Mobile game-based learning in cultural heritage education: a bibliometric analysis

Daniel Camuñas-García

Department of Didactics of Social Sciences, University of Granada, Granada, Spain

María Pilar Cáceres-Reche

Department of Didactics and School Organization, University of Granada, Granada, Spain, and

María de la Encarnación Cambil-Hernández

Department of Didactics of Social Sciences, University of Granada, Granada, Spain

Abstract

Purpose – The purpose of this study was to analyze the state of mobile game-based learning in the field of cultural heritage education.

Design/methodology/approach – A bibliometric methodology based on scientific mapping and an analysis of co-words was used. The scientific production on this field of study indexed in Scopus was analyzed. The analysis included a total of 725 publications.

Findings – The results show that the National Research Council of Italy is the institution with the highest volume of production. Among the journals, the Journal on Computing and Cultural Heritage stands out. In addition, in the analysis of the structural and thematic development of co-words, a low percentage of keyword matching was observed. The research is currently mainly oriented to pedagogical methods, especially game-based learning, gamification and the use of serious games, although these are not the only trends in this field. Research is also focusing on virtual reality, augmented reality, and mixed reality.

Originality/value – This work is an exploratory and novel study that analyzes the publications to date on mobile game-based learning in cultural heritage education. In theoretical terms, this can serve as support so that other researchers interested in this field can access the information highlighted in this work. From a practical perspective, this work will contribute to the promotion of new innovative actions in cultural heritage education to satisfy the demands of a learning group increasingly familiar with games technology.

Keywords Bibliometric analysis, Scientific mapping, Mobile learning, Game-based learning, Video games, Heritage education

Paper type Literature review

1. Introduction

The field of education is evolving to meet the new challenges related to the competencies of the professionals of the future and the demands of a new generation of learners that is immersed in the digital world from birth (Díaz *et al.*, 2019). Mobile game-based learning is one of the emerging methods that have the potential to reach these objectives.

Mobile game-based learning is a method that focuses on the application of digital games and game-based apps in education and training through mobile devices (Krouska *et al.*, 2022).

From serious games to virtual and augmented reality mobile apps, several studies demonstrate that mobile gaming can promote positive educational outcomes (Heflin *et al.*, 2017; Huizenga *et al.*, 2019). With the motivation factor being one of the most cited arguments in the literature (De Freitas, 2018), other positive outcomes include student satisfaction with the learning experiences (Gao *et al.*, 2020), increased student achievement across all educational levels (Heflin *et al.*, 2017), and development of the 21st-century skills (Qian and Clark, 2016).

Regarding vocational education in the field of cultural heritage (called CH from now on), mobile game-based learning represents a great opportunity to engage learners from different educational levels and knowledge domains with CH assets. Studies such as García-Fernández and Medeiros (2019), Mortara *et al.* (2014), and Petrucco and Agostini (2016), have demonstrated the capacity of digital games to promote cultural values and to raise the awareness of CH conservation. There are many examples of digital games that use game technology to create entertaining and cultural learning experiences (Malegiannaki and Daradoumis, 2017). Both learning and entertainment elements can coexist without conflict, because the entertainment factor encourages the learners to participate in the game, but their understanding of what they have learned during the game persists beyond the experience (Simon, 2010). The relevance of these digital games is that they let players/learners examine CH without the barriers of time and space (Champion, 2015).

Mobile game-based learning in CH education have opened the door for new types of interactions and shortened the distance between the public and the CH through simulation and co-participation (Ćosović and Ramić-Brkić, 2020). The effective communication of CH in digital games and virtual and augmented reality mobile apps allow learners to virtually experience cultural and historical contents of remote places, in often inaccessible geographies, and even travel through time (Kiefer *et al.*, 2006). In other words, these digital technologies have reconfigured the ways of transmission and reception of information about CH and its significance. This study contributes to research by analyzing the state of mobile game-based learning in the field of CH education.

