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Mapping Arabic Calligraphy Education Research Structure: A Bibliometric Analysis between 2016 and 2021 Using Vosviewer

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ABSTRACT

Abstract: The purpose of this study is to present a bibliometric analysis of Arabic calligraphy research from the Scopus database from 2016 to 2021. This study identified 43 English documents for further analysis based on the query used and the document screening stages. In this study, Vosviewer was used to visualize the data, and Harzing's Publish or Perish is used to harvest data, calculate metrics, and analyze citations. According to our findings, Arabic calligraphy research publications are increasing, with the peak occurring in 2019, including in terms of citations. The findings indicate that research in language and arts is closely related to the primary research domain, and that the arts have the prospect to displace the language groups that previously dominated. Apart from the current subject, research into the role of language and art (aesthetics) in Arabic calligraphy is still constricted and should be expanded.

Arabic calligraphy (in Arabic, khatt) is a form of artistic handwriting based on the Arabic alphabet (Widany, 2011). Arabic calligraphy is immensely appreciated since it is a defining feature of Islamic art and bears a strong resemblance to the Qur'an's language (Kattan, 2020). Additionally, the Arabic written form serves a variety of functions, most notably as a decorative form and a medium for religiously charged direct material (Welch, 1980). In other words, the most fundamental design element of Arabic calligraphy is the colorful and symbolic manner in which Allah's message is transmitted (Hajra & Saleem, 2021).

Nowadays, the subject of its application in contemporary design raises a slew of aesthetic and ethical concerns (Baba, 2019). Arabic calligraphy is aesthetic in nature, following the standards of current art creation, and ethical in nature, following the Qur'an and Al-Hadith (Ahmad, 2021). Calligraphy enables practitioners to be intimately associated with the Qur'an, since they are expected to continuously interpret, compose, and re-present the divine message (Senay, 2017). According to a few of these theories, there are concerns regarding a harmonic balance between artistic and functional writing in the latest research trends in Arabic calligraphy (Yaghan, 2018).

Bibliographic studies have long been used to discover trends in specific areas of research (Ahmi & Mohd Nasir, 2019). While the review of Arabic calligraphy remains limited to a systematic review with an emphasis on artistic function (Alashari & abd hamid, 2021), we propose that research trends in the two fields be separated through quantitative metadata analysis of output by year, country, affiliation, author, and journal.

The study's primary purpose is to synthesize patterns in the generation of information about Arabic calligraphy. This review will focus on the quantity, growth, distribution, subjects, and content of publications, authors, and articles that have had the greatest impact on Arabic calligraphy research. This review analyzes 43 Scopus-indexed documents using scientific mapping. The data analysis process used Harzing's publish or perish and Vosviewer to perform descriptive statistics, citation analysis, and co-occurrence analysis. This bibliometric analysis aims to gain a global perspective on the Arabic calligraphy base of knowledge from 2016 to 2021.

METHOD

Research Design

The approach utilized in this study was bibliometric analysis of scientific literature on the subject of "Arabic calligraphy." The primary objective of this bibliometric analysis was to investigate the trend in the number of papers on the subject from 2016 to 2021. This study, in particular, used keyword analysis to suggest research topics relevant to Arabic calligraphy. Generally, this mapping results in a knowledge-based structural composition (White & McCain, 1998). Thus, the outcomes of this review were distinct from narrative reviews and meta-analyses, which seek to incorporate the study's substantive findings (Zupic & ater, 2015).

Sources of Data and Query Approach

Researchers retrieved the data using Harzing's Publish or Perish software. This research topic is concentrated on "Arabic calligraphy as a linguistic and aesthetic function." The search term used is a broad term, specifically: ("arabic calligraphy"), with the years 2016—2021.

Scopus was used as the source document for this review. Scopus is the most comprehensive indexing database available. The following are some of the reasons to use Scopus. To begin, Scopus maintains consistent standards for document selection (Hallinger & Nguyen, 2020). Second, the scopus indexing supports a broader range of document attributes than the Web of Science indexing platform (Hallinger & Chatpinyakoop, 2019; Mongeon & Paul-Hus, 2016). Third, it outperforms Google Scholar in terms of capabilities (Hallinger & Nguyen, 2020), but with less data extraction. The number of documents successfully downloaded was 52, out of a maximum of 200.

