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Digital Resources for Teaching and Learning History: A Research Review

Recursos digitales para la enseñanza y aprendizaje de Historia: una revisión de la investigación

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Resumen

Los procesos de enseñanza y aprendizaje de la Historia están mediatizados por los recursos educativos que los profesores deciden utilizar en su asignatura. Resulta interesante analizar el uso e impacto de los recursos educativos digitales en estos procesos. Este trabajo consiste, por un lado, en un estudio bibliométrico que cuantifica la producción científica de la última década mediante el análisis de 116 documentos recuperados de la base de datos Scopus y, por otro, en un análisis de contenido que profundiza en la evidencia científica. Los resultados confirman que nos encontramos ante un campo de investigación emergente en los últimos años y que la temática está muy extendida, siendo estudiada por diferentes países e instituciones. Por otro lado, dado el número de documentos analizados, concluimos que son necesarios más esfuerzos en este campo, especialmente en la evaluación de los recursos digitales utilizados en la enseñanza/aprendizaje de la Historia.

Palabras clave

Historia, Enseñanza de la Historia, Recursos educacionales, Digitalización.

Abstract

The teaching and learning processes of History are mediated by the educational resources that teachers decide to use in their subject. It is interesting to analyze the use and impact of digital educational resources in these processes. This work consists, on the one hand, of a bibliometric study that quantifies the scientific production of the last decade through the analysis of 116 documents retrieved from the Scopus database and, on the other hand, of a content analysis that delves into the scientific evidence. The results confirm that we are facing an emerging field of research in recent years and that the subject is widespread, being studied by different countries and institutions. On the other hand, given the number of documents analyzed, we conclude that more efforts are needed in this field, especially in the evaluation of digital resources used in the teaching/learning of history.

Keywords

History, Teaching history, Educational resources, Digitization.

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1. Introduction

In recent years, there have been many reflections on the processes of digitization of teaching and on the role of the different educational actors in this process. In this sense, several studies carried out in recent years have shown the contribution of digital resources to the improvement and possibilities of teaching-learning processes in different fields of knowledge (Aurel-Railean, 2017; López-Gómez & Rodríguez-Rodríguez, 2021; Rodriguez-Regueira y Rodríguez-Rodríguez, 2023). The Escuel@ Digit@l[1] and Infanci@ Digital[2] projects, which have been developed in the Spanish context for more than a decade, and which have focused on the study of the characteristics and use of different types of digital materials at the pre-school and primary levels, have, in a very special way and taking into account the specificity of the subject, shed light on the possibilities and potential applications of digital resources in teaching practice, showing, as stated in the conclusions of these studies, that a correct use of these resources can contribute enormously to improving the quality of educational practice in different areas. However, in order to use them effectively in the classroom, it is necessary that approaches to working with digital resources include the development of a project structure that sets objectives and clearly defined deadlines and respects the development of boys and girls. Similarly, it is important to avoid falling into a transmissive approach to the use of technology and not taking advantage of a truly digital learning environment that allows for less static interactions. There is a need for school actions that guarantee real media literacy and facilitate a more critical and informed use of these media (Rego-Agraso et al., 2023). It is also necessary that these proposals be accompanied by a proactive institutional attitude towards the use of ICTs in schools, aiming at the best possible integration (Santana y Sanabria, 2015). There is also widespread evidence that, in order to achieve appropriate processes for the use and integration of digital resources in the classroom, it is necessary to provide adequate training for teachers (Marín-Suelves et al., 2021) and to address digital competence adequately in university curricula (Peirats-Chacon et al., 2018).

2. Theoretical framework

Digital technology can play a mediating role, helping to establish links with reality. In some fields, such as social sciences and history, this function is particularly important, as they require resources that help to contextualize teaching and make learning processes meaningful and adapted to school reality. It should not be forgotten that one of the criticisms often made in the literature in relation to history teaching processes is that students will only use technologies if they are able to use them in the context of their own learning (Mills-Kelly, 2013).

For this to happen, Mills-Kelly (2013) suggests that teachers need to work on students' information literacy. Only then will digital history learning be possible. Similarly, as numerous studies have shown, students do not feel involved in the way history is taught, for example in relation to cultural heritage, and they usually demand more active experiences (Santacana-Mestre et al., 2016). Alike, in many cases and depending on the type of applications and digital resources, we find studies that demonstrate the limited educational potential of some applications that are mainly recreational and entertaining in nature (Martinez et al., 2018). In the same way, some studies on digital resources and pedagogical approaches in initial teacher training in history show similar shortcomings in digital resources

[1] https://edullab.webs.ull.es/wordpress/proyectos-de-investigacion/escuel-digitl/
[2] http://stellae.usc.es/infanciadigital/

(Gómez-Carrasco et al., 2022). On the other hand, it is important not to lose sight of a certain scholastic character that curricular models have long offered us in relation to the teaching of history in the processes of educational reform (Prats, 2000). Identically, the high dependence of teachers on textbooks – many of them digital, but with a markedly traditional character in their approach (Meseguer et al., 2022; Rodríguez et al., 2023) – does not favour the development of truly meaningful learning processes at some levels of education, such as primary education. In the specific case of history teachers in Spain, the study (Martinez et al., 2009) identified the importance of textbooks as mediators of learning, although not as the only source of teaching and learning processes in history. For example, the researchers found that seven out of ten history teachers who participated in the study used textbooks in their teaching practice. Among the ways in which they used textbooks was what the authors described as the "classical" way, which focused on reading, dictation and carrying out didactic activities. As defended by Parada-Gañete et al. (2024), the teaching of history facilitates citizen education for the construction of a democratic society (Álvarez-Sepúlveda, 2023), favors critical thinking and understanding of the contemporary world (Gross, 1992). But history teachers face challenges in the teaching/learning processes to bring students closer to these contents. Methodologies and resources have experienced significant changes in recent times, even more so after the incorporation of technologies in classrooms (Carrasco, 2023). Methodologies such as functional learning, problem-based learning and cooperative learning, and the use of emerging technologies, such as Artificial Intelligence, have begun to be used as a tool for teaching and learning History (Incio-Flores et al., 2022; UNESCO, 2023), which enables transformation and new opportunities in education, optimizing the learning experience of students (Bonam et al., 2020; Barrios et al., 2021). Also, as a result of this research, they noted the emergence of ICTs as a resource, albeit to a lesser extent, in the teaching of history at baccalaureate level. In a more recent study (Sanchez-Garcia y Toledo-Morales, 2018) they noted the presence of ICTs in the teaching of history, although some teachers felt uncertain about their training in the use of digital technologies. Through the use of questionnaires and interviews, the researchers found that students feel more motivated by the use of ICTs, but we cannot say that this leads to more meaningful learning. On the other hand, we need to be aware that the role of digital resources in the teaching and learning of history is also controversial in terms of its possibilities and functions, and that we also need to be aware of the potential problems that their use may entail. For example, in relation to the generation of applications, the work of Santacana-Mestre (2017) on future challenges presents a series of reflections and "concerns" that we cannot fail to take into account. Among the numerous and valuable contributions related to some digital technologies, this study of Santacana-Mestre (2017, p. 380) highlights the fact that "the deception of the past is easier than before...". For example, who has not seen ideal reconstructions of the Solomon's Temple, which led us to believe that the ancient kingdom of Israel was the world centre of art? Who can imagine that 5th century Athens was an ugly, smelly, dusty city based on some of today's virtual images? Who has not seen virtual images of Rome that look more like Washington than the Roman metropolis? (Santacana-Mestre, 2017).

3. Method

3.1. Object

The aim of this article is to present, in an organized and systematic way, the main studies that have been carried out on the role of digital resources in history teaching and learning processes to identify the main opportunities and difficulties that they currently present, as well as the main aspects that need to be addressed at the moment.

The objectives of this study were twofold: a) to quantify the scientific production of recent years, in relation to the object of study through indicators of productivity, collaboration, impact and dissemination, and b) to perform a content analysis of the selected articles in order to approach the reality and learn about the topics addressed and the main findings obtained in these works.

3.2. Procedure

In order to address the object of study, a mixed design approach was adopted, involving a content analysis and a bibliometric study. This approach allows an in-depth look at the state of the art of digital educational resources for teaching/learning history and cultural heritage in the last decade (2013-2023). The content is analysed and information is obtained through the quantification of the scientific production.