2. Justification and objectives
This work derives from the impact that the normalization of video games and video gaming in our society has had on the teaching and learning processes (Muriel and Crawford, 2018). In this regard, science advances quickly, above all, on topics of special relevance to the present, as is everything related to the use of video games for educational purposes. Recently published works can improve knowledge and reduce the gap on the status of a specific issue of concern by means of their findings. This is especially so in the field of technology, because of the importance of knowing the most recent digital technologies and platforms. The field of vocational education and training, and more specifically CH education, also acquires a relevant value in society, to train future generations of teachers and other educational professionals with skills for innovation and creativity that are required to ensure that cultural heritage and its significance are preserved in the future (Delgado-Algarra and Cuenca-López, 2020). After analyzing the literature on mobile game-based learning in CH education, it was observed that there are no studies that have analyzed the construct in a comprehensive manner. This is, from a bibliometric approach, based on the scientific mapping of published studies. For this reason, this research work is valuable for the purpose of analyzing the volume of publications carried out on the status of mobile game-based learning, specifically in CH education. This will serve to settle the knowledge bases on what has been studied by different expert researchers in the field of CH education. This will create new progress and proposals to inform, act, and improve CH education in times of academic uncertainty.

To find out how mobile game-based learning is causing alterations in CH education strategies around the world, this research work was carried out from a bibliometric approach

of the scientific production. Bibliometry is a set of research methods used to analyze publications on a specific question or focus of study (López-Robles *et al.*, 2019; López-Belmonte *et al.*, 2021). This allows the scientific community to know the progress and evolution that a topic or construct has achieved throughout time (Martínez *et al.*, 2014).

A fundamental aspect of a bibliometric analysis is the selection of an adequate scientific database. In the case of this study, the analysis carried out was based on the Scopus database. The choice of the Scopus database is justified because it is considered one of the databases that compiles a large volume of publications concerning the field of Social Sciences and Humanities (Donthu *et al.*, 2021; Machado and Davim, 2022).

The purpose of this work was to analyze the influence of mobile game-based learning in CH education in publications indexed in Scopus. This will allow us to establish the basis of the knowledge generated by this topic. Additionally, this will also serve as a reference to initiate future research by the scientific community. Therefore, this study represents an exploratory vision of mobile game-based learning in the field of CH education.

Therefore, the objectives of this study are focused on knowing the documentary performance in Scopus of mobile game-based learning in the field of CH education, determining its scientific progression, revealing the most significant themes covered in the literature, locating the most influential journals, authors, institutions, and countries, and predicting the topics and motor authors.

3. Method

In this study, an analysis of the literature was conducted, ranging from the study of documentary development to the use of an analytical approach based on scientific mapping of mobile game-based learning in CH education. To carry out an adequate study, we followed the methodological guidelines proposed by experts in this type of research (Donthu *et al.*, 2021; Carmona-Serrano *et al.*, 2021; Cobo *et al.*, 2011). Additionally, we used a model for the presentation of the findings validated by the scientific community (López-Belmonte *et al.*, 2020; Soler-Costa *et al.*, 2021).

3.1 Research design

Starting from bibliometrics as the main research method, a research design was developed to carry out the search, registration, analysis and prediction of scientific literature (Hirsch, 2005). This research design was supported by a co-word analysis (Mac-Fadden *et al.*, 2021; Moreno-Guerrero *et al.*, 2020), as well as by an analysis of the h-index. The different processes carried out in this research design allowed both the creation of scientific maps with nodes that reflect the conceptual domains and subdomains, as well as revealing the thematic evolution throughout time (Montero-Díaz *et al.*, 2018).

3.2 Procedure and data analysis

As previous works have done (Carmona-Serrano *et al.*, 2020; Martínez *et al.*, 2014; Moral-Muñoz *et al.*, 2020; Soler-Costa *et al.*, 2021), the research procedure was carried out in various steps:

(1) Choosing the database: In the case of this study, Scopus was chosen for the reasons mentioned above and because it is considered a worldwide scientific database, in addition to bringing together those publications indexed in the Scimago Journal Rank (SJR);

(2) Defining the search keywords: For this step, impact studies were reviewed (Bekele *et al.*, 2018; Mortara *et al.*, 2014) in order to create a list of keywords to include in the search. These keywords were: digital game, video game, mobile game, educational game, learning game, serious game, augmented reality, virtual reality, cultural heritage, and heritage education;

(3) Generating the search string: Considering the keywords, the search string generated was: ("digital game" OR "video game" OR "mobile game" OR "educational game" OR "learning game" OR "serious game" OR "augmented reality" OR "virtual reality") AND ("cultural heritage" OR "heritage education"). This search string was applied to find documents that had any of these terms in their titles, abstracts, or keywords;

(4) Selecting the subject areas in Scopus: In particular, all those related to the field of CH education (Social Sciences, Arts and Humanities, and Environmental Science) were selected;

(5) Refining the search: The application of the previous steps generated 733 scientific documents. Then, to refine the search, we establish various search criteria. As an inclusion criterion, all years (2000–2022) were taken, and as an exclusion criterion, repeated or poorly indexed documents in Scopus ($n = 8$) were excluded. This resulted in a total of 725 publications (https://bit.ly/3xsn5lF).