Examination of Documents

The screening of documents in this study was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). By defining inclusion and exclusion criteria, this strategy enables reviewers to easily locate and filter papers. A preliminary search using Harzing's Publish or Perish generated 52 documents. Then, based on the document type, we excluded one document (e.g. book). This research was limited to the evaluation of journal articles (including reviews) and conference proceedings. Following that, we concentrated on the title and abstract of each document. This is a critical stage in identifying papers that may be included in the review (Ng et al., 2014). At least four documents were deleted as a result of this procedure. It is frequently devoted to Arabic scripts (e.g. poetry).

Regardless of the database's reliability employed in this study, Scopus also has a significant constraint in that it covers only documents written in English, whereas study on Arabic calligraphy themes may be authored in other languages (especially in Arabic). This alternative, on the other hand, has the ability to provide a comprehensive and global view. As a result, we limited the number of documents included in the evaluation to those written in English, resulting in a total of 43 documents spanning the years 2016 to 2021. The PRISMA document screening procedure is summarized in Figure 1.

Analysis

Following the approach of previous research (Zakaria et al., 2021), this study used a variety of applications to aid with data analysis. To begin, Microsoft Excel 365 will be used to determine the frequency and proportion of topics. Second, in addition to assisting in data collection, Harzing's Publish or Perish was utilized to construct citation metrics (Agarwal et al., 2016). Thirdly, VOSviewer (version 1.6.18) was used to visualize knowledge domains as a bibliometric network in order to map them (Wrigley et al., 2019).

Nees Jan van Eck and Ludo Waltman created VOSviewer as a software application (van Eck & Waltman, 2010). This software can be used to create a bibliometric network based on the co-occurrence keyword. This analysis is founded on the rules governing psychological closeness relationships, as well as on concepts governing knowledge structures and mapping (Teixeira & Sequeira, 2009). Co-occurrence, in its simplest form, refers to the frequency with which two terms occur concurrently and are deemed semantically connected or handled as idioms (Kroeger, 2005).

Findings

Description of the retrieved literature

From the Scopus database, a total of 43 papers were identified based on their document type and source type. Journal articles and proceedings are examples of documents. Journal articles accounted for nearly three-quarters (72.1%) of all documents downloaded, while proceedings articles accounted for only 12 documents. The documents analyzed received a total of 50 citations, an average of 8.33 citations per year and 1.16 citations per publication. The retrieved document does have an h-index of 4.