The Scopus database and the PRISMA method (Urrutia y Bonfil, 2010) were used to select the documents to be analysed. The process was divided into four phases (Figure 1).

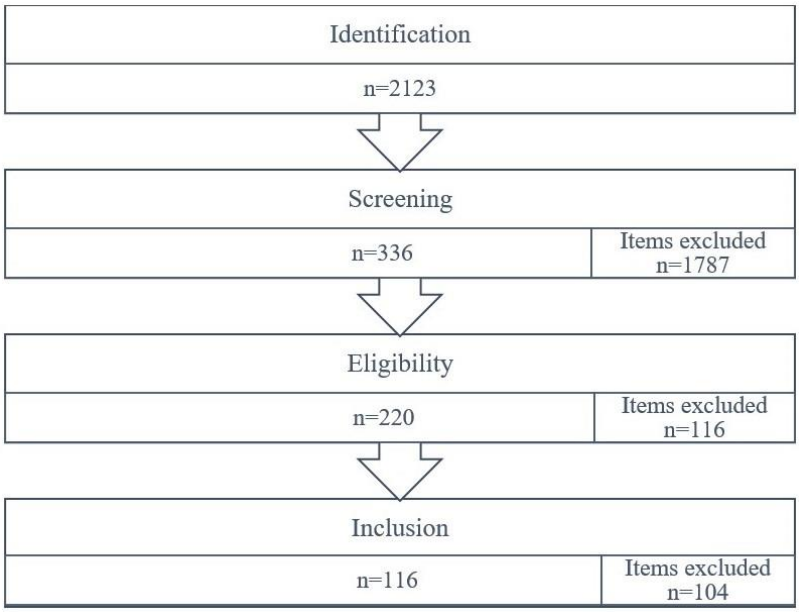

Figure 1. Flow chart. Source: our own elaboration

The first phase involved a search using the following combination of keywords and Boolean operators: resources OR materials AND technology OR digital AND teaching OR learning AND history OR "cultural heritage".

In the screening phase, the inclusion and exclusion criteria listed in Table 1 were applied.

Table 1

Inclusion and exclusion criteria

Criterion	Inclusion	Exclusion
Document type	Articles	Chapters, papers, theses, literature reviews.
Field	Social sciences	Others such as medicine, psychology, computer sciences...
Date	Last decade [2013-2023*] *first quarter of that year	Documents published before 2013

Source: our own elaboration.

The analysis of articles was considered due to open science policies that facilitate access to the full text, as opposed to book chapters or conferences.

In the eligibility phase, the full texts were read and a total of 116 academic articles published in the last decade on digital resources for history teaching/learning were finally included in the analysis.

Cohen's kappa calculation (Altman, 1991) was used to assess the degree of inter-coder agreement, which was very high with a value of 0,93.

The content analysis process was inductive, with categories emerging in the three-phase process: a) data reduction, b) descriptive analysis and, c) interpretation of the categories. Emergent categories were established as content analysis variables, based on the independent reading of the documents by three researchers. An ad hoc file was used for the content analysis, recording identification data such as authorship and date, subject, matter, objectives, results, and conclusions of each paper. Six categories were established, based on a previous analysis of the articles (Table 2).

Table 2

Categories

Categories	Description
1) Technologies and history teacher training.	1) initial and ongoing training.
2) Technologies and interdisciplinary history teaching.	2) broad approach with intersection of academic disciplines.
3) Technologies and cultural heritage.	3) heritage.
4) Technologies and resources for history teaching/learning.	4) didactic materials.
5) Technologies and online history teaching.	5) non-face-to-face teaching.
6) Technologies and history teaching/learning in schools.	6) face-to-face teaching.

The bibliometric analysis included indicators of productivity, collaboration, impact and dissemination.

The data were presented using VosViewer 1.6.11 (Van-Eck y Waltman, 2011) and Iramuteq (Ticona et al., 2022).

4. Results

The findings of this work were obtained through a content analysis and a bibliometric analysis. The content analysis focused on the use of technology in history teaching, based on six dimensions of analysis. The bibliometric study considered four indicators: productivity, collaboration, impact and dissemination.

Through the productivity indicator, the aim is to answer questions about how many articles have been published each year, from which countries they have been carried out or what language is chosen by researchers to disseminate their findings.

The collaboration indicator seeks to answer questions related to the degree of collaboration measured through the number of signatories of each article, as well as the networks that are generated.

With the impact, the number of citations that the works and journals accumulate are taken as a reference.

Finally, diffusion provides information about those journals in which the greatest number of articles on the same topic are concentrated.

4.1. Bibliometric analysis

We began our presentation of the results with the bibliometric analysis, seeking to answer the objective of quantify the scientific production of recent years, in relation to the object of study through indicators of productivity, collaboration, impact and dissemination. The productivity indicators taken into consideration were the number of publications per year, the number of articles per country and the language.

Firstly, Figure 2 shows the number of articles published over the last decade and the upward trend, with 2020 being the year in which the most documents were counted.

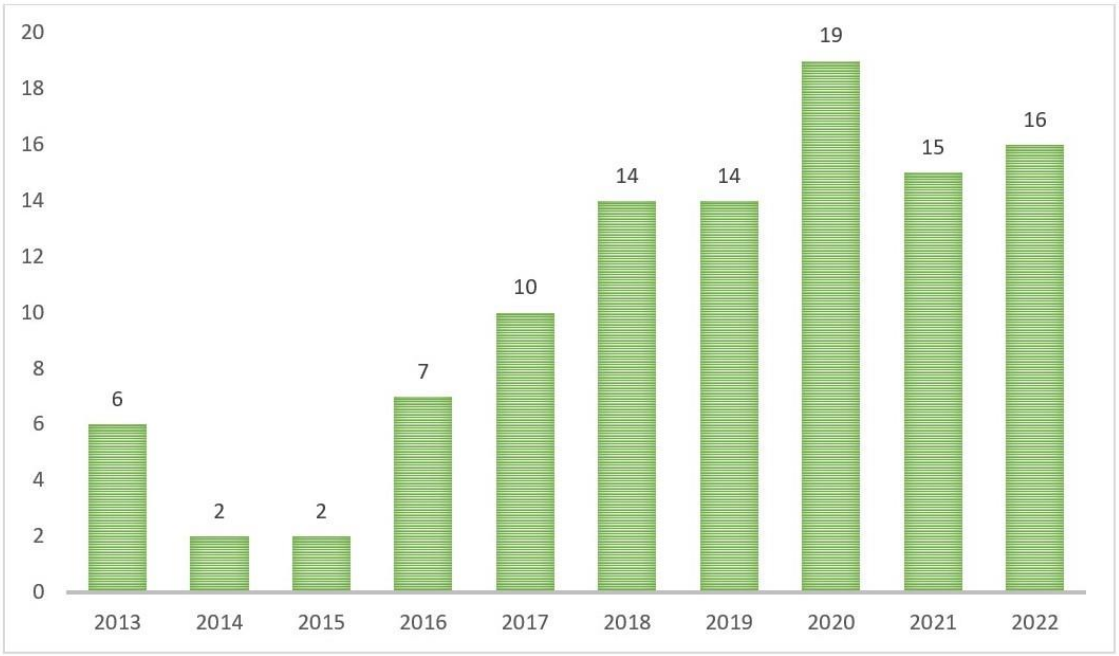

Figure 2. Production by year. Source: our own elaboration.

The data for 2023 are not shown in the figure above because the articles analysed belong to the first quarter of that year and the 11 documents included in the analysis are therefore not representative of the total data for 2023.

For the rest of the analyzes carried out, all the documents analyzed were considered (n=116).

In terms of the countries that have made great efforts to study the use of teaching resources and digital technologies in the teaching/learning of history, the USA is in first place, with Spain in second place in terms of the number of publications. Figure 3 shows the data for countries with five or more articles, but there are 39 countries in total, including countries as distant and diverse as New Zealand, Ukraine, China, Germany and Brazil, from five continents.