All this procedure was materialized in a flow diagram that synthesizes the guidelines contained in the PRISMA protocol (see Figure 1).

(6) Establishing the requirements: At the same time, different requirements, taken from previous works, were configured to represent production and scientific performance adequately in the present study (Martínez *et al.*, 2014). These were language ($x \geq 5$), subject areas ($x \geq 90$), type of documents ($x \geq 150$), institutions ($x \geq 9$), authors ($x \geq 4$), type of source ($x \geq 10$), country/territory ($x \geq 40$), and the four most cited publications.

To analyze the reported publications, various pieces software was used. Two are tools from Scopus, PlumX Metrics and View Citation Overview. These tools were used to extract the data related to the year, authorship, country, type of document, institution, language, and most cited publications. The other software was SciMAT, an open-source tool used to longitudinally analyze the structural and dynamic development of scientific production (Cobo *et al.*, 2011). SciMAT also performs scientific mapping analysis, i.e. it analyzes, through methods, algorithms, and other measurement methods, scientific production from different points of view (co-words, co-citations, co-authors, etc.), and can carry out various bibliometric studies. In this case, SciMAT can process and visually represent the findings obtained in the performed analysis. In the results visualization, SciMAT makes possible to represent strategic diagrams, cluster networks, and graphs of thematic evolution. In relation to the analysis of co-words, these are defined as analysis of co-occurrences, or joint appearances, of two keywords or terms in a given text with the objective of identifying the thematic and conceptual structure of a certain field of knowledge (Mac-Fadden *et al.*, 2021). In order to adequately carry out the analysis, the recommendations of other works were considered (Soler-Costa *et al.*, 2021). Likewise, the analysis of co-words was carried out in various steps:

(7) Recognition: The keywords ($n = 687$) of the different documents were analyzed. Co-occurrence maps were designed. A contiguous word network was developed. Keywords were refined; 687 keywords were analyzed and those that were both plural and singular, or acronyms, were grouped, and those that had spelling mistakes were corrected. Consequently, the total number of keywords was reduced ($n = 602$). The most important themes and concepts were delimited through a clustering algorithm;

(8) Reproduction: Thematic networks and strategic maps divided into four regions were created. The upper left quadrant brings together isolated and deep-seated problems. The upper right quadrant covers relevant topics and engines. The lower left quadrant delimits the topics in disappearance or projection. The lower right quadrant reveals
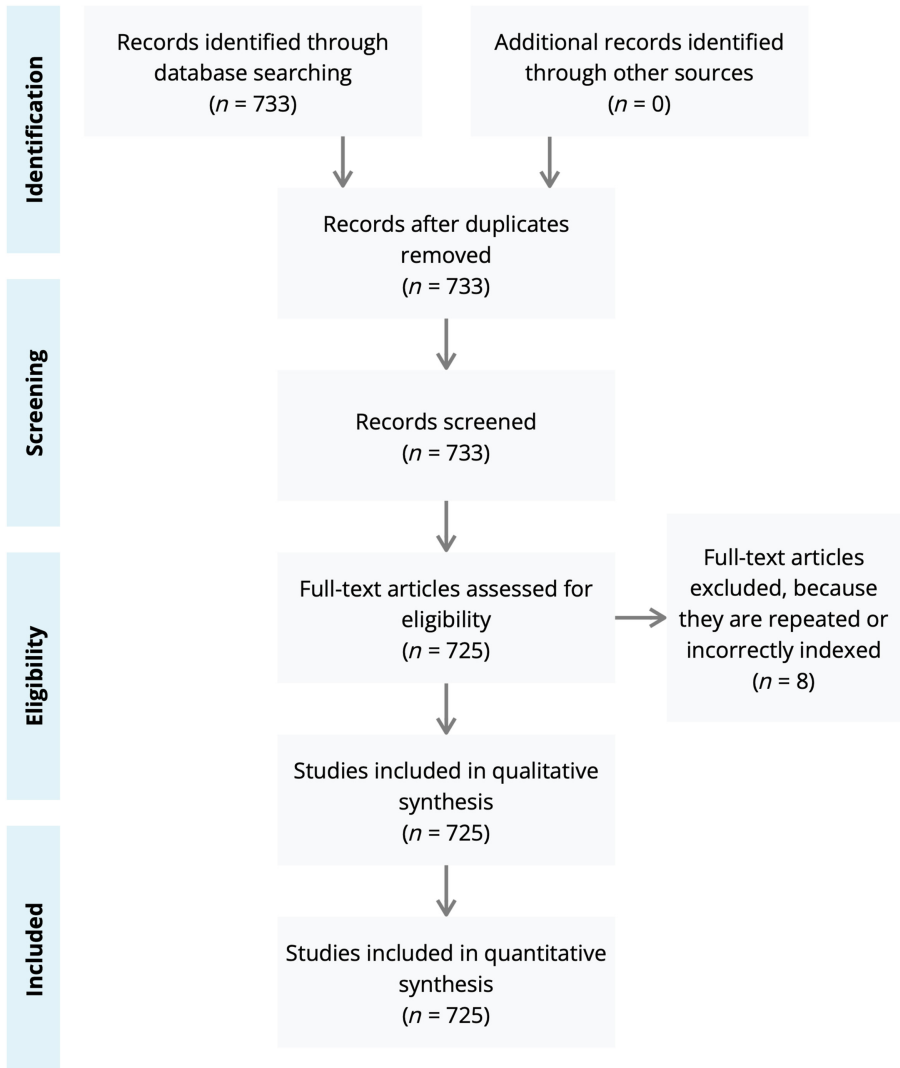
Figure 1.
PRISMA flow diagram