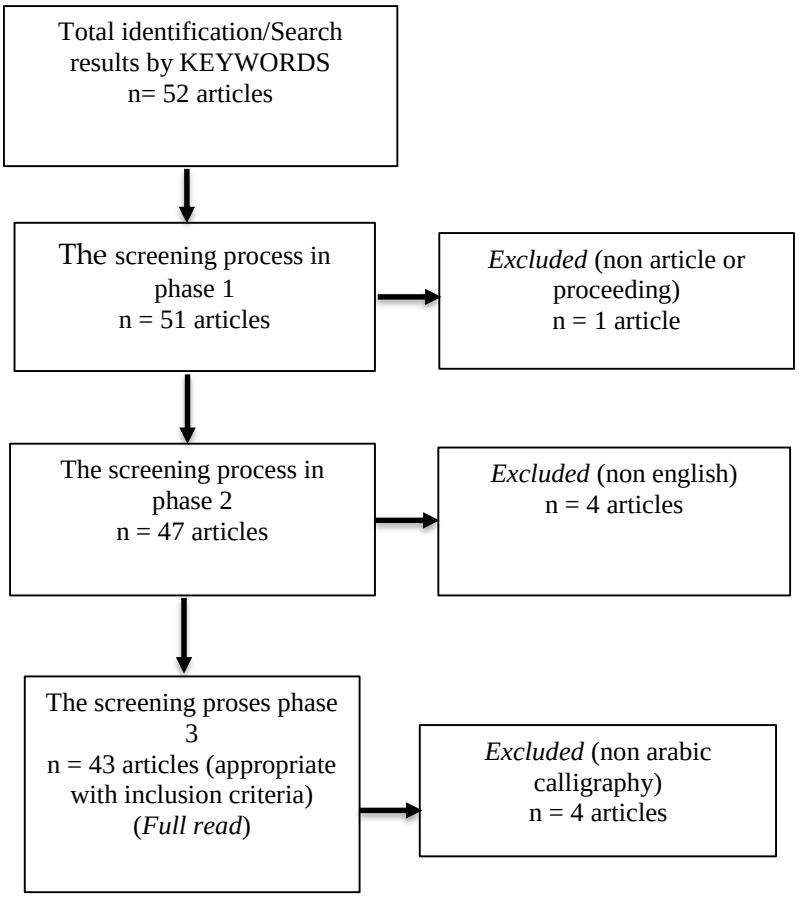

Figure 1. Document Screening Procedure

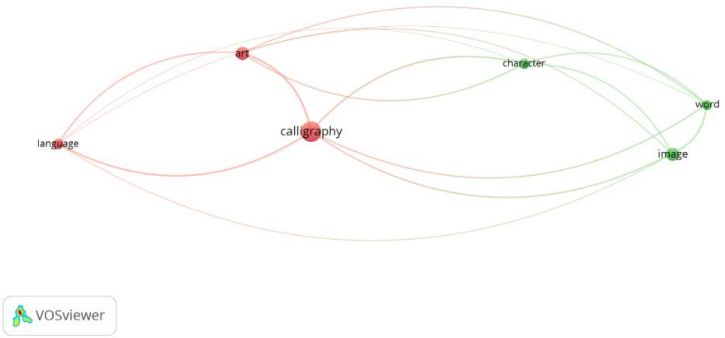

Figure 2. Network Visualization

Co-occurrence analysis was successful in identifying subjects from other scholars' papers and proceedings (Lai, 2020). The mapping of author keywords using the VOSviewer technique (Figure 2) reveals that the most often occurring author keywords are language, art, character, image, and word. The same hue indicates the same cluster, and the results are categorized according to the research topic (van Eck & Waltman, 2010). Two clusters were identified in this investigation. As indicated by the red

cluster (cluster 1, three items), keywords such as language and associated arts were concentrated on the primary domain "calligraphy." Keywords such as word and image are associated with "character" in the green cluster (cluster 2, 3 items). Meanwhile, the distance between the circles indicates the strength of the association formed by the co-occurrence of keywords, implying that Arabic calligraphy is inextricably connected to language and art.

Publication Growth

Document inspection has aided researchers in observing the growth patterns of research participants on occasion (Ahmi & Mohamad, 2019). Co-occurrence analysis, in particular, illustrates the evolution of the domain through time (Deng & Xia, 2020), allowing for the identification of study subject trends (Göksu, 2021). The findings of this study (Figure 3) indicate that research in Arabic calligraphy has moved from the study of words and characters to the study of language and, more recently, images. However, as evidenced by the density of research (Figure 4), language, word, and character are generally under-researched in comparison to picture and art.

The maximum productivity was recorded in 2019, with a total of 11 documents, while the lowest productivity was found in 2016, with only three documents. Between 2016 and 2021, the quantity of documents increased, but decreased slightly between 2019 and 2020. In a linear relationship with the number of documents published, the maximum number of citations per publication was recorded in 2019 (1.55 citations per paper), while the lowest number of citations per publication was found in 2016. (0.67 citations per paper). Table 1 illustrates the citation matrix by document year.

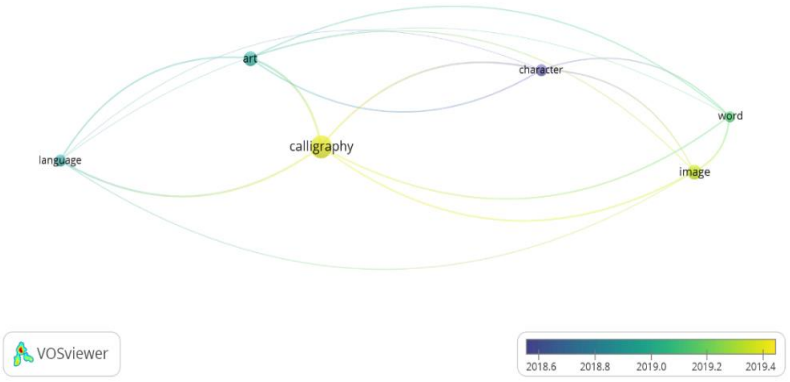

Figure 3. Overlay Visualization

Table 1. Publication Growth

Year	TP	TC	C/Y	C/P	h	g
2016	3	2	0.33	0.67	1	1
2017	4	5	1	1.25	1	2
2018	7	7	1.75	1	2	2
2019	11	17	5.67	1.55	3	4
2020	9	10	5	1.11	2	3
2021	9	9	1	1	1	3

Notes: TP = *total number of paper*; TC = *total citations*; C/Y = *citations per year*; C/P = *citations per paper*; h = *h-index*; and g = *g-index*.

