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Bibliometric Analysis: Toxicity Levels of MOBA Game Players Among Students and the General Public

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ABSTRACT

Multiplayer Online Battle Arena (MOBA) games have become a global phenomenon in the gaming industry. This article aims to examine the evolution, impact, and social aspects of MOBA games. We analyzed various literature sources, including scientific journals, articles, and research reports relevant to the keyword "MOBA." In our analysis, we see the development of MOBA games from their beginnings as modified real-time strategy (RTS) games to become a very popular standalone game genre. We also investigated the influence of MOBA games on mental health, social behavior, and addiction rates among players. Abstract P-ISSN: 2302-8734 Abstract Additionally, we explore social aspects such as communication within teams, development of collaborative skills, and learning related to MOBA gaming. Our research results show that MOBA games have a significant impact on players, both positive and negative. In a positive aspect, this game can improve social skills, strategic thinking skills, and team coordination. http://jurnal.umt.ac.id/index.php/jt/index E-ISSN: 2581-0006 Multiplayer Online Battle Arena (MOBA) games have become a global phenomenon in the gaming industry. This article aims to examine the evolution, impact, and social aspects of MOBA games. We analyzed various literature sources, including scientific journals, articles, and research reports relevant to the keyword "MOBA." In our analysis, we see the development of MOBA games from their beginnings as modified real-time strategy (RTS) games to become a very popular standalone game genre. We also investigated the influence of MOBA games on mental health, social behavior, and addiction rates among players. Additionally, we explore social aspects such as communication within teams, development of collaborative skills, and learning related to MOBA gaming. Our research results show that MOBA games have a significant impact on players, both positive and negative. In a positive aspect, this game can improve social skills, strategic thinking skills, and team coordination. However, there is also a risk of high levels of addiction and mental health disorders associated with excessive use. This research provides in-depth insight into the MOBA gaming phenomenon and the importance of understanding social aspects and their impact. However, there is also a risk of high levels of addiction and mental health disorders associated with excessive use. This research provides in-depth insight into the MOBA gaming phenomenon and the importance of understanding social aspects and their impact.

Keywords: *Bibliometric, Online Games, MOBA, Toxicity, Student*

1. INTRODUCTION

It is possible to accomplish this objective by playing games on mobile phones. The use of digital games and apps that are based on games in the context of teaching and training that is carried out through mobile devices is the primary emphasis of mobile game-based learning. In order to fulfill the expectations of a new generation of students who have been ensnared in the digital world from the moment they were born, the area of education is undergoing a fundamental transformation in order to address new problems connected to future professional capabilities [1].

Several studies, including virtual mobile applications, serious games, and augmented reality, show that mobile games can improve educational outcomes [2]. According to [3], one of the arguments most cited in the literature is motivational factors. Increased student achievement at all levels of education, increased 21st century skills, and student satisfaction with their learning experiences are other positive outcomes [2]. According to [4], the use of game-based learning on

mobile devices in CH education has enabled a new type of education and has reduced the distance between society and CH through simulation and joint participation.

With CH's success in digital games, virtual mobile applications, and AR, students can experience cultural and historical content virtually from remote, often geographically inaccessible locations, and even travel through time [5]. To put it another way, the transmission and receiving of CH information, as well as the relevance of this information, have been redesigned as a result of new digital technologies. This research makes a contribution to the research that has been done in the past by examining the current state of game-based learning in CH education.

2. METHODS

In this area of research, literature has been analyzed ranging from documentary development studies to the application of a scientific mapping analysis technique that is based on scientific mapping to H-learning within the context of games. In order to carry out a marking study, we made use of the methodological principles that were recommended by specialists in this field of research. We also used a model of presenting findings recognized by the scientific community [6].

2.1. Research Design

Departing from bibliometrics as the main research method, this research platform is designed to search, register, analyze, and predict the loyerature [7]. This design is supported by h-index analysis and h-index analysis [8] Procedure and data analysis As done by previous studies, this research was conducted in several steps.

1) Choosing a database: Dimensions was chosen for this study for the reasons above. It is also a global scientific database that brings together publications indexed by Scimago Journal Rank (SJR).
2) Determining search keywords: For this step, an impact study was reviewed [9] to create a list of keywords to be included in the search. "Game", "player", "occupation", "toxicity", and "sport" were the keywords.
3) Generates a search string: The strings generated based on the keywords are: "MOBA", "games", "online games", and "poison". Using this search string, you can find documents that contain any of these terms in their title, abstract, or keywords.
4) Selecting subject areas within Dimensions: Specifically, we selected the fields of study related to Toxicity Levels of Human-Centered MOBA Players and Biomedical and Clinical Sciences.
5) Improving Search: The result of implementing the previous steps yielded 87 scientific documents. Next, we set various criteria to improve the search. All years (2020-2024) were taken as inclusion criteria, and documents that were repeated or not well indexed in Dimensions (n=8) were rejected.