cross-cutting and underdeveloped themes. In this procedure, the principles of density or internal strength and the centrality or degree of connection established in the networks were considered (Moral-Muñoz et al., 2020);

(9) Determination: Publications were cataloged in two time periods (P1 = 2000–2010; P2 = 2011–2022). The strength of the association between these two periods was measured by the number of keywords or topics in common. However, for the authors' analysis, only one period (PX = 2000–2022) was established;

(10) Performance: In this last step, various production indicators were connected with their respective inclusion criteria (see Table 1).

4. Results

4.1 Scientific performance and production

Studies related to mobile game-based learning in CH education were mainly written in English. Although Spanish and Italian appear on the list, their production volume is very small compared to English (see Table 2).

The main subject area that collects studies related to mobile game-based learning in CH education is Social Sciences, followed by Arts and Humanities (see Table 3).

The two main types of documents used by the scientific community to show its results are the conference paper and the research article (see Table 4).

The institution with the highest volume of production in the study on mobile game-based learning in CH education is the National Research Council of Italy. The rest of institutions had lower production volumes (see Table 5).

Configuration	Values
Analysis unit	Keywords authors, keywords Scopus
Frequency threshold	Keywords: P1 = (2), P2 = (2)
Network type	Authors: PX = (2)
Co-occurrence union value threshold	Co-occurrence
	Keywords: P1 = (2), P2 = (1)
	Authors: PX = (2)
Normalization measure	Equivalence index: $eij = cij2/Root\ (ci\text{-}cj)$
Clustering algorithm	Maximum size: 9; minimum size: 3
Evolutionary measure	Jaccard index
Overlapping measure	Inclusion rate

Table 1.
Production indicators
and inclusion criteria

Language	n
English	707
Spanish	14
Italian	7

Table 2.
Scientific
language used

Subject area	n
Social Sciences	493
Arts and Humanities	285
Environmental Science	102

Table 3.
Subject areas

Type of document	n
Conference paper	351
Article	291
Book chapter	36
Review	21
Conference review	18
Editorial	3
Book	2

Table 4.
Type of document

The academic production of the authors is fairly even. Of all authors who investigate mobile game-based learning in CH education, two stand out (Bruno, F. and Carrozzino, M.), with 8 productions each (see Table 6).

The sources of provenance for research on mobile game-based learning in CH education are mainly found in research journals. Of all journals, the one that has generated the highest volume of production to date is the Journal on Computing and Cultural Heritage, with a total of 38 manuscripts. The rest of journals present a lower volume of production (see Table 7).

The country with the most scientific production on mobile game-based learning in CH education is Italy. The rest of countries have produced far fewer (see Table 8).

The volume of citations of the most cited publications related to mobile game-based learning in CH education is noteworthy. The publications were published in the period of 2010–2018, and many of them have more than 200 citations. The study by Mortara *et al.* (2014) has the most citations with 283 (see Table 9).

In the last years, several commercial video games have been the focus of interest by several cultural and educational institutions, and have been linked with different degrees of integration on projects with CH educational purposes. Table 10 shows a list of commercial video games that have been used in CH education, ordered by its published entries in Scopus.