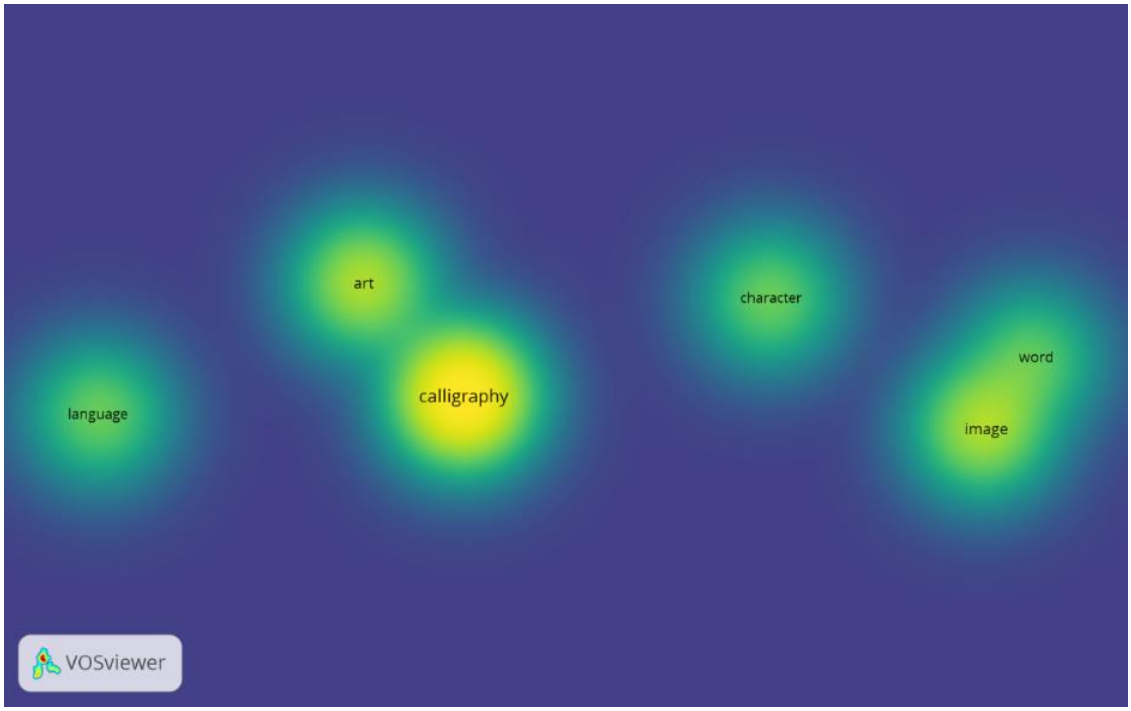

Figure 4. Density Visualization

Authorship, collaboration and prolific writer

Sixteen of the documents are single-author publications, while the majority of the documents (27 papers) are multi-author publications. As a result, the percentage of collaboration among researchers of Arabic calligraphy is 62.79 percent. In Figure 5, authors with a minimum output of three documents are depicted. This map contains only one closed circle, indicating the presence of only three active authors who work closely together, notably Kaoudja, Khaldi, and Kherfi.

Table 2 details the five most prolific writers between 2016 and 2021. Koudja, Z. is the most productive author with the most publications and citations (3 publications; 8 citations), followed by Hamzah, A. in second place (2 publications; 8 citations). Both institutions are located in Africa, specifically the University of Kasdi Merbah in Algeria and the University of Cairo (Egypt).