Figure 1. shows a flow chart that incorporates guidelines from the PRISMA protocol to illustrate all these procedures

6) Establishing Requirements: Different requirements were set up simultaneously to represent scientific production and performance in this study [10]. Subject area ($x \geq 90$), document type ($x \geq 150$), institution ($x \geq 9$), author ($x \geq 4$), source type ($x \geq 10$), country/region ($x \geq 40$), and the four most cited publications were among these requirements.

Various software programs were used to analyze the reported publications. Two of them are Dimensions software, which is used to extract data on year, authorship, country, document type, institution, language, and most cited publications. Vos viewers is another open-source software used to analyze the structural and dynamic development of scientific production longitudinally. Vos

viewers also performs scientific mapping analysis, which analyzes scientific production from various perspectives (co-words, co-citations, co-authors, etc.), using other methods, algorithms, and measurement methods [11]. In this case, Vos viewers can process and visually display the analysis results obtained. They can display strategic diagrams, cluster networks, and thematic evolution graphs when visualizing results. Co-occurrence analysis is the analysis of co-occurrence, or combined co-occurrence, of two keywords or terms in a given text with the aim of discovering the thematic and conceptual structure of a given field of knowledge. Recommendations from other studies are taken into consideration to perform an adequate analysis [12]. In the same way, the analysis of co-occurring words was carried out in several stages:

7) Recognition: Keyword analysis (n=268) was performed on various documents. A collective occurrence map was created. A network of adjacent words emerged. To refine the keywords, 268 keywords were studied, grouped into plural and singular groups, or acronyms, and spelling mistakes were corrected. As a result, the number of existing keywords dropped (n = 121). The clustering algorithm limited the most important ideas and themes.
8) Reproduction: It is decided to develop a strategic map as well as a theme network that is comprised of four zones. In the upper left quadrant, separate and in-depth concerns are grouped together. In the upper right quadrant, important subjects and engines are contained, and in the bottom left quadrant, missing projections or topics are delineated. Undeveloped and cross-cutting themes are displayed in the lower right quadrant of the diagram. Centrality, which refers to the extent to which links are developed inside the network, and density, which refers to the degree of internal strength, are both taken into consideration by this technique [13].

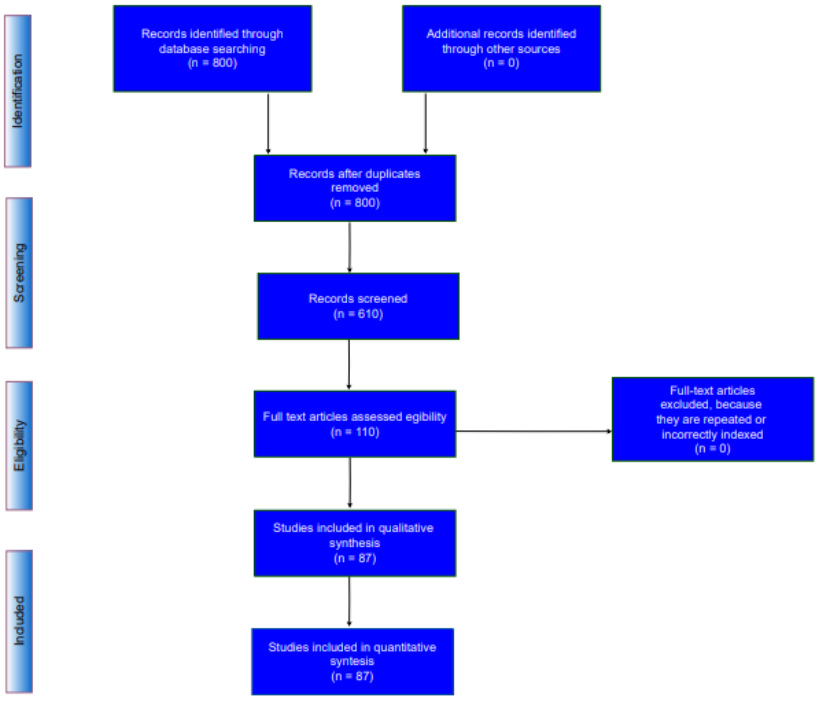

Figure 1. PRIMA Flow Diagram

9) Determination: Publications were cataloged in two time intervals (P1 = 2020-2024), and the strength for each interval was determined.
10) Performance: In this final step, different production indicators are linked to their respective inclusion criteria, as shown in Table 1.