4.2 Structural and thematic development

In the present work, two time periods (P1 = 2000–2010; P2 = 2011–2022) were taken as reference. The keyword continuity analysis shows the volume of keywords collected in each

Institution	*n*
National Research Council of Italy	33
University of Calabria	15
Polytechnic University of Milan	15
Marche Polytechnic University	13
University of Naples Federico II	12
National Technical University of Athens	11
University of the Aegean	11
University of Palermo	11
Carleton University	10
Bulgarian Academy of Sciences	10

Table 5.
Most prolific institutions

Author	*n*
Bruno, F.	8
Carrozzino, M.	8

Table 6.
Most prolific authors

Source of provenance	*n*
Journal on Computing and Cultural Heritage	38
Journal of Cultural Heritage	25
Sustainability	20
Digital Presentation and Preservation of Cultural and Scientific Heritage	15
Digital Applications in Archaeology and Cultural Heritage	13
Heritage	13

Table 7.
Source of provenance

interval. In the period of 2000–2010, there are a total of 81 keywords, while in the period of 2011–2022, there are a total of 644 keywords. This is expected, given that the volume of production from one interval to another differs. The up arrow shows the number of keywords that are not used in the period of 2011–2022. The down arrow shows new keywords being introduced into the field of mobile game-based learning in CH education. Based on this data, plus the volume of keywords for each period, the percentage of keyword matching between both periods is established. Currently, the match percentage is 6% (represented by the horizontal arrow). This indicates that the field of study on mobile game-based learning in CH education has established new research trends and topics (see Figure 2).

The analysis of academic performance shows data on bibliometric indicators generated after applying the co-word analysis. In the period of 2000–2010, the topics with the highest bibliometric indicators are "virtual reality" and "cultural heritage". In the period of 2011–2022, the topics with the highest bibliometric indicators are "cultural heritage", "virtual reality", "augmented reality", "serious games", and "museums" (see Table 11).

Country	n
Italy	225
Greece	67
Spain	59
United States	55
United Kingdom	47

Table 8.
Most prolific countries

Reference	Citations
Mortara *et al.*, 2014	283
Bekele *et al.*, 2018	275
Carrozzino and Bergamasco, 2010	266
Bruno *et al.*, 2010	242

Table 9.
Most cited publications

Video game	n
Minecraft	334
Assassin's Creed	59
Civilization	22
The Witcher	16
Red Dead Redemption	13
Tomb Raider	11
Uncharted	7
Age of Empires	6
This War of Mine	5
Bury Me, My Love	4
Never Alone	4
Valiant Hearts: The Great War	4
1979 Revolution Black Friday	2
Monument Valley	2
Broken Sword	1
My Memory of Us	1
Through the Darkest of Times	1
Where the Water Tastes Like Wine	1

Table 10.
List of commercial video games based on their use in CH education

The strategic diagrams show data on the importance of each of the themes in the established periods. The diagrams are categorized according to the h-index. The Cartesian axis shows the centrality of a theme (represented by the X axis), which indicates the internal relationship existing in each of the themes, and the density of a theme (represented by the Y axis), which indicates the external relationship between the themes resulting from the study (see Figures 3 and 4).
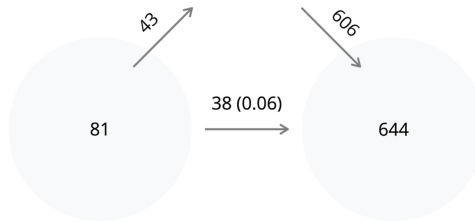

Figure 2.
Keyword continuity between periods

| Interval 2000–2010 | | | |
Topic	Works	h-index	Citations
Virtual reality	69	15	1,200
Cultural heritage	56	12	412
Museums	7	4	292
Augmented reality	5	1	219
Education	3	1	3
Education computing	2	1	2
Exhibitions	2	1	4
Immersion	2	2	268
Interactive	2	2	6
Virtual museum	2	1	242

| Interval 2011–2022 | | | |
Topic	Works	h-index	Citations
Cultural heritage	354	29	3,175
Virtual reality	281	23	2,499
Augmented reality	199	23	2,079
Serious games	62	12	885
Museums	36	12	492
E-Learning	22	5	144
Education	20	5	190
Exhibitions	20	5	415
Gamification	17	3	73
Mixed reality	15	5	330
Learning	13	4	119
Immersive	12	3	37
Students	12	4	96
Interactivity	11	5	76
Game-based learning	10	6	552
Storytelling	10	3	92
Sustainable development	10	5	69
Virtual tour	10	6	105
Video games	9	4	61
Mobile devices	8	5	120

