International Seminar on Student Research in Education, Science, and Technology
ISSN 3047-1532 | Volume 2 April 2025, pp. 117-125
https://www.issrestec.id/
http://journal.ummat.ac.id/index.php/issrestec
Universitas Muhammadiyah Mataram, Indonesia

Digital Game-Based Learning in Education: A Visual Bibliometric Network Analysis

Gilang Maulana Jamaludin[1], Muhammad Japar[1], Mohamad Syarif Sumantri[1]
[1]Basic Education, Universitas Negeri Jakarta, Indonesia
gmaulana231@gmail.com, mjapar@unj.ac.id, mohamadsumantri@gmail.com

Abstract: Digital Game-Based Learning (DGBL) has become an increasingly prominent area of research in the field of education. This study aims to map the development of DGBL research through a visual bibliometric network analysis using Scopus-indexed publications from 2004 to 2025. Using a quantitative descriptive approach, this research identifies publication trends, influential authors and institutions, research collaboration networks, and dominant keywords. The analysis was conducted using RStudio and visualized through co-authorship, co-citation, and keyword co-occurrence mapping. The findings show that DGBL studies have experienced consistent growth, with China being the most productive country and Computers and Education as the most influential journal. Prominent authors such as HWANG G-J and highly cited documents by Papastergiou (2009) highlight key contributions in the field. The results provide a comprehensive understanding of the DGBL research landscape and offer insights into potential directions for future exploration in game-based learning.

Keywords: Digital Game-Based Learning, Bibliometric Analysis, Network Visualization, Educational Technology, Research Trends.

Article History:
Received: 01-04-2025
Online : 24-04-2025

A. INTRODUCTION

In recent decades, digital technology has experienced rapid development and has had a significant impact on various aspects of life, including in the world of education (Collins & Halverson, 2018; Haleem et al., 2022a; Kalolo, 2019; Ng, 2015). One of the innovations that is increasingly applied in learning is Digital Game-Based Learning (DGBL), which is a learning method that integrates elements of digital games to improve the learning experience (All et al., 2015; Behnamnia et al., 2020; Tay et al., 2022; Zin et al., 2009). Digital Game-Based Learning (DGBL) is designed to increase engagement, motivation, and understanding of concepts for students by providing more engaging interactions compared to conventional learning methods (Anastasiadis et al., 2018a; Coleman & Money, 2020; Khan et al., 2017). Digital Game- Based Learning (DGBL) is a learning method or atmosphere that combines digital games with learning knowledge and skills (Kaimara et al., 2021; Salainti & Neman, 2024; Umamah & Saukah, 2022)This allows students to solve problems and face challenges competitively while playing.

Digital games are widely used to teach a variety of subjects, such as math, science, history, and language (Gros, 2007; Papadakis, 2018; Takeuchi & Vaala, 2014). This technology allows students to acquire new abilities and skills and with digital gaming technology (Anastasiadis et al., 2018b; Haleem et al., 2022b; Prensky, 2005). Various studies have shown

that digital game-based learning is able to support a wide range of 21st century skills, such as critical thinking, problem-solving, collaboration, creativity and student learning outcomes.

Along with the increasing interest in Digital Game-Based Learning (DGBL), the number of academic publications on this topic has also seen significant growth. Many studies have explored the effectiveness of Digital Game-Based Learning (DGBL) in a variety of educational contexts, including its application to specific subjects, its impact on student learning outcomes, and optimal learning design strategies. However, although the Digital Game-Based Learning (DGBL) literature is growing rapidly, there are still limitations in mapping the research patterns that have been carried out systematically. A comprehensive study of research trends, collaboration networks between researchers, and the main themes that develop in Digital Game-Based Learning (DGBL) research has not been widely conducted.