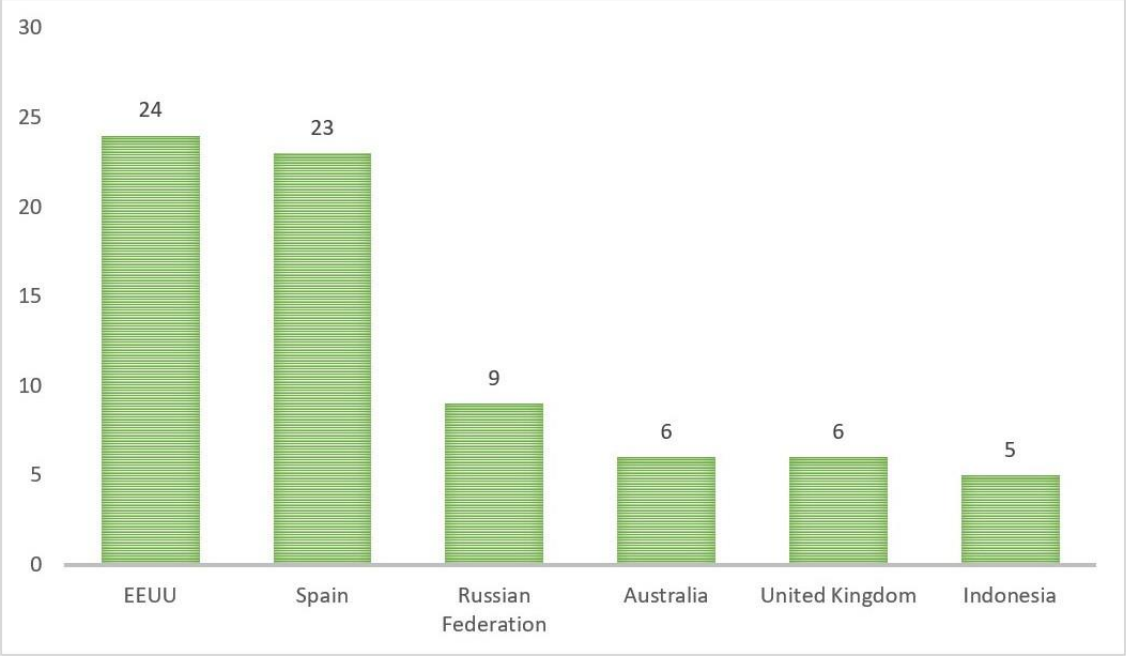

Figure 3. Production by location. Source: our own elaboration.

Finally, the language chosen by the researchers to disseminate their results was taken into account. A high percentage (73,3%), almost three quarters of the total number of articles, are written in English, and there are papers published in five other languages, as shown in Figure 4. Some examples are works such as Potočnik (2017), written in Slovenian, on modern methods of teaching history, or Şengül Bircan (2016) focusing on the effect of technology-mediated history teaching on students' performance and spatial perception, and Kasapoğlu Akyol (2016) on a webquest on cultural heritage, both articles written in Turkish.

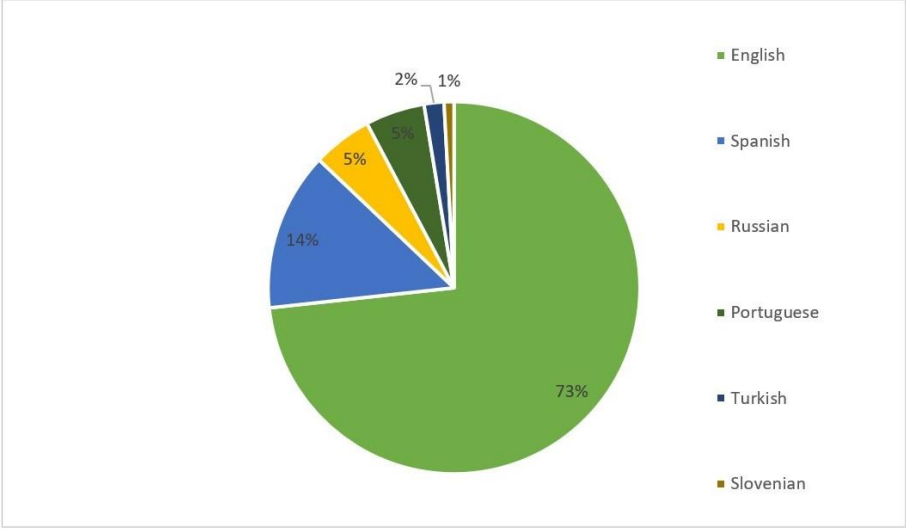

Figure 4. Production by language. Source: our own elaboration.

The bibliometric indicators of collaboration were based on the analysis of authorship and the networks generated.

On the one hand, the number of signatories per document was taken into account to analyse the degree of collaboration (Table 3). It was found that co-authored articles, i.e. those written by two or more authors, were the most common, and that about a quarter of the documents (25,9%) were written by a single author. On the other hand, the article by Tilak et al (2023) is the one with the highest number of authors, 11 in total, and analyses the implementation of an immersive cyber story as a learning tool in the zone of proximal development.

Table 3

Number of authors per paper

Authors	n	%
1	30	25,9
2	25	21,6
3	26	22,4
4	21	18,1
5 or more	14	12,1

Source: our own elaboration.

On the other hand, the collaborative networks created were analysed; they are numerous and powerful, the most common being shared authorship between researchers from the same institution (Gillate et al., 2023; Jadresin-Milic et al, 2022) or from neighbouring institutions in the same territory (Černý et al., 2023; García-Bustos et al., 2023). Figure 5 shows the international networks created around digital teaching resources in history.

Figure 5. International collaborative networks. Source: VOSviewer.

Examples of this collaboration are the works by Santamaría y Giraldo (2020), which focuses on the teaching of cultural heritage using the city and its resources as the axis and is signed by researchers from Colombia and Brazil; or Tausendfreund et al. (2019), signed by researchers from Germany and Russia, analysing the role of online archives for the study of Nazi Germany through interviews and an educational platform.

Thirdly, with regard to impact indicators, we analysed the classification of authorship, the number of cumulative citations and the most cited works, as well as the impact index of the sources, in this case scientific journals.

The total number of citations accumulated by each article was also taken into account, including self-citations. The frequency of citations is shown in the table below. As can be seen, a significant number of articles have no citations at all (38,8%) and more than half (51,7%) accumulate between one and ten citations.

Table 4

Number of citations

Citations	n	%
0	45	38.8
1-10	60	51.7
11-20	7	6
21-30	2	1.7
31-40	1	0.9
41-50	1	0.9
51-100	0	0

Source: our own elaboration.

Table 5 shows the key data for the most cited papers.

Table 5

Most cited articles

Author and date	Journal	Citations
Bozzelli et al. (2019)	Digital Applications in Archaeology and Cultural Heritage	45
Anderson et al. (2018)	Language and Education	35
Damala et al. (2016)	Mediterranean Archaeology and Archaeometry	30
Villena-Taranilla et al. (2022)	Interactive Learning Environments	22
Chin et al. (2018)	Interactive Learning Environments	20

Source: our own elaboration.

The following figure (Figure 6) shows articles with 20 or more citations.

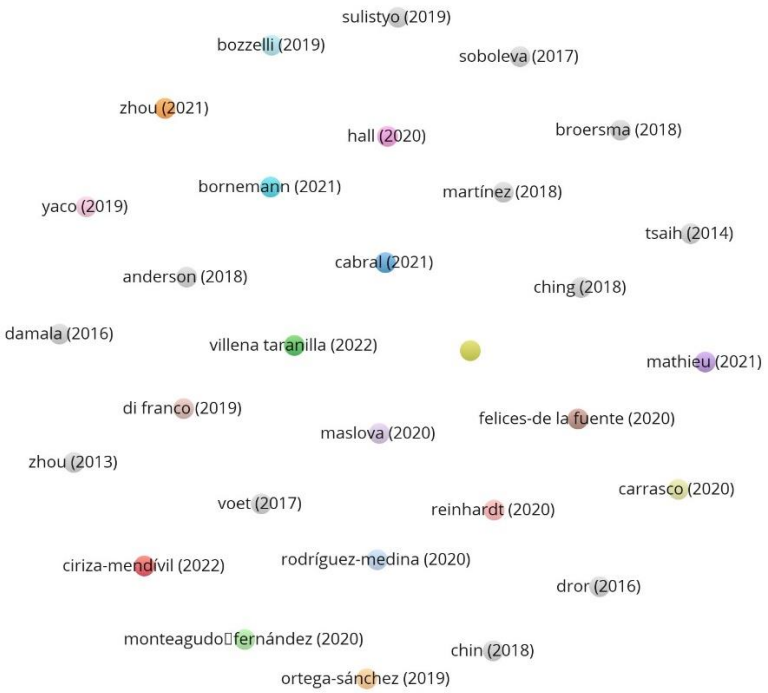

Figure 6. Most cited papers. Source: VOSviewer.

