Center of Language and Cultural Studies

LINGUA

Jurnal Bahasa, Sastra, dan Pengajarannya
https://lingua.soloclcs.org/index.php/lingua
ISSN : 1979-9411
EISSN: 2442-238X

Month, Vol, No	**:**	September, Vol.21 No.02
DOI	**:**	10.30957/lingua.v21i2.1045
Received	**:**	February, 2025
Accepted	**:**	March, 2025
Published	**:**	March, 2025

Research on Technology in Arabic Language Learning: A Bibliometric Analysis (1993-2024)

Muhammad Hafidz Khusnadin[1], Dwi Arian Putra Mandaka[2], Zulfi Fadhlurrahman[3], Zaeni Anwar[4], Ramadhan Safrudin[5*]
Institut Agama Islam Negeri Metro Lampung[1], State Islamic University Sunan Kalijaga Yogyakarta[2],PTIQ University Jakarta[3,4], State Islamic University Sunan Gunung Djati Bandung[5]
Email: rmdhnsafrudin@gmail.com[5]

Abstract
This study aims to analyze research trends related to the use of technology in Arabic language learning from 1993 to 2024 using bibliometric analysis methods. The research data was obtained from the Scopus database, and through data processing, the authors identified 100 relevant publications. The bibliometric analysis revealed that 2023 had the highest number of publications, with 21 articles related to the use of technology in Arabic language learning. Furthermore, a significant citation trend associated with this topic occurred in 2022, with a total of 135 citations in scientific literature. Regarding the origin of the research, Malaysia emerged as the leading contributor with 24 related publications, while Saudi Arabia stood out as the country with the most significant international collaboration, with 23 collaborative links with other countries. Of all the journals that published this research, 26 were classified as Q1 journals, indicating a high level of relevance and impact of this research in the scientific literature. A deeper analysis revealed that the focus of research related to the use of technology in Arabic language learning encompasses four main aspects: 1) Deep Learning and e-learning; 2) Speech recognition; 3) Learning systems and machine learning; 4) Natural language processing. This study provides a comprehensive insight into the research trends and developments in the use of technology in the context of Arabic language learning over the past two decades.

Keywords: Arabic Language Learning; Bibliometric Analysis; Technology; Scopus Database

Citation (APA):
Khusnadin, H.M, dkk. (2024). Research on Technology in Arabic Language Learning: A Bibliometric Analysis (1993-2024). *LINGUA: Jurnal Bahasa, Sastra, Dan Pengajarannya*, *21*(2),309-324. https://doi.org/10.30957/lingua.v21i2.1045

1. Introduction

Education has undergone significant paradigmatic changes along with advances in information and communication technology (Mayulu et al., 2022). The adoption of technology in the educational landscape, commonly referred to as e-learning or technology-assisted learning, has emerged as a prevailing trend in global education (Santi Maudiarti, 2018). Today's generation is very accustomed to technology in their daily lives. This development has also had an impact on Arabic language learning. Therefore, integrating this technology into Arabic Language learning for Specific Purposes will provide great educational benefits (Safrudin, et al., 2024).

Arabic is one of the world's languages that has an important role in various aspects of life, especially in the context of Islam, communication between countries, and global business relations (Nasution & Lubis, 2023). Therefore, learning Arabic is not only relevant for communities that use this language as a mother tongue, but also becomes important for the international community interested in understanding this language in a broader context.

The incorporation of technology in the learning of the Arabic language has created novel opportunities (Shabur & Amadi, 2023). Technology enables easier access to learning resources, and opportunities to practice language skills and interact with diverse learning materials. It can also facilitate independent learning, personalize the learning experience, and help improve Arabic language skills for learners from diverse backgrounds (Haniefa et al., 2023). Recent studies indicate that key areas in Arabic language learning research include e-learning platforms, bilingualism, and computational linguistics, reflecting a shift towards more technology driven pedagogy (Safrudin, et al., 2024)

However, to understand how technology has influenced Arabic language learning over the past two decades, it is necessary to have a deep understanding of the development of scientific research in this domain. Identifying, examining, and assessing trends in scientific research and academic literature regarding the integration of technology in Arabic language learning can be accomplished through bibliometric analysis. Bibliometric analysis is a method that enables the presentation of a comprehensive overview of extensive academic literature (van Nunen et al., 2018). Utilizing bibliometric methods enables the evaluation of the performance and research patterns of authors, journals, countries, and institutions. Additionally, it facilitates the identification and measurement of collaboration patterns among these entities (Li & Zhao, 2015).