To fill this gap, this study aims to conduct a visual-based bibliometric analysis of publications on Digital Digital Game-Based Learning (DGBL) in the field of education. Using data from Scopus, the study will explore publication trends, identify influential authors and institutions, and analyze collaborative networks and emerging research topics. A bibliometric network analysis approach will be used to visualize the relationships between various elements in the Digital Game-Based Learning (DGBL) research ecosystem including co-citation, co-authorship, and keyword co-occurrence analysis.

Through this approach, this research is expected to provide broader insights into how Digital Game-Based Learning (DGBL) has evolved in academic studies. The results of this analysis are not only useful for researchers who want to understand the direction of Digital Game-Based Learning (DGBL) research development, but also for educators and policymakers in developing more effective game-based learning implementation strategies. Thus, this research contributes to providing a comprehensive overview of the DGBL research landscape and opens up opportunities for further exploration in this field.

B. METHOD

This study uses a quantitative descriptive approach of bibliometric network analysis to analyze the development of studies related to Digital Game-Based Learning (DGBL) in education. Bibliometric analysis methods allow for the exploration of publication patterns, relationships between researchers, as well as key trends in the academic literature (Donthu et al., 2021; Zupic & Čater, 2015). Data collection strategies collected from the Scopus database. Data from Scopus contains many reputable and relevant articles related to this research topic. In addition, scopus data is widely used as a source of bibliometric analysis data by researchers. Some of the criteria applied are articles published between2004-2025 and articles written in English. The research procedure carried out can be presented in the following picture:

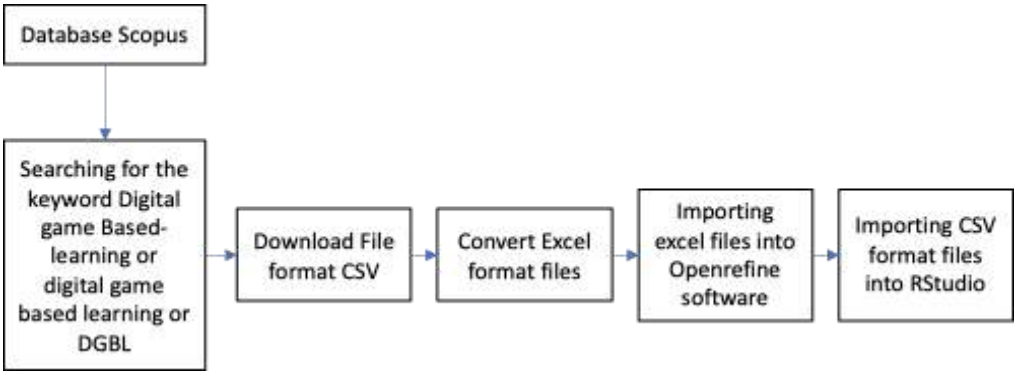

Figure 1. Research steps

Based on figure 1. The first step is to search for keywords in the Scopus database TITLE-ABS-KEY (Digital Game-Based Learning) atau (Digital Game Based Learning) or (DGBL) or (Game Based Learning) and TITLE-ABS-KEY (Education). The restriction of the year of publication starts from 2004-2025 and the source type is journals. The second stage is carried out in collecting data from Scopus, which starts with downloading files in CSV format. Tahapan ketiga merubah format file ke format file excel pada microsoft excel lalu file excel tersebut di download atau disimpan. The fourth stage is to input the excel format file into the Openrefine software which functions to clean typo keywords and duplicate themes. Tahap kelima yaitu menyimpan kembali file tersebut dengan format CSV. The sixth stage, namely the stored CSV file, is then ready to be used by opening the Rstudio software to analyze the results.

C. RESULTS AND DISCUSSION

In this part of the results and discussion, we will analyze the data extracted from the scopus database using Rstudio software which is presented in the form of tables, images, and maps.

1. Results

a. Main Information

In bibliometric research, the first stage is to identify key information. Data on research developments obtained through the Scopus database related to the topic of digital game-based learning in the period 2004-2025 can be presented in the following Table 1.