In addition, impact was assessed using data from the journals with the highest number of articles (Table 6). Only seven journals have two or more articles, and the journal with the most publications on digital teaching resources in history is Sustainability.

Table 6

Journal impact.

Journal	n	Cumulative citations	Impact index
Sustainability	6	17	2.83
International Journal of Emerging Technologies in Learning	5	40	8
Frontiers in Education	4	6	1.5
Education Sciences	2	6	3
Integration of Education	2	6	3
Interactive Learning Environments	2	42	21
Perspektivy Nauki I Obrazovania	2	1	0.5

Source: our own elaboration.

Finally, the dispersion was evaluated by measuring the accumulation of publications in the same journal, and a distribution in three zones was found, with a well differentiated core and two other equivalent zones. Therefore, the distribution does not conform to Bradford's law, as it does not meet the proportionality requirement.

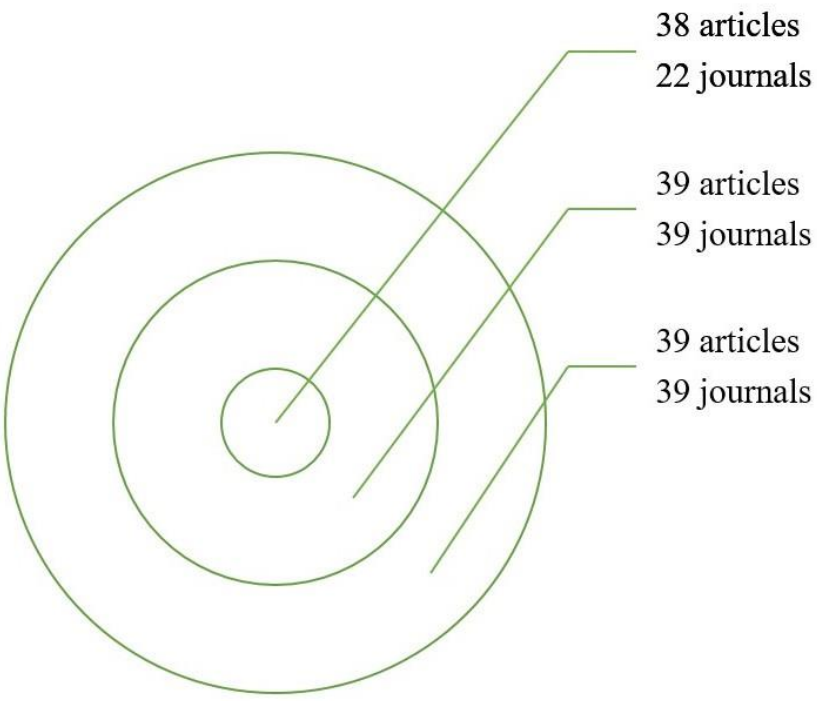

Figure 7. Dispersion zones. Source: our own elaboration.

4.2. Content analysis

In order to answer the second objective of the study, to perform a content analysis of the selected articles in order to approach the reality and learn about the topics addressed and the main findings obtained in these works, we present the analysis results.
The analysis was based on a total of 116 articles focusing on digital resources in history teaching/learning, which were divided into the following categories (Table 7):

Table 7

Articles by category of analysis

Category	Article	Percentage
Technologies and history teacher training	40	34,5%
Technologies and interdisciplinary history teaching	25	21,6%
Technologies and cultural heritage	24	20,7%
Technologies and resources for history teaching/learning	12	10,2%
Technologies and online history teaching	9	7,8%
Technologies and history teaching/learning in schools	6	5,2%

Source: our own elaboration.

Next, we go into detail in the presentation of the results obtained for each of the listed categories, describing what is studied in relation to each of them.
History teacher training seems to be one of the main areas of interest for researchers. This interest can be explained by the technological transformations resulting from the computer revolution, which have made the emergence of a digital culture possible (Castells, 2008). Moreover, regarding the new challenges for teachers, Prensky (2011) states that:

> One of the big differences between teaching in the 21st century and in the past is that in the past, things did not change very quickly. So teachers prepared their students for a world that was very similar to the one they were living in. But that situation has changed dramatically. The world our students will live and work in will be radically different from the one they, and we, live in now. The past must of course be respected, but our students will not live in it (p. 111).

These changes in the way we teach and learn justify, in a way, the efforts of researchers in recent years to understand the processes of teacher education. They also serve as a hypothesis for understanding the large number of articles on the subject found in the sample. Other emerging fields, such as digital humanities and digital history, help to explain the high number of interdisciplinary and heritage-related studies in the sample. Many of these focus on the use of digital methods in museums, archives, libraries and other learning spaces. Research on technologies and heritage was also well represented. In most cases, this research focuses on the use of digital methods in archives and museums.
Research on resources for history teaching/learning is more limited. It is somewhat worrying that there is still very little research on digital resources and materials for teaching history. We consider this to be one of the most important areas when it comes to educational technologies and the teaching/learning of history.
Second to last, we identify articles that deal with online teaching. Most of them deal with issues and methodologies aimed at improving the teaching/learning of history.

Nonetheless, the research analysed does not yet have a strong focus on the school and students directly, as we can see from the quantitative analysis of the data. Only 6 of the 116 articles found refer to the teaching/learning of history in school contexts.

The content analysis was based on an initial lexical search using the Iramuteq software. This software, developed by the University of Toulouse in France, can identify the most common terms in the articles by means of statistical and similarity analyses, allowing questions to be raised and research approaches to be explored.

4.2.1. Technologies and training of future history teachers

In this category, the most common concepts in the cluster are: teaching, history, teachers, students and learning. The co-occurrence graph (Figure 8) shows that within the teaching cluster, the theme of resources is linked to digital, content and knowledge is linked to history, and finally research also stands out. In the history cluster the most relevant terms are: design, technology, experience and teacher, the latter forming a new cluster with the terms exercise or training, implementation, future and problem. The terminology presented in the cluster of the student body is closely related to studying, education, educational, curricular, pedagogical, university and, especially, learning, which in turn forms another cluster. The analysis carried out on this category allows us to link the research concerned, on the one hand, with the study of the perceptions and opinions – mainly of university students, and therefore future teachers – on different educational models and digital resources for learning history content. Interesting works in this respect include (Toktamysov et al., 2023), which investigates the academic performance of students learning history using digital technologies such as Quizlet apps and 3D virtual reality glasses; and (Ciriza-Mendvil et al., 2022), which analyses an innovative educational proposal implemented using the TPACK (Technological, Pedagogical, and Content Knowledge) model with the participation of more than 200 university students studying to become primary school teachers (in the Spanish education system). On the other hand, it is possible to distinguish studies focusing on describing or proposing online courses with history content (Berliner y Hecla, 2022; Marinensi y Matera, 2013), from other documents presenting experiences and good practices in the classroom supported by digital resources (Ortega-Sanchez y Gomez-Trigueros, 2019; Puche, 2019).