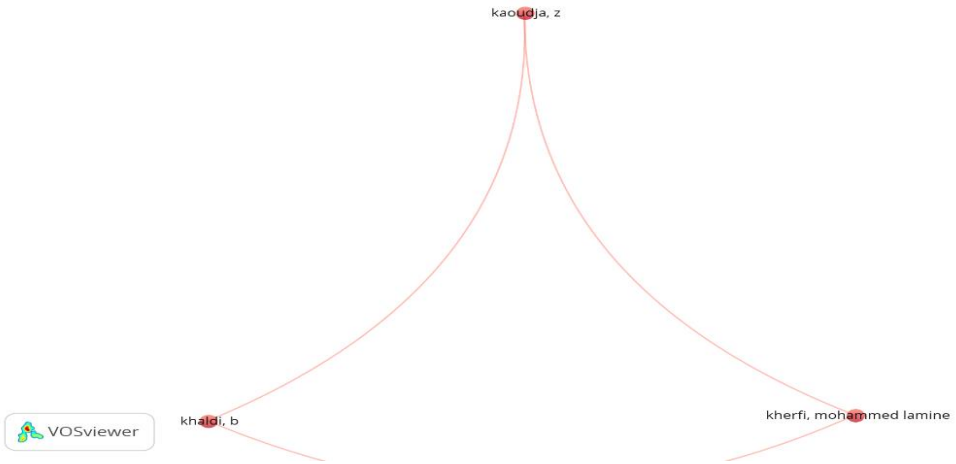

Figure 5. Co-Authorship Network Map

Table 2. The Five

Most Prolific Writers

Name	Afiliation	Country	TP	TC	C/Y	C/P	h	g
Kaoudja, Z.	University of Kasdi Merbah	Algeria	3	8	2.67	2.67	2	2
Hamzah, A. A.	University of Cairo	Egypt	2	8	4	4	1	2
Makhfi, N. E.	PMIC Lab	Marocco	2	6	2	3	2	2
Yaghan, M. A.	German Jordanian Universit	Germany	2	8	2	2	1	2
AlSalamah, S.	University of Manchester	UK	2	2	0.5	1	1	1

Notes: TP = *total number of paper*; TC = *total citations*; C/Y = *citations per year*; C/P = *citations per paper*; h = *h-index*; and g = *g-index*.

Geographic distribution of publications

At least 102 scholars from 23 different countries have published articles in the field of Arabic calligraphy research. Saudi Arabia and Canada took the lead with four documents each, followed by Algeria, Iran, Germany, Malaysia, Morocco, Egypt, Russia, and the United Kingdom with three each. Collaboration between countries with a minimum productivity of three papers reveals that Algeria and Canada are the only two that work closely together on a regular basis. Meanwhile, the University of Kasdi Merbah (Algeria), the Université du Québec (Canada), and the University of Cairo are the most influential universities, each with at least three publications (Egypt).

Preferred Journal

Numerous journals, including WIT Transactions on the Built Environment, International Journal of Visual Design, IEEE Access, and Advances in Intelligent Systems and Computing, publish multiple Arabic calligraphy research documents. Other publications, on the other hand, only publish one document at a time.

The Most Frequently Cited Documents

Table 3 lists the five articles cited in the field of Arabic calligraphy. The article with the most citations, titled "A framework for linguistic steganography employing Arabic calligraphy," was published in 2021 in the Journal of King Saud University - Computer and Information Sciences. According to citations per year (7 C/Y), this article has the greatest influence. Second place goes to the article with the most citations, "Improving Urdu Recognition Using Character-Based Artistic Features of Nastalique Calligraphy," which was also published in IEEE Access in 2019 and garnered a total of six citations and two C/Y.

Table 3. The Five Most Cited Articles

Name	Title of the Paper	TC	C/Y	C/P	h	g
Hamzah, A A, Khattab, S., & Bayomi, H	A linguistic steganography framework using Arabic calligraphy	7	7	7	1	1
Akram, Q. U. A. & Hussain, S.	Improving Urdu Recognition Using Character-Based Artistic Features of Nastalique Calligraphy	6	2	6	1	1
Al-Hmouz, R.	Deep learning autoencoder approach: Automatic recognition of artistic Arabic calligraphy types	4	2	4	1	1
Kaoudja, Z. Khaldi, B. & Kherfi, M. L.	Arabic artistic script style identification using texture descriptors	4	2	4	1	1
Kaoudja, Z. Kherfi, M. L. & Khaldi, B.	An efficient multiple-classifier system for Arabic calligraphy style recognition	4	1.33	4	1	1

Notes: TC = *total citations*; C/Y = *citations per year*; C/P = *citations per paper*; h = *h-index*; and g = *g-index*.

DISCUSSION

The purpose of this study is to conduct a bibliometric analysis of Arabic calligraphy research documents published between 2016 and 2021. We were able to retrieve 58 documents from the Scopus database, but ultimately used only 43 after three screening stages. In general, our findings indicate that the number of documents produced annually is increasing, though the total remains limited. In terms of citations, documents published in 2019 received more citations (e.g., citations per year and per publication), had a higher h-index, and had a higher g-index than documents published in the previous and subsequent years. This finding differs slightly from Ugolini et al. (2012)'s explanation that older citations receive more citations than the most recent.