Table 1. Main Information

Main Information About Data	
Timespan	2004:2025
Sources (Journals, Books, etc)	229
Documents	534
Annual Growth Rate %	5.37
Document Average Age	5.78
Average citations per doc	29.5
References	26307
Document Contents	

Keywords Plus (ID)	1031
Author's Keywords (DE)	505
AUTHORS	
Authors	1380
Authors of single-authored docs	54
Authors Collaboration	
Single-authored docs	61
Co-Authors per Doc	3.23
International co-authorships %	17.42
Document Types	

Based on table 1, the main information includes the document time range, number of articles, number of publications, document type, author, and document content. The data shows that there are a total of 534 documents used from journals and books indexed by Scopus. The number of people who publish digital game-based learning topics amounted to 1380 authors, with 54 single authors and international collaborations only reached 17.42% with an average of 3.23 collaborations/ documents. In addition, there are 26,307 references that are appropriate to the topic of digital game- based learning.

b. Annual Scientific Production

The development of the number of articles published on Scopus per year can be seen in table 2.

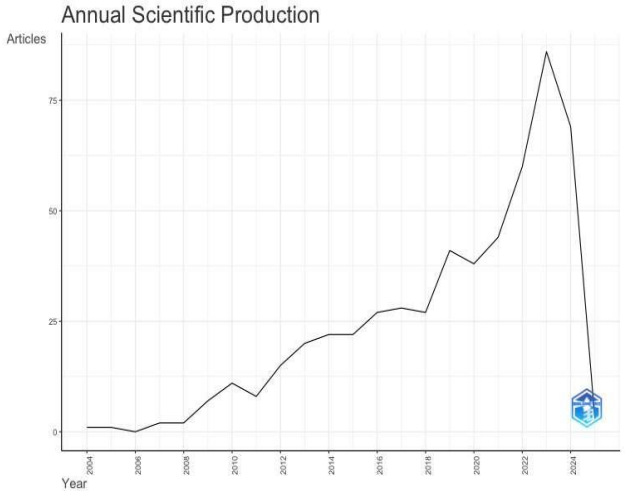

Figure 2. Number of Articles Published in Scopus Per Year

Figure 2. It shows that the number of articles related to the theme of digital game-based learning in education continues to grow every year and is the highest until 2023 as many as 86 articles, then in 2025 when the author takes data at the beginning of the year, of course this data will continue to develop until the end of 2025.

c. Three Field Plot

In the three field plot section in figure 2. What is presented below is to explain the visualization of state relations, author names and affiliations.