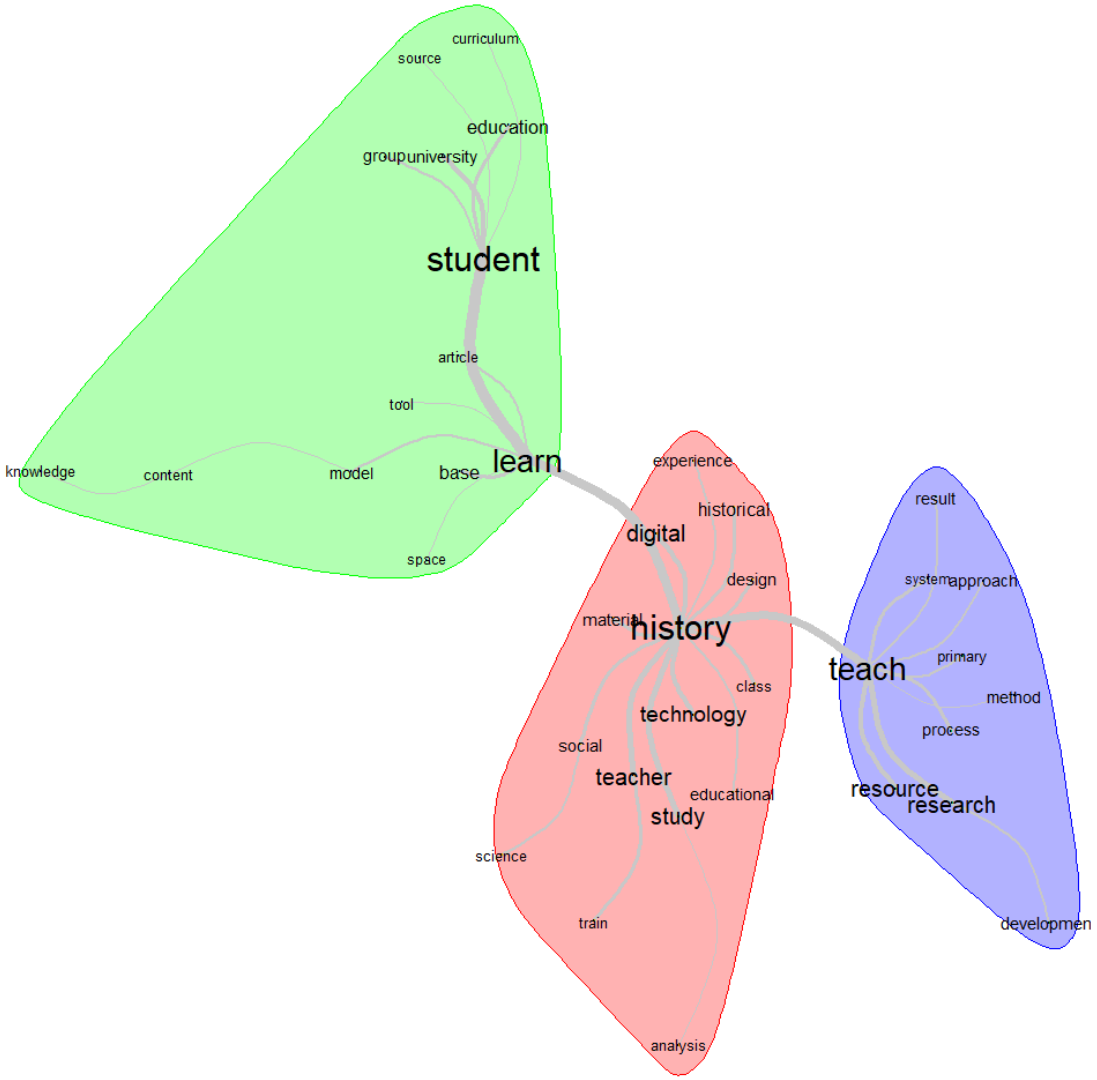

Figure 8. Co-occurrence map of the teacher training category. Source: Iramuteq.

4.2.2. Technologies and history teaching from and interdisciplinary perspective

This category groups together research that relates technologies and history teaching/learning from an interdisciplinary perspective. In the statistical analysis, the most frequent terms are learning, history, digital and student. The co-occurrence analysis revealed the following elements (Figure 9):

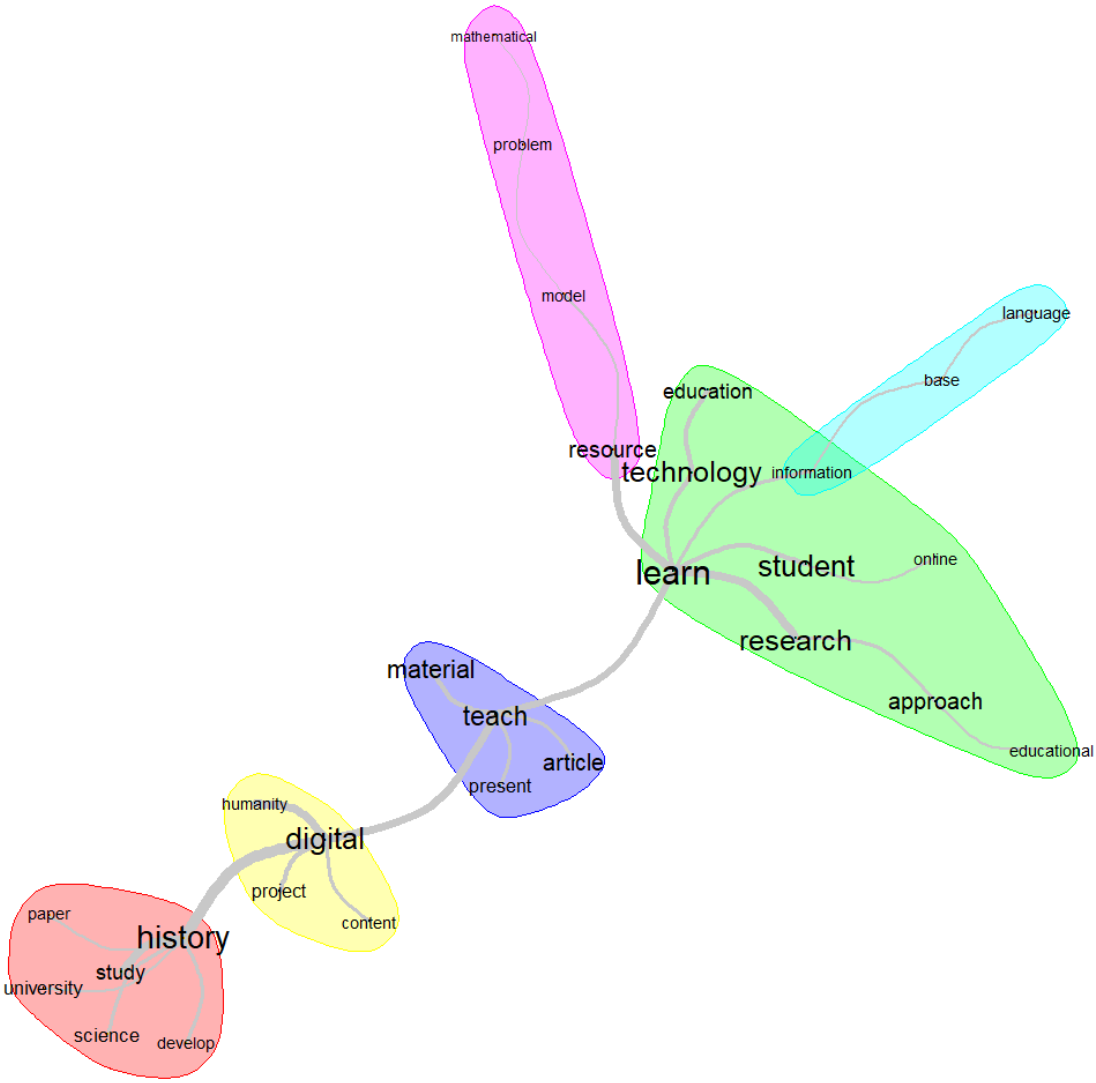

Figure 9. Co-occurrence map of the interdisciplinarity category. Source: Iramuteq.

The term teaching is connected with research, approaches, technologies and students. These terms, together with teaching, digital and history, form a central cluster. A more detailed analysis reveals the emergence of digital humanities in four articles and digital history in two. The subjects are quite diverse, including the history of mathematics (Thomsen et al., 2022), gastronomy (Huh et al., 2017), science (Klopfer y Aikenhead, 2022) and architecture (Marcinkowski, 2018).

Twelve articles have undergraduate students from a variety of disciplines as the subject of analysis. We consider the analysis of these articles to be key because they analyse the contributions of history to other fields of knowledge. The analysis did not allow us to identify the exact methods and approaches of each article. Those that present them explicitly refer to digital data and the construction of databases, as in Bornemann et al (2021), Romero-Lopez (2018) and Davis et al (2017).

The results are generally presented as digital experiences and practices related to vocational training in different fields of knowledge. Formal education in schools is only the subject of historical studies such as Dias-Trindade et al (2021) and Bin-Baba et al (2018).