Table 11.
Thematic performance of mobile game-based learning in the field of CH education

density

Museums
4

Education
1

Cultural Heritage
12

Education
Computing
1

Exhibitions
1

Virtual Museum
1

centrality
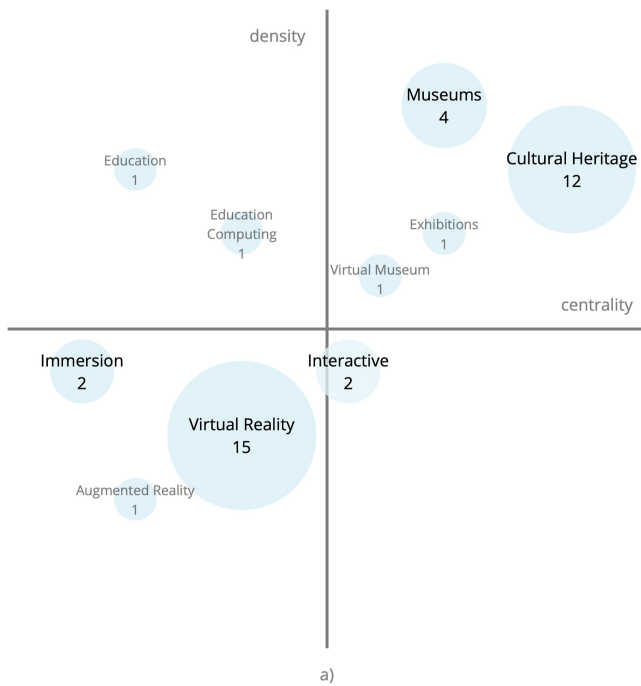
Immersion
2

Interactive
2

Virtual Reality
15

Augmented Reality
1

a)

Figure 3.
Strategic diagram by
h-index of mobile
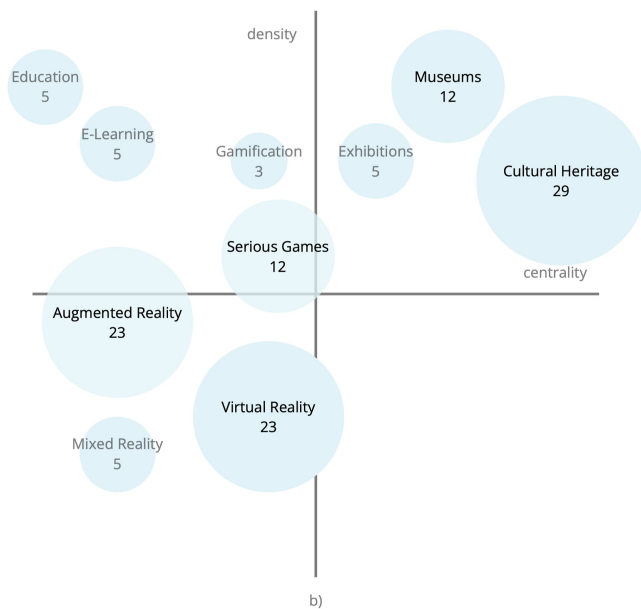game-based learning in
the field of CH
education. Interval
2000–2010

density

Education
5

Museums
12

E-Learning
5

Gamification
3

Exhibitions
5

Cultural Heritage
29

Serious Games
12

centrality

Augmented Reality
23

Virtual Reality
23

Mixed Reality
5

b)

Figure 4.
Strategic diagram by
h-index of mobile
game-based learning in
the field of CH
education. Interval
2011–2022

4.3 Thematic evolution

The evolution of the themes, divided by time periods, shows the relationship between the themes of different intervals. The conceptual relationships (represented with a continuous line) show that there is a relationship based on themes. The non-conceptual relationships (represented by a dashed line) show that there is a relationship based on keywords. The thickness of the line indicates the number of matching themes or keywords.