3. RESULTS AND DISCUSSION

3.1 Performance Results and Scientific Production

The main field of study that gathers MOBA game player toxicity studies in the study is Information and Computer Sciences, followed by Human-Centered Computing and Biomedical and Clinical Sciences (see Table 2). Research papers and books are the two primary sorts of materials that are utilized by the scientific community in order to demonstrate their findings (see Table 3).

The UGC Journal List Group II is the organization that has the biggest production volume in the research related to the study of the toxicity level of users of multiplayer online battle arena games. Production quantities at other universities are smaller (see Table 4 for further information).

Table 1. Production indicators and inclusion criteria

Configuration	Values
Unit of analysis	Keyword author, keyword Dimensions
Threshord frekuensi	Keywords : P1 = (2), P2 = (2)
Network type	Authors : PX = (2)
Co-occurrence union value threshold	Co-occurrence
	Keywords : P1 = (2), P2 = (2)
	Authors : PX = (2)
Normalization measurement	Equivalence index eij = cij2/Root(ci-cj)
Clustering Algorithm	Maximum size : 9; Minimum size :3
Clustering Algorithm	Jaccard index
Overlapping Measurement	Inclusion rate

Table 2. Subject area

Subject area	n
46 Information and Computer Sciences	43
4608 Human-Centered Computing	28
32 Biomedical and Clinical Sciences	18
52 Psycology	12
42 Health Sciences	8

Table 3. Document type

Document type	n
Article	48
Edited Book	17
Preprint	8
Proceeding	6
Chapter	4
Monograph	4

The academic products of the authors are relatively similar. Two prominent authors (Andrey Somov and Anton Smerdov) have 5 posts out of all authors investigating short studies on MOBA game toxicity (table 5).

The sources used for this brief study on player MOBA game toxicity are mostly found in research journals. To date, UGC Journal List Group II produced 51 manuscripts, the highest of all journals. Other journals produced a lower number (table 6).

The United States is the country that has produced the most scholarly research on game-based learning in schools, with other countries producing fewer (Table 7).

It is important to note the number of citations of the most cited publications regarding the brief research on MOBA game toxicity. More than 200 citations were found in publications published between 2020 and 2024. A study conducted by [13]. had the highest number of citations at 460 (see Table 8).

There have been a few commercial video games that have garnered the attention of a few educational and cultural organizations in recent years. It has been shown that they are connected with varied degrees of integration in initiatives that have CH education goals. A collection of commercial video games that have been utilized in CH instruction is shown in Table 10, which is organized according to the entries that have been published in Dimensions.

3.2 Structural and Thematic Development

This study used two time periods (P1 = 2020-2021). As a result of the keyword continuity analysis, the number of keywords collected in each of the two time periods was analyzed.

Table 4. Most productive institutions

Institution	n
UGC Journal List Group II	51
ERA 2023	45
VABB-SHW	39
Norwegian register level 1	38
ERA 2018	34

Table 5. Most productive authors

Author	n
Andrey Somov	5
Anton Smerdov	5
Gro Dehli Villanger	4
Line Småstuen Haug	4
Regan Lee Mandryk	4

Table 6. Origin of most sources

Source origin	n
arXiv	7
Proceedings of the ACM on Human-Computer Interaction	6
Frontiers in Psycology	3
Lecture Notes in Computer Science	3
Europian Journal on Criminal Policy and Research	2

From 2020 to 2024, there were 171 keywords. Given the difference in production volume from interval to interval, this is to be expected. The keyword matching percentage between the two periods can be calculated based on this data, where the keyword volume for each period is added.

Currently, the match percentage is 6%. Figure 2 shows that game-based learning in CH has created new trends and research topics.

The bibliometric indicator data generated after co-word analysis is shown in the academic performance analysis for the period 2020-2024. The topics with the highest bibliometric indicators are "game", "player", "work", "toxicity", and "esport" (see Table 11).

Table 7. Country of origin

Country	n
United States	18
Germany	6
Finland	5
Norway	5

Table 8. Most cited publications

References	Citations
Chain, 2020	460
Skogheim, 2021	50
Beres, 2021	46
Anonymous, 2020	41
Kowert, 2020	28
Kleinman, 2021	23

Table 9: List of video games

Video Games	n
League	12
DOTA	3

The data on each theme's network over a predetermined period of time is shown in the strategic diagram. The diagram is organized so as to show the internal relationships that exist in each of the themes resulting from this research (see Figure 2).