4.2.3 Technologies and cultural heritage

With regard to the category of technologies and cultural heritage, it was possible to identify the recurrence of concepts such as: heritage, cultural and learn. The co-occurrence map (Figure 10) allows us to see the connections between these terms and other elements in the research analysed:

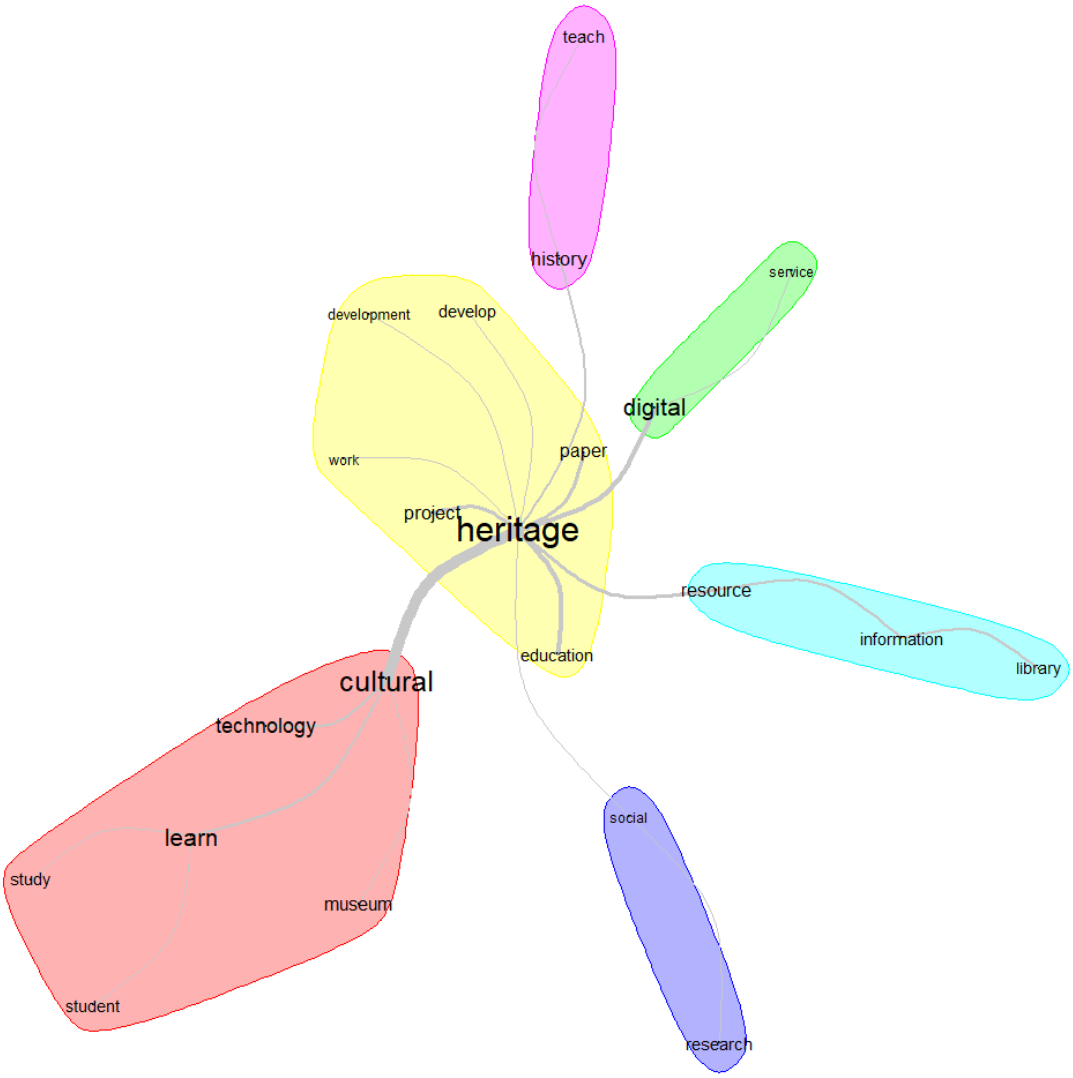

Figure 10. Co-occurrence map of the technology and cultural heritage category. Source: Iramuteq.

Around the concept of heritage, we observe a concern with the preservation, construction and promotion of historical knowledge. In the digital sphere, we see the centrality of archives, collections and public services as opportunities to improve engagement with history. In the cultural sphere, the main terms are experience, practice and education, with a strong focus on museums. In addition, with a high frequency (although lower than the previous terms), we find learning, technologies and resources.

The analysis allows us to approach the central themes of the studies analysed: heritage, based in most of the studies on experiences in public spaces such as museums, archives and libraries. These experiences are characterised by a concern with material cultural heritage, most of them without very explicit research methods. Some works that make their methods explicit (Wright et al., 2023) use participant observation and qualitative interviews.

Jadresin-Milic et al (2022) use a case study and a questionnaire. Markova (2019) also mentions the use of literature review as a method.

There is no evidence of studies analysing the relationships between the processes of teaching and learning history from the students' point of view, and more attention seems to be paid to broader issues related to education for wider audiences such as children and their families (Hao, 2023), museum visitors (Baker et al., 2021) and general web users (Bozzelli et al., 2019).

Some research focuses on students of architecture and art. The results are always described as limited and in need of further research or literature.

Despite the appearance of the term students in the figure, they are not the informants in the analyses and no effort is made in the cultural heritage literature to analyse their role in the learning process.

4.2.4. Technologies and resources for history teaching/learning

In the centre of Figure 11, the terms history, book, learning, digital, development and develop are closely clustered. Around this core flow three groups led mainly by the terms process and educational (group 1), study and student (group 2, which in turn leads to another subgroup around the term game), and material (group 3, which leads to the area of teaching, technology, textbook and school). Although the research in category 4 focuses more on the platforms that host digital learning materials, such as social networks, virtual worlds, etc., in this category the focus is mainly on concrete and specific resources, on digital learning objects, among which textbooks stand out as the main protagonist. In this sense, it is interesting to cite the contribution by Lucca (2022) on the geopolitics behind textbooks, due to its critical and analytical content. The work by Martinez y Rubio (2018) analyses the research carried out on textbooks and its conclusions suggest that we need further work on these studies, highlighting the fact that the gradual incorporation of digital textbooks in educational centres has not been accompanied by sufficient analytical research. Continuing with the topic of digital textbooks, we observe a strong interest in this field of study in Indonesia, where Saripudin et al (2022) analyse students' perceptions of an interactive e-book for dealing with content related to the local history of a province in that country; and Nafi'ah y Mashuri-Wijaya (2019) focuses on the development of a digital book to be used in the teaching and learning process within the Department of History at Malang State University.

In this category, there is also interest in video or digital games for museum education (Beavis et al., 2021), as an object of analysis to improve the efficiency of the educational process (Soboleva et al., 2017), or as a medium for speculative activism (Cortez y Lizárraga, 2022).