The data presented in Figure 5 indicates that there is no conceptual gap, since there are themes that are repeated in both time periods, such as "cultural heritage", "virtual reality" or "augmented reality". This does not indicate, however, that these are the only lines of research established and relevant in the studies of mobile game-based learning in CH education. Other relevant lines of research are observed, such as "serious games", "e-learning" or "gamification". In these cases, there is a trend of research oriented to the gamification of CH learning activities. As shown, the number of conceptual relationships is greater than the
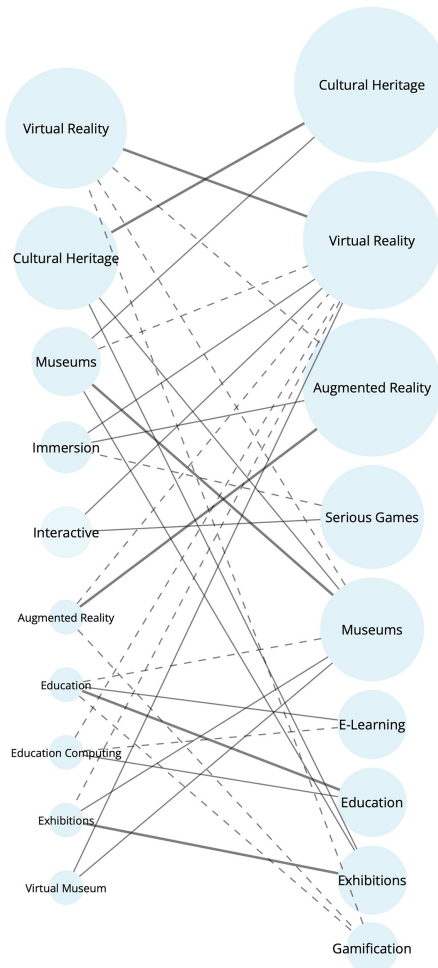
Figure 5.
Thematic evolution by h-index of mobile game-based learning in the field of CH education

number of non-conceptual relationships. This indicates that the investigations are interrelated.

4.4 Authors with the highest relevance index
In relation to the authors, Bruno, F. and Carrozzino, M. are considered the main authors in the study of mobile game-based learning in CH education. Additionally, due to their location in the diagram, Mortara, M. and Bekele, M. K. should be taken into consideration. They will probably become relevant authors in the near future in this field of study (see Figure 6).

5. Discussion
This study has revealed the state of the research carried out on mobile game-based learning in the field of CH education. This has made it possible to establish new knowledge bases for future research, as this study acquires a component of sustenance to start new directions or paths through which this topic is currently running.

In relation to the academic performance of the publications on mobile game-based learning in CH education, the results extracted from the study have shown that the publications are mainly written in English. This is somewhat understandable, given that Scopus focuses more on English-language journals. The main Scopus subject area where these studies are collected is Social Sciences, followed by Arts and Humanities. The main formats where these studies are presented are the conference paper and the research article. This indicates that, although this field of study is in its initial phase, the investigations are of great relevance and interest. The most prolific institution is the National Research Council of Italy, which is today a benchmark in this field of study. The most prolific country is Italy, and the journal with the greatest capacity on the topic under analysis is the Journal on Computing and Cultural Heritage.
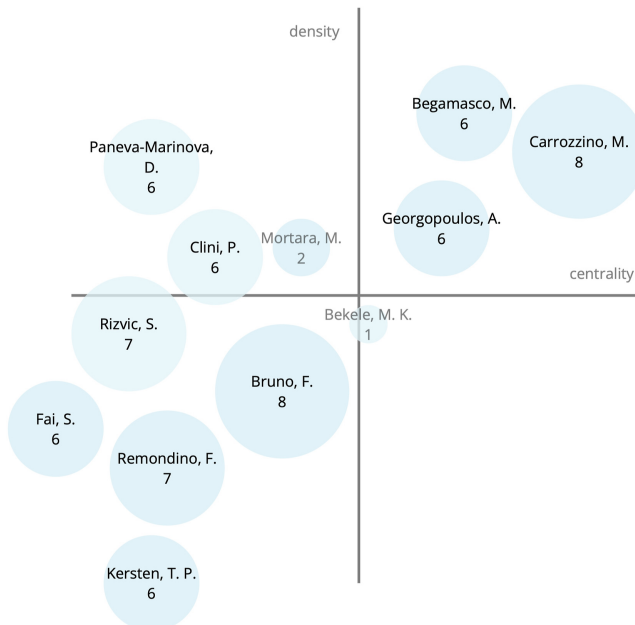

Figure 6.
Strategic diagram of authors of all production on mobile game-based learning in the field of CH education

Regarding the most prominent authors in research on mobile game-based learning in CH education, Bruno, F. and Carrozzino, M. stand as researchers with the highest volume of production. Georgopoulos, A. is presented as the most relevant author due to his strategic position in the diagram, given his values achieved in the analyzed indices. Mortara, M. and Bekele, M. K., who may become motor authors in the near future, should also be kept in mind as reflected by their position in the diagram. The authors with the highest number of citations are Mortara *et al.* in their article published in 2014 in the Journal of Cultural Heritage.