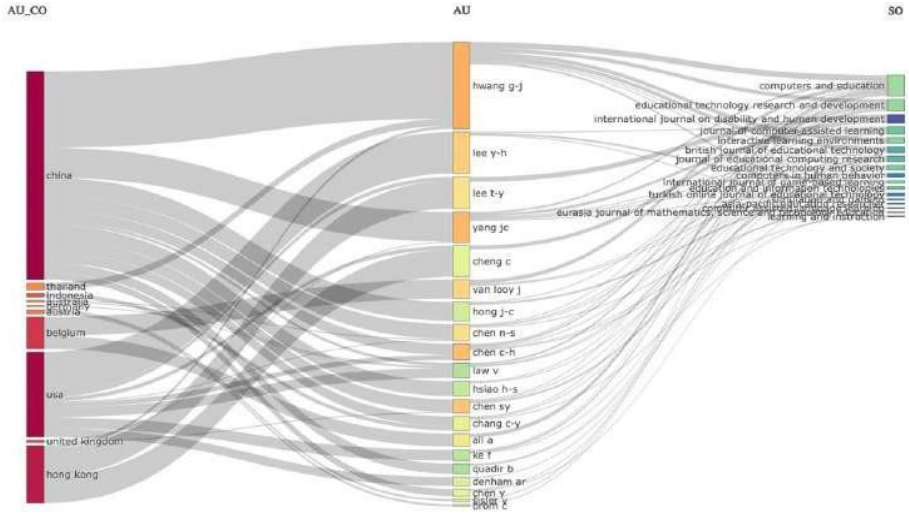

Figure 2. Countrie, Author, Sources

Based on figure 2. It shows that the country with the most publications related to digital game-based learning in education is China, the next country is the USA, Hong Kong, Belgium, Thailand, the United Kingdom, Indonesia, Australia, Germany, Austria. Publications from each of these countries are spread across many journals such as Computer amd Education, Educational Technology Research and Development. More clearly can be presented in figure 2.

d. Most Relevan Sources

Figure 3 presented explains the most relevant sources of publications on the topic of digital game-based learning.

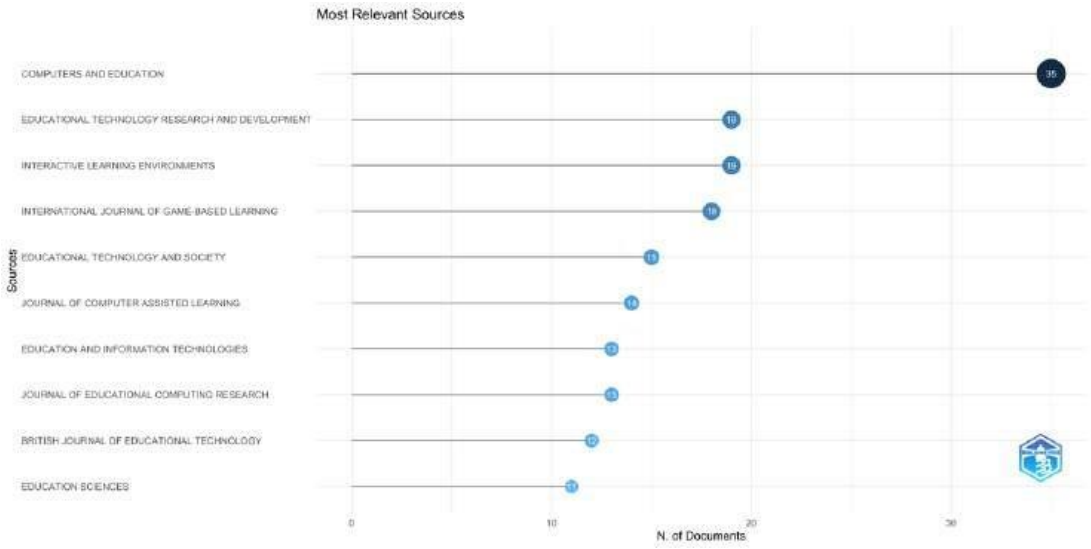

Figure 3. Most Relevant Publication Sources

Based on figure 3. It features the top 10 publications related to digital game-based learning in education and the most in computer and education journals with a total of 35 articles, the journal of educational technology research and development with a total of 19 articles, the journal of interactive learning environments with 19 articles, the international journal of the journal og game-based learning with a total of 18 articles, the journal of educational technology and society with a total of 15 articles, Journal of Computer Assisted Learning with a total of 14 articles, Journal of Education and Information Technology with a total of 13 articles, Journal of Educational Computing Research with a total of 13 articles, British Journal of Educational Technology with a total of 12 articles and Journal of Education Sciences with 11 articles.