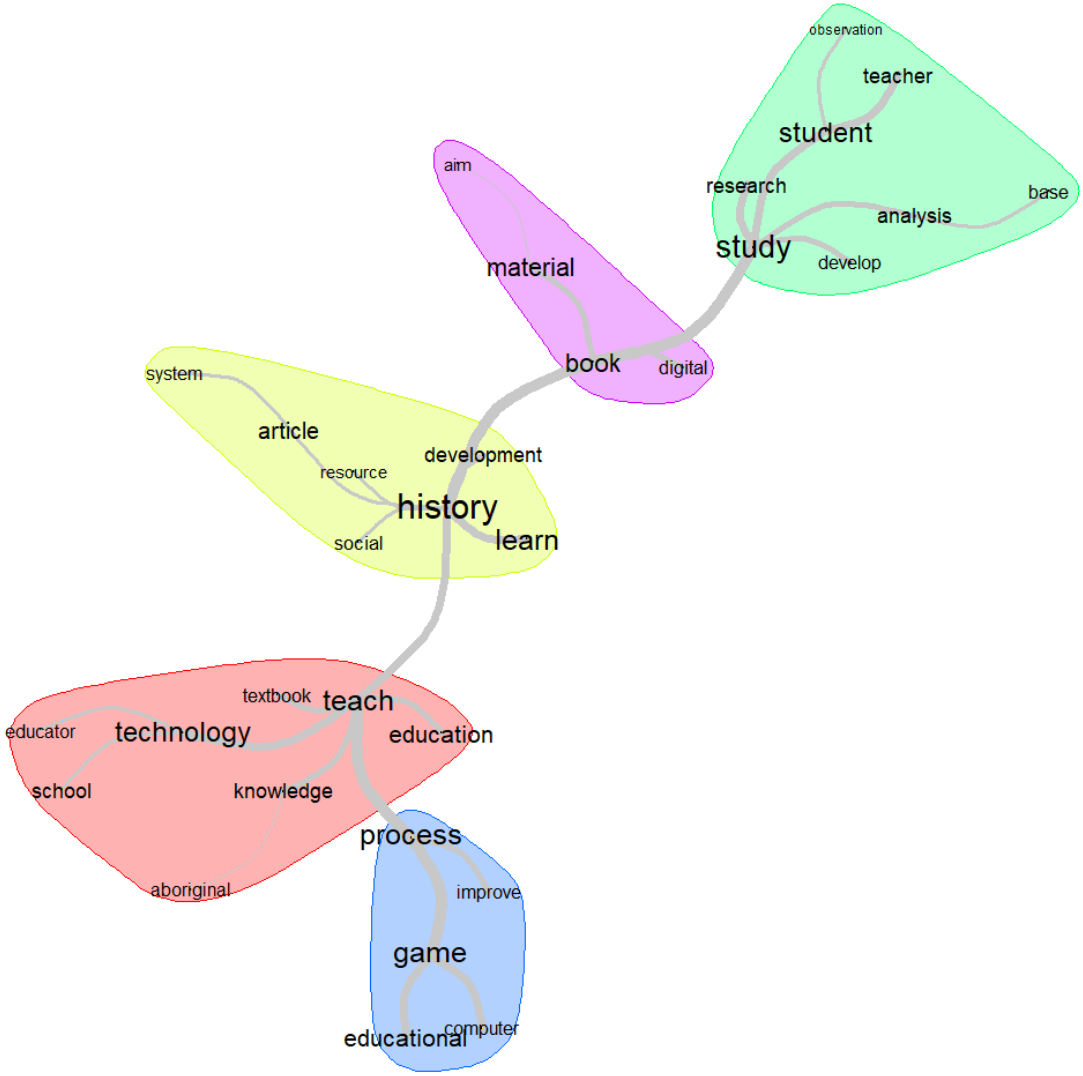

Figure 11. Co-occurrence map of the technological resources category. Source: Iramuteq.

4.2.5. Technologies and online history teaching

With regard to the category of online history teaching (Figure 12), we can identify terms related to development and design associated with the concept of learning, which, although not as prominent in the visual representation as the words digital, educational, history and university (which also appear more frequently in the other categories), are some of the pillars on which the publications included in this category are based, as they mainly present virtual environments that can serve as the basis for learning experiences. An example of this is Mead et al. (2022), which presents the Surviving Extinction project (https://vft.asu.edu/survive/). This is a free, gamified virtual environment where one can learn about the evolutionary history of vertebrates over the last 350 million years. An overview of learning activities in virtual environments, known as e-activities, is given in Cabero-Almenara and Palacios-Rodríguez (2021). Uljanatunnisa et al. (2023) and Tausendfreund et al (2019) provide virtual experiences for the treatment of educational content, in the first case through the Instagram account of the National Museum of Indonesia (@museum_nasional_indonesia), and in the second case through an online platform and narrative biographical interviews with victims of forced labour in Nazi Germany.

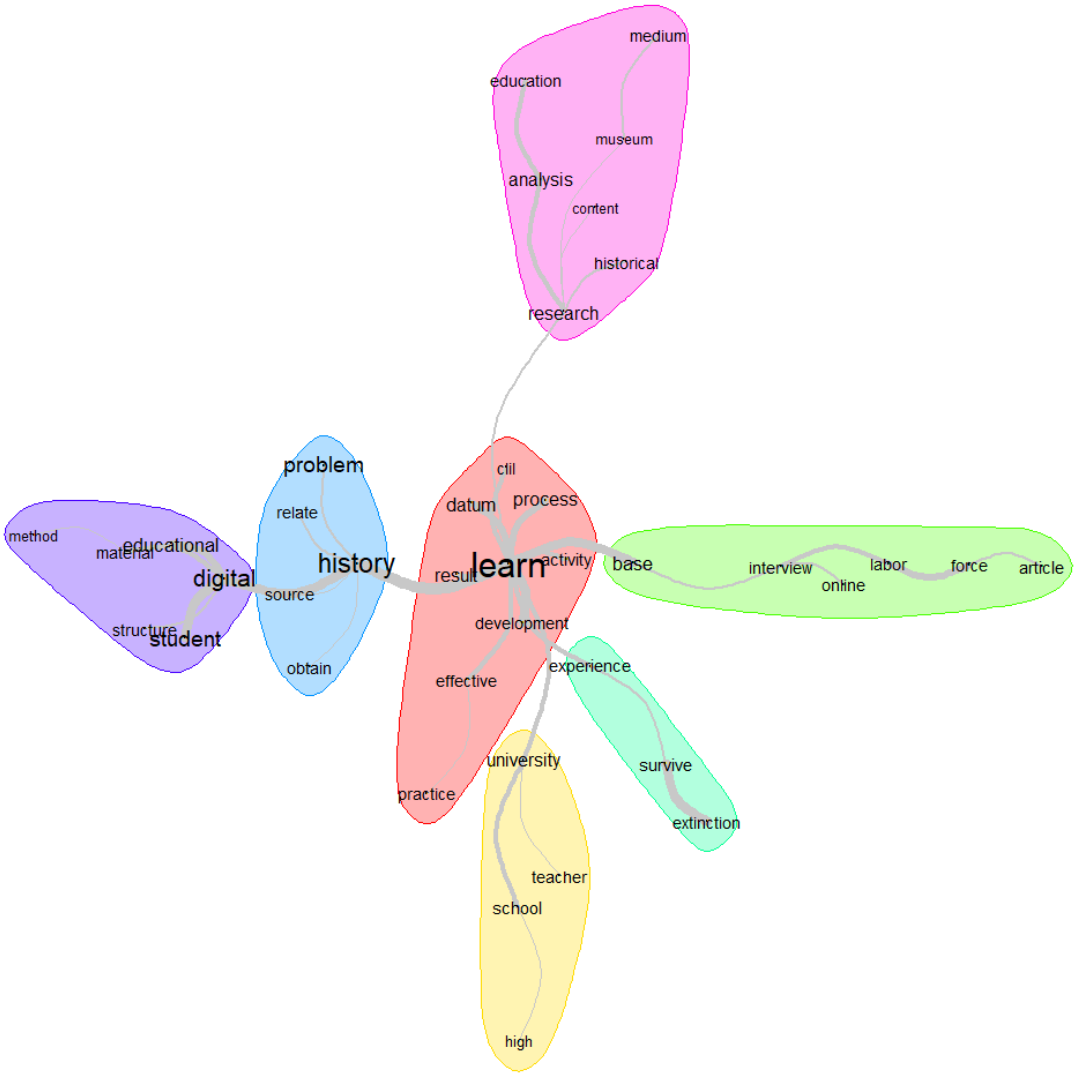

Figure 12. Co-occurrence map of the online history teaching category. Source: Iramuteq.

4.2.6. Technologies and history teaching/learning in schools

The category most directly related to formal history teaching and learning in schools is shown in Figure 13. The results of the statistical analysis allowed us to see the centrality of students, history teaching and learning as fundamental axes of the studies. This characteristic was also found in the co-occurrence analysis presented below.

The graph allows us to observe the centrality of students, who seem to be directly related to teaching, learning, resources, education and history. In these works, students are at the centre of the research proposals.

Among the articles in this category, we highlight Villena-Taranilla et al (2022), which takes the Roman Empire as a starting point to explore the potential of using augmented reality in the teaching of history at primary school level. In addition, Monteagudo-Fernández et al (2020) presents research on students' perceptions of the use of ICTs. Both research projects show that technology, when used in a planned way, can contribute to learning and that students enjoy learning through technology, from their own point of view.