With respect to the structural and thematic development of the publications on mobile game-based learning in CH education, the percentage of coincidence of keywords is low. This indicates that this field of study has established new research trends and topics. Of the hottest topics in this field of study, based on their bibliometric values, "virtual reality" and "cultural heritage" stand out in the period of 2000–2010, and "cultural heritage", "virtual reality", "augmented reality", "serious games", and "museums", stand out in the period of 2011–2022. In both intervals, the common denominators are "virtual reality" and "cultural heritage". The fact that in the period of 2000–2010 it will be "virtual reality" is mainly due to the high volume produced in the field of Computer Science. This field of knowledge has more journals indexed in Scopus than other fields of study, such as Social Sciences or Arts and Humanities.

Regarding the motor themes of the period of 2000–2010, these focus on "virtual reality", "3d modeling", "3d reconstruction", "museums", and "education computing". In a more concrete way, motor themes are mainly focused on the use of game-based technologies in the virtual reconstruction of different CH contexts, in non-formal education contexts, such as museums and other heritage centers, and in Computer Science.

On the other hand, the motor themes of the period of 2011–2022 are focused on "virtual reality", "augmented reality", "serious games", "museums", "e-learning", "education", "gamification", "game-based learning", "video games", and "mobile devices". More specifically, research focuses on both virtual and augmented reality technologies (mobile apps on both smartphones and tablets), on the pedagogical models (gamification, game-based learning) used by teachers for the training of students, the acceptance of games in general across audiences, the use of serious and commercial games, and on interventions oriented to heritage preservation and education.

One aspect to take into consideration is the presence of themes such as "virtual reality", "augmented reality", "serious games", "e-learning", "gamification", "game-based learning", "storytelling", "sustainable development", "video games", and "mobile devices". Based on the results, these will probably be the driving themes in the near future. This is somewhat understandable due to the organizational and educational management problems that the integration of mobile game-based learning into CH learning strategies is generating, as well as the great concerns that it is causing. Some topics, such as "virtual reality", "augmented reality" or "museums", are repeated in both intervals but this does not indicate that they are the only lines of research in studies on mobile game-based learning in CH education. In this sense, other new and relevant lines of research are observed, such as "serious games", "e-learning", "gamification", or "game-based learning". All this indicates that there is a trend of research oriented to the educational use of games: especially studies on how these technologies affect motivation and involvement, cooperation, creativity, and problem solving (Dalisay *et al.*, 2014); studies on the different possibilities of use, specifically how they promote CH learning (Mortara *et al.*, 2014), how to practice and integrate what has been learned (García-Fernández and Medeiros, 2019), how to problematize a situation (Petrucco and Agostini, 2016), how to evaluate what has been learned (Rubino *et al.*, 2015), what causes triggering situations (Tzima *et al.*, 2019); studies that contribute to the systematization of game-based learning principles for CH preservation and education (Bellotti *et al.*, 2012); and studies on the design of disciplinary and interdisciplinary CH learning situations that are transferable to different educational levels, contexts, and training situations (Andreoli *et al.*, 2018).

6. Conclusion

It can be concluded that research into mobile game-based learning in CH education is in its initial process. Current research is mainly oriented to pedagogical methods, especially e-learning, game-based learning or gamification, although they are not the only trends in this field of study. Research is also focusing on virtual reality, augmented reality, and mixed reality. In the near future, research on mobile game-based learning in CH education will probably be oriented to the application of games and other digital tools to train students of various educational stages.

A series of limitations were found in this work. One of them is the purification of the reported Scopus data, in which repeated publications were found, as well as other studies that were not related to the object of study analyzed, i.e. they had been incorrectly indexed. Another limitation focuses on the criteria established by the authors to present the most relevant findings. Therefore, the results of this work should be interpreted with caution.

For future lines of study, we intend to initiate two paths under different methodological approaches, with video games and cultural heritage as the link between the various investigations. On the one hand, we intend to carry out a framework for cultural heritage engagement through video games. On the other hand, we intend to compile video games that represent cultural heritage. Those video games will be analyzed by the application of the framework and statistically compared.

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Corresponding author
Daniel Camuñas-García can be contacted at: danielcg@ugr.es