their peers. Their contributions have

likely played a key role in shaping the academic discourse and research agenda on gamification in nursing. Furthermore, the analysis identified the most cited authors who have effectively shaped the academic literature and influenced the direction of research in this field. These authors' work serves as a foundation for future studies and their influence is evident in the evolving landscape of gamification research within nursing.

Country-level analysis revealed that the United States, Spain, and China were the most prolific contributors to the literature on gamification in nursing. The United States led with 79 publications and 858 citations, followed by Spain with 47 publications and 600 citations. China emerged as the third most active country with 19 publications. These findings demonstrate the global reach of gamification research within nursing and highlight the significant contributions of these countries to the field.

Analysis at the institutional level further emphasized the prominence of Spanish universities in gamification research. Almeria University, Granada University, and Huelva University were particularly noteworthy for their high publication and citation counts. Almeria University led with 12 publications, while Granada University garnered the most citations with 186. These results underscore the leadership role of Spanish institutions in advancing knowledge and promoting scholarly activity in the field of gamification in nursing.

Keyword analysis identified the central themes and concepts associated with gamification in nursing. "Gamification" was the most frequent keyword (132 occurrences), followed by "education" (24 occurrences) and "nursing" (14 occurrences). The analysis revealed 149 links between 32 keywords clustered into 6 groups, with a total link strength of 352. This intricate network suggests that gamification in nursing is a multi-faceted field with connections to various sub-disciplines and research areas. The high frequency of keywords like "education" and "nursing" emphasizes the importance of gamification in these specific contexts.

Finally, the bibliographic coupling analysis identified the most frequently cited works within the gamification in nursing literature, providing insights into the key publications shaping this field. Specifically, studies by Gomez-Urquiza (2019), Gonzalez et al. (2016), and Brull and Finlayson (2016) emerged as highly influential works with strong bibliographic connections. By visualizing the relationships between these and other frequently cited works, the analysis illuminated the interconnectedness of the literature and highlighted the core publications driving research in this area. This understanding of the intellectual landscape is crucial for situating new research within the existing body of knowledge and identifying potential areas for future exploration.

In conclusion, this study provides a comprehensive overview of the gamification in nursing literature, revealing its scope, trends, and key contributors. The findings demonstrate the growing prominence of gamification within nursing research and offer valuable guidance for future investigations. This analysis serves as a roadmap for researchers, highlighting influential publications, collaborative networks, and emerging trends that can inform future research directions and contribute to the advancement of knowledge in this evolving field.

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