Additionally, our findings indicate that the majority of Arabic calligraphy publications originate from African and European academic institutions, including Algeria, Egypt, Morocco, Germany, and the United Kingdom. Our findings, however, suggest that the geographic distribution of melatonin publications is changing, with European countries on the verge of outshining the African region and possibly even outstripping the Asian region. This may be because many institutions in the European region, such as researchers at the German Jordanian University and the University of Manchester, have begun to actively research this field, but the African region continues to stand out, with the continent's most prolific writers hailing from there. These findings indicate that no European country is active at the global level in the field of Arabic calligraphy research, but an examination of the European contribution reveals the presence of Germany and the United Kingdom. In other words, Arabic calligraphy research publications can be significant, and they are not limited to universities or Middle Eastern countries.

Kaoudja, Z. was the most prolific author, contributing three articles, two of which were highly cited, published in Proceedings-ICNAS 2019: 4th International Conference on Networking and Advanced Systems and CCSSP 2020-1st International Conference on Communications, Control Systems, and Signal Processing, respectively. Meanwhile, Hamzah, A. A. was the second most prolific author, contributing two documents, the most cited of which was one of the articles published in the Journal of King Saud University - Computer and Information Sciences. The two most prolific writers are graduates of Africa's most prestigious institutions, the University of Kasdi Merbah and the University of Cairo.

Our other observation is that collaboration between researchers of Arabic calligraphy is remarkably limited, despite the fact that there are numerous writers from dozens of countries. The primary and only collaborations visualized using the vosViewer technique are between Algerian and Canadian authors. The findings of this study indicate that, despite America's limited presence, the continent's countries collaborate more effectively than countries in the Middle East and Asia. Efforts should be made to promote collaborative research among Asian countries in order to bolster their image as a significant culture.

Arabic calligraphy has developed into a research domain in this study due to its close relationship to the function of language and art. Rather than art (illustration) research supplanting the group of linguists who previously dominated calligraphy research, it appears that research on language functions needs to be explored more thoroughly, as it has remained remarkably limited in recent years. This research trend may have ramifications for calligraphy writing as a graphic space design technique rather than a straightforward transcription of spoken language (Osborn, 2009). On the other hand, incorporating Arabic calligraphy into artistic endeavors can contribute to the growth of cultural and religious literacy (Gulbahar & Adnan, 2020). Numerous questions arise as a result of these findings and could be the subject of future research. Is language irrelevant in Arabic calligraphy? Or is the language irrelevant in the domain of Arabic calligraphy research? Future research trends must maintain a healthy balance between artistic and functional writing (Yaghan, 2018).

Numerous recommendations are made in this bibliometric study. The scarcity of documents in the Scopus database argues that research in the field of Arabic calligraphy, particularly from Muslim-majority countries, should be prioritized. Capacity building can be accomplished through the establishment of a specialized study program in the field of Arabic calligraphy (eg Islamic architecture). Additionally, the low number of documents published in a number of journals indicates a need for the establishment of scientific journals dedicated to capturing and highlighting Arabic calligraphy research. Additionally, our research findings can provide critical information for researchers working on this subject, as the findings can be used as a "reading list," given the scarcity of documents pertaining to Arabic calligraphy research.

CONCLUSIONS

Saudi Arabia and Canada are the two countries that make the most significant contributions to Arabic calligraphy research. Meanwhile, the University of Kasdi Merbah in Algeria, the Université du Québec in Canada, and the University of Cairo in Egypt are the institutions that stand to benefit most from collaborative research in this field. Language and art research is closely related to the primary research domain, and the network overlay indicates that research on art (particularly images) may develop in the coming years.

This bibliometric study has several limitations. To begin, this analysis utilizes only documents from the Scopus database. As a result, this review will focus exclusively on English-language journal articles and conference proceedings. The findings of this study provide an incomplete picture of global research in Arabic calligraphy. Second, the data in this study cover the period from 2016 to 2021, and research on Arabic calligraphy may have increased in the year preceding the study period. Third, the citation count used to determine the impact of research may not accurately reflect the quality of each study. Finally, we restrict our data search to the term "Arabic calligraphy."

Future bibliometric research will need to incorporate documents from the Google Scholar (GS) database that span a longer period of time and contain a variety of document types. This effort is intended to capture findings reported in documents published in other languages, and the sample of research documents on Arabic calligraphy is expected to be significantly larger. The use of the GS database enables the retrieval of several documents from the "gray literature" in order to provide a more comprehensive picture with the least amount of bias. Additionally, a synonym search query is required to broaden the range of documents that can be extracted.

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