e. Most Global Cited Documents

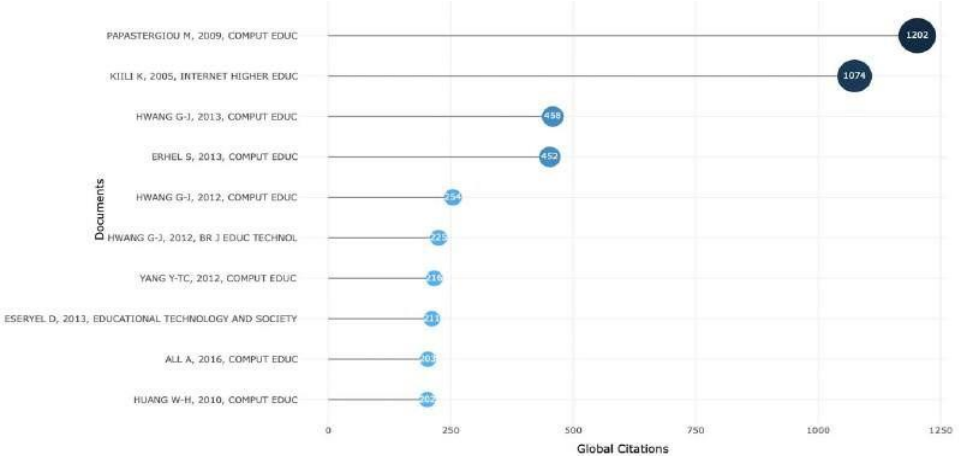

Figure 4. Most Cited Documents Globally

Based on figure 4. is a dataset that displays the most cited documents globally with 10 frequently cited documents in the topic of digital game-based learning. The first order of the most cited document is from (Papastergiou M, 2009) with the title "Digital Game-Based Learning in high school Computer Science education: Impact on educational effectiveness and student motivation" which is cited 1202 times.

f. WordCloud

Figure 5. WordCloud Results

Based on figure 5. The wordCloud results provide an overview of the words that are most often used as keywords and that often appear in scientific publications on the topic of digital game-based learning based on bibliometric data from Scopus. Word size indicates the level of frequency and significance of the topic in the literature analyzed. Digital game-based learning is the most dominant keyword seen, other words such as computer games, e-learning, student, and learning highlight the role of digital games in the context of education and student engagement. Meanwhile, topics such as motivation, teaching, computer aided instruction reflect attention in pedagogical and technological aspects of learning.

2. Discussion

The results of the bibliometric analysis show that research on Digital Game-Based Learning (DGBL) in education has experienced a significant growth trend over the past two decades. This is reflected in the increasing number of publications that reached their peak in 2023. This growth indicates that DGBL has become an important topic in global educational innovation, in line with the advancement of digital technology and the needs of 21st century learning.

The most active countries in DGBL publications are China, the United States, and several other Asian countries such as Hong Kong and Thailand. China's dominance in the number of publications indicates a great concern for the integration of technology in their education system. In addition, reputable journals such as Computers and Education, Educational Technology Research and Development, and Interactive Learning Environments are the main sources of DGBL publications, indicating that this topic has a special place in leading educational technology journals. Influential authors and institutions were also identified, one of which was HWANG G-J from Taiwan, which consistently produced quality publications in this field. In terms of documentation, Papastergiou's (2009) work is the most cited publication globally, confirming that initial research related to the effectiveness and motivation of learning through digital games is still relevant and is the main reference.

The WordCloud visualization reinforces the findings that keywords such as student, e-learning, computer games, and motivation are at the core of DGBL's discourse. This shows that DGBL not only focuses on the use of technology, but also on the psychological and pedagogical aspects of students in the learning process. Overall, this analysis provides a comprehensive overview of the DGBL research ecosystem and reveals the potential for global collaboration and research areas that can still be explored further, such as the implementation of DGBL in basic education, local cultural adaptation, and the development of game-based evaluation models.

D. CONCLUSIONS AND SUGGESTIONS

This study concludes that Digital Game-Based Learning is a field of study that continues to grow and receives wide attention globally. The results of the bibliometric network analysis show an increasing trend of publications, significant contributions of authors and institutions, and diverse research themes. Digital Game-Based Learning is proving to be not

only a technological, but also pedagogical topic, which has an impact on modern learning strategies. As a suggestion, the researcher can further expand the study by combining bibliometric and systematic review approaches, as well as exploring the application of Digital Game-Based Learning in a more specific educational context. In addition, international collaboration and cross-disciplinary studies need to be enhanced to strengthen the use of Digital Game-Based Learning in facing future educational challenges.

ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to the Basic Education Doctoral Program, Universitas Negeri Jakarta, for the support and academic guidance provided throughout the research process. Special thanks also go to the organizing committee of the International Seminar on Student Research in Education, Science, and Technology (ISSRESTec) for the opportunity to present and publish this work.

REFERENCES

All, A., Castellar, E. P. N., & Van Looy, J. (2015). Towards a conceptual framework for assessing the effectiveness of digital game-based learning. *Computers & Education*, *88*, 29–37.

Anastasiadis, T., Lampropoulos, G., & Siakas, K. (2018a). Digital game-based learning and serious games in education. *International Journal of Advances in Scientific Research and Engineering*, *4*(12), 139–144.

Anastasiadis, T., Lampropoulos, G., & Siakas, K. (2018b). Digital game-based learning and serious games in education. *International Journal of Advances in Scientific Research and Engineering*, *4*(12), 139–144.

Behnamnia, N., Kamsin, A., Ismail, M. A. B., & Hayati, A. (2020). The effective components of creativity in digital game-based learning among young children: A case study.
Children and Youth Services Review, *116*, 105227.

Coleman, T. E., & Money, A. G. (2020). Student-centred digital game–based learning: a conceptual framework and survey of the state of the art. *Higher Education*, *79*(3), 415–457.

Collins, A., & Halverson, R. (2018). *Rethinking education in the age of technology: The digital revolution and schooling in America*. Teachers College Press.

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.

Gros, B. (2007). Digital games in education: The design of games-based learning environments. *Journal of Research on Technology in Education*, *40*(1), 23–38.

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022a). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, *3*, 275–285.

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022b). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, *3*, 275–285.

Kaimara, P., Fokides, E., Oikonomou, A., & Deliyannis, I. (2021). Potential barriers to the implementation of digital game-based learning in the classroom: Pre-service teachers' views. *Technology, Knowledge and Learning*, *26*(4), 825–844.

Kalolo, J. F. (2019). Digital revolution and its impact on education systems in developing countries. *Education and Information Technologies*, *24*, 345–358.

Khan, A., Ahmad, F. H., & Malik, M. M. (2017). Use of digital game based learning and gamification in secondary school science: The effect on student engagement, learning and gender difference. *Education and Information Technologies*, *22*, 2767–2804.

Ng, W. (2015). New digital technology in education. *Switzerland: Springer*.

Papadakis, S. (2018). The use of computer games in classroom environment. *International Journal of Teaching and Case Studies*, *9*(1), 1–25.

Prensky, M. (2005). Computer games and learning: Digital game-based learning. *Handbook of Computer Game Studies*, *18*(2005), 97–122.

Salainti, E., & Neman, M. I. E. (2024). Teachers' Perception of Using Digital Game-Based Learning in Teaching and Learning Process. *EDUKASIA: Jurnal Pendidikan Dan Pembelajaran*, *5*(1), 955–962.

Takeuchi, L. M., & Vaala, S. (2014). Level up Learning: A National Survey on Teaching with Digital Games. *Joan Ganz Cooney Center at Sesame Workshop*.

Tay, J., Goh, Y. M., Safiena, S., & Bound, H. (2022). Designing digital game-based learning for professional upskilling: A systematic literature review. *Computers & Education*, *184*, 104518.

Umamah, A., & Saukah, A. (2022). Digital Game-Based Learning (DGBL): The voice of EFL university students and teachers. *PASAA*, *63*(1), 279–314.

Zin, N. A. M., Jaafar, A., & Yue, W. S. (2009). Digital game-based learning (DGBL) model and development methodology for teaching history. *WSEAS Transactions on Computers*, *8*(2), 322–333.

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods*, *18*(3), 429–472.