Tab;e 10: Thematic performance of provisions in the study

Interval 2020-2023		
Topic	**Appearance**	**Relevansi**
Player	28	0.12
Toxicity	15	0.36
Video Game	15	0.03
Community	13	0.44
League	12	0.37
Student	9	0.31
Toxic Behavior	8	0.38
Industry	7	0.09
Match	7	0.94
Relationship	7	0.34

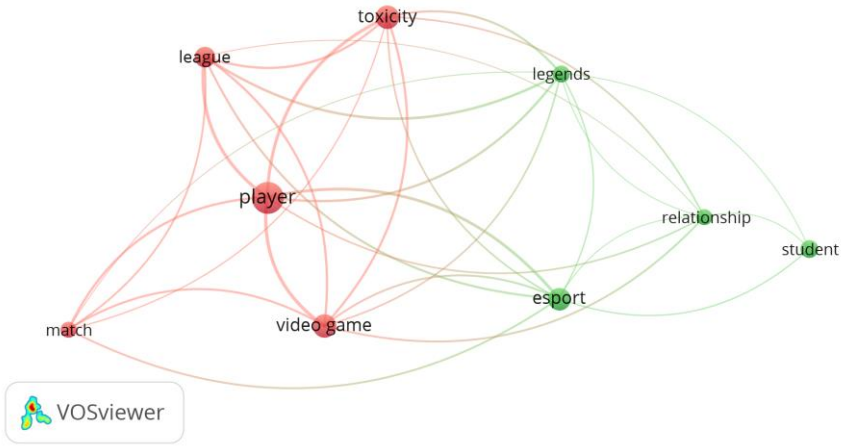

Figure 1. Internal Network Relationships on the Theme

3.3 Authors With the Highest Relevance Index

With respect to the authors, Andrey Somov and Anton Smerdov are considered the main authors of the study of the toxicity level of MOBA games. In addition, Gro Dehli Villanger and Line Småstuen Haug should be considered due to their place in the diagram. Figure 3 shows the likelihood that they will become relevant authors in the near future in this field of study.

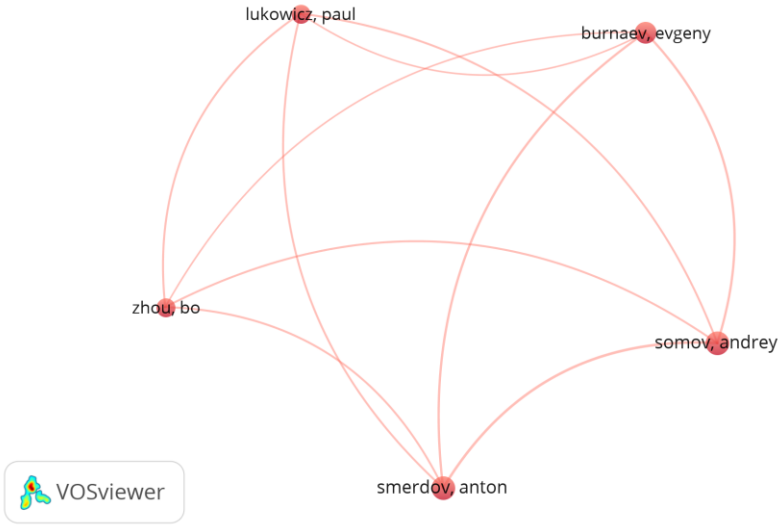

Figure 3. The Author's Internal Relationship

4. CONCLUSION

It is clear from this that research on the application of mobile games in the field of CH education is still in its infancy. In spite of the fact that gamification, e-learning, and game-based learning are not the only developments in this sector, the majority of the research that is being done right now is centered on pedagogical approaches. Additionally, virtual reality, augmented reality, and mixed reality are also being investigated by researchers. It is possible that in the not too distant future, research on the toxicity level of MOBA games will concentrate on the use of games and other

digital tools to instruct students at various stages of learning. These studies may also concentrate on the utilization of games and other digital resources to instruct students at various stages of learning.

A number of restrictions were encountered in this investigation. An additional limitation focuses on the criteria that were established by the authors in order to present the most pertinent results. This includes the purification of the data that was reported from Dimensions, where it was discovered that repeated publications were found in addition to other research that was unrelated to the subject of the study that was being analyzed and was therefore not properly indexed. As a consequence of this, the results of this study must to be considered with very extreme care.

Utilizing cultural heritage and video games as a link between diverse disciplines, we want to begin on two separate lines of inquiry for future study. These lines of inquiry will be conducted utilizing a variety of methodological techniques. It is our intention to collect video games that are representative of cultural heritage, and we also plan to develop a framework for the interaction of cultural heritage through the medium of video games. In order to conduct statistical analysis and make comparisons, the framework will be applied to each and every video game.

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