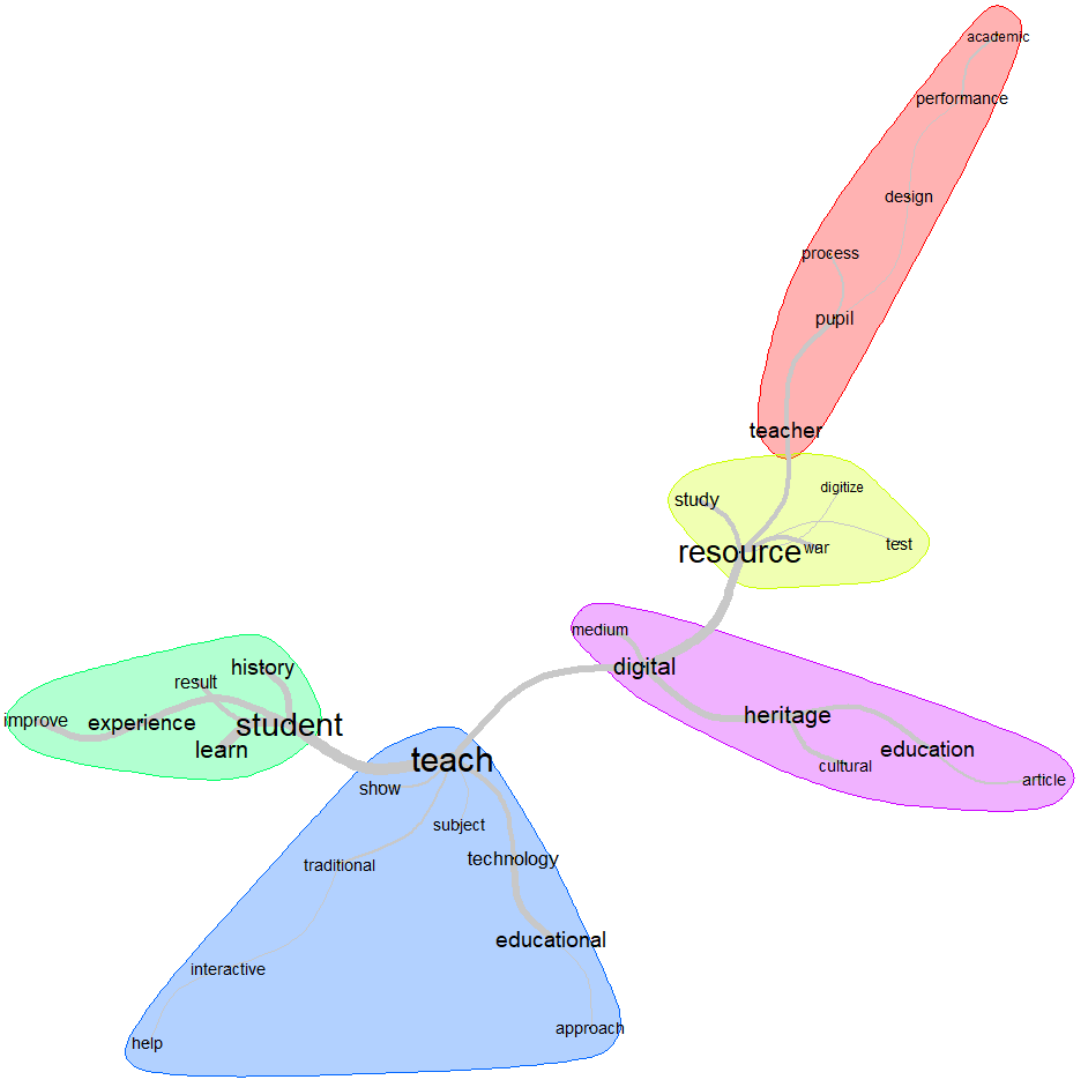

Figure 13. Co-occurrence map of the history teaching/learning category. Source: Iramuteq.

5. Discussion

The results of the bibliometric analysis, on the other hand, show an upward trend in the number of scientific publications, especially in the last five years, as has been noted in other recent studies (Gutiérrez-González et al., 2023), which also found a high level of collaboration, with the existence of intra- and inter-institutional and international networks involving researchers from several countries (Roda-Segarra, 2023). The weight of the USA and Spain is fundamental, in line with previous studies on augmented reality in education (Rodríguez et al., 2023) and English is again the predominant language (Gómez et al., 2023). Neither medium nor large producers were identified in this work (Sánchez et al., in press). The impact of publications is low, with almost all papers having fewer than 10 citations. The distribution of publications is not concentrated in three well-defined concentric zones of productivity, in line with previous work such as that by Astudillo et al (2023).

We highlight some research that allows us to visualize the plurality of works that deal with digital resources in the teaching and learning of History, regarding approaches, themes and results. The development of a Wikipedia page on Japanese prisoners during World War II involved students from the University of California, who conducted research and organized the entry on the Merced Assembly Center in the free encyclopedia (Squibb et al., 2023). Another work (García-Bustos et al., 2023) developed by the DIDPATRI group at the University of Barcelona aimed to recreate the context of the Spanish Civil War in an audiovisual format. Focusing on hospitals and health problems in the recreated context, the project was based on assumptions of Public History and Archaeology.

Among the main conclusions drawn from the content analysis, the need to train history teachers in digital competence stands out. At present, especially as a result of the COVID-19 coronavirus pandemic, we consider that digital technologies are excellent tools for educational innovation and the development of new methodological approaches, but teachers need to be better trained to use them. The study also concludes that there is a need for further research into ways of teaching history using digital technologies. In general, the research analysed provides findings and recommendations that can be used to develop digital teaching materials, e-learning courses and new curricula for the teaching and understanding of history-related content.

We identified a large number of research studies related to technologies in interdisciplinary and heritage-related fields. In the first group of studies, we consider this result proves the potential of educational technology to work with content and subjects in an interdisciplinary way. In the second, we observe the use of technologies for the preservation, organization and dissemination of material and immaterial cultural heritage. We must emphasize the strong presence of technologies in museums seen in the research in this category analyzed in this study.

Resources were the subject of a number of articles in the sample. This seems to indicate a challenge for the future in terms of research analyzing and producing digital resources for history teaching/learning.

Research on online history teaching/learning was present, albeit in small numbers. Even the pandemic, which forced the use of technology in education, does not seem to have boosted the data in this research category.

Finally, the category with the fewest research papers was related to history teaching/learning in schools. In the analyzed works, the student's positive perception of the integration of technology in the teaching/learning processes in the school context is concluded. But these results need to be taken with caution, since the motivational factor present in the students, for example, when a video game is used, it does not directly imply that the degree of knowledge acquired on the subject is neither higher nor deeper (Egea-Vivancos & Arias-Ferrer, 2021), lacking coherence in their responses when learning in the area of history and the possible transfer of the promoted knowledge are valued (Martínez et al., 2018). This also suggests a challenge for the future, to try to focus more on research in the school environment to understand the use of technologies by history students and teachers.

In the future, it would be interesting to carry out analyses referencing other databases, such as Dialnet or WOS, as well as differentiated analyses that take into account the geographical origin of the studies. The inclusion of altmetrics in the analysis could be of interest in today's globalized and hyper-connected world. As a prospective approach, the possibility of carrying out similar analyzes taking as reference other types of documents such as doctoral theses, book chapters or conferences and communications made at conferences. All these issues have been identified as fundamental limitations of this work.

6. Final reflection

The aim of this bibliometric study was to map and analyze studies dealing with the relationship between teaching and learning History and digital resources. To this end, a search was carried out in the Scopus database with the aim of identifying studies on the subject.

The bibliometric analysis identified a certain concentration of studies in the United States and Spain. It also made it possible to visualize collaborative work between researchers as a characteristic of the production found. English continues to be the language most often used in studies.

We then categorized the research into six categories: 1) Technologies and training of future history teachers; 2) Technologies and history teaching from and interdisciplinary perspective; 3) Technologies and cultural heritage; 4) Technologies and resources for history teaching/learnin; 5) Technologies and online history teaching; 6) Technologies and history teaching/learning in schools.

In general terms, the research that has been mapped and analyzed allows us to observe the plurality of investigations into the teaching and learning of history using digital resources. In this sense, the studies indicate the potential of these resources when used in teaching and learning situations.

The study also identified at least two future challenges. The first is to take a more comprehensive look at teaching and learning processes in schooling spaces. The second is to investigate how digital resources are used in the initial and continuing training of history teachers.

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Specific contribution of the authors

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