This research aims to address this knowledge gap by performing a meticulous bibliometric analysis of the scholarly literature concerning the integration of technology in Arabic language learning spanning from 1993 to 2024. In conducting this analysis, authors will be able to identify key research trends, collaboration between researchers, research impact, and the most dominant research direction in this field. The information gained from this research will provide valuable insights into developments and changes in Arabic learning approaches influenced by technology over the past two decades and help plan future research and development directions.

This research aims to address this knowledge gap by performing a meticulous bibliometric analysis of the scholarly literature concerning the integration of technology in Arabic language learning spanning from 1993 to 2024. In conducting this analysis, authors will be able to identify key research trends, collaboration between researchers, research impact, and the most dominant research direction in this field. The information gained from this research will provide valuable insights into developments and changes in Arabic learning approaches influenced by technology over the past two decades and help plan future research and development directions.

1.1. Research Questions

This study aims to survey research focused on the utilization of technology in Arabic language learning from 1993 to 2024. To fulfill this objective, the study will seek to address several research questions, including:

1. What trends are evident in the citations within the academic literature regarding the utilization of technology in Arabic language learning throughout the course of this study?
2. How are relevant scientific publications distributed geographically, and what cooperation patterns exist among countries in the realm of technology in Arabic language learning?
3. What is the quartile ranking-based assessment of journals publishing research on technology in Arabic language learning?
4. What are the primary research areas in the scholarly literature regarding technology in Arabic language learning from 1993 to 2024?

This study aims to offer an all-encompassing insight into the advancements in research on the utilization of technology in Arabic language learning. It will identify the prevailing trends and key research areas in this field over the last two decades. The information derived from the bibliometric analysis is anticipated to guide educators, researchers, and policymakers in understanding the prospective directions for the development of technology in Arabic language learning and its potential impact on enhancing learning outcomes.

2. Review of Literature

2.1. Review of theories on your variables

Education has undergone significant paradigmatic changes along with advances in information and communication technology. The adoption of technology in the educational landscape, commonly referred to as e-learning or technology-assisted learning, has emerged as a prevailing trend in global education.The incorporation of technology in Arabic language learning has created novel opportunities. Technology enables easier access to learning resources, opportunities to practice language skills, and interaction with diverse learning materials. It can also facilitate independent learning, personalize the learning experience, and help improve Arabic language skills for learners from diverse backgrounds.

Recent studies indicate that key areas in Arabic language learning research include e-learning platforms, bilingualism, and computational linguistics, reflecting a shift towards more technology-driven pedagogy.However, to understand how technology has influenced Arabic language learning over the past two decades, it is necessary to have a deep understanding of the development of scientific research in this domain. Identifying, examining, and assessing trends in scientific research and academic literature regarding the integration of technology in Arabic language learning can be accomplished through bibliometric analysis.

2.2. Review of Previous Studies

Bibliometric analysis is a method that enables the presentation of a comprehensive overview of extensive academic literature. Utilizing bibliometric methods enables the evaluation of the performance and research patterns of authors, journals, countries, and institutions. Additionally, it facilitates the identification and measurement of collaboration patterns among these entities.

A bibliometric analysis of scholarly literature concerning the integration of technology in Arabic language learning spanning from 1993 to 2024 has revealed key research trends, collaboration between researchers, research impact, and dominant research directions in this field. The information gained from this research provides valuable insights into developments and changes in Arabic learning approaches influenced by technology over the past two decades and helps plan future research and development directions.

3. Methods

3.1. Data Collection

The authors employed the Scopus database to retrieve data pertaining to "technology in Arabic learning" due to its extensive cross-disciplinary coverage. During the data collection from Scopus, several crucial steps were undertaken to enhance the dataset, as depicted in Figure 1 (Moher, 2009). The first stage involves identification, with researchers entering keywords ("technology" AND "Arabic language" AND "learning") during searches within the Scopus database. The initial identification results resulted in 197 publications related to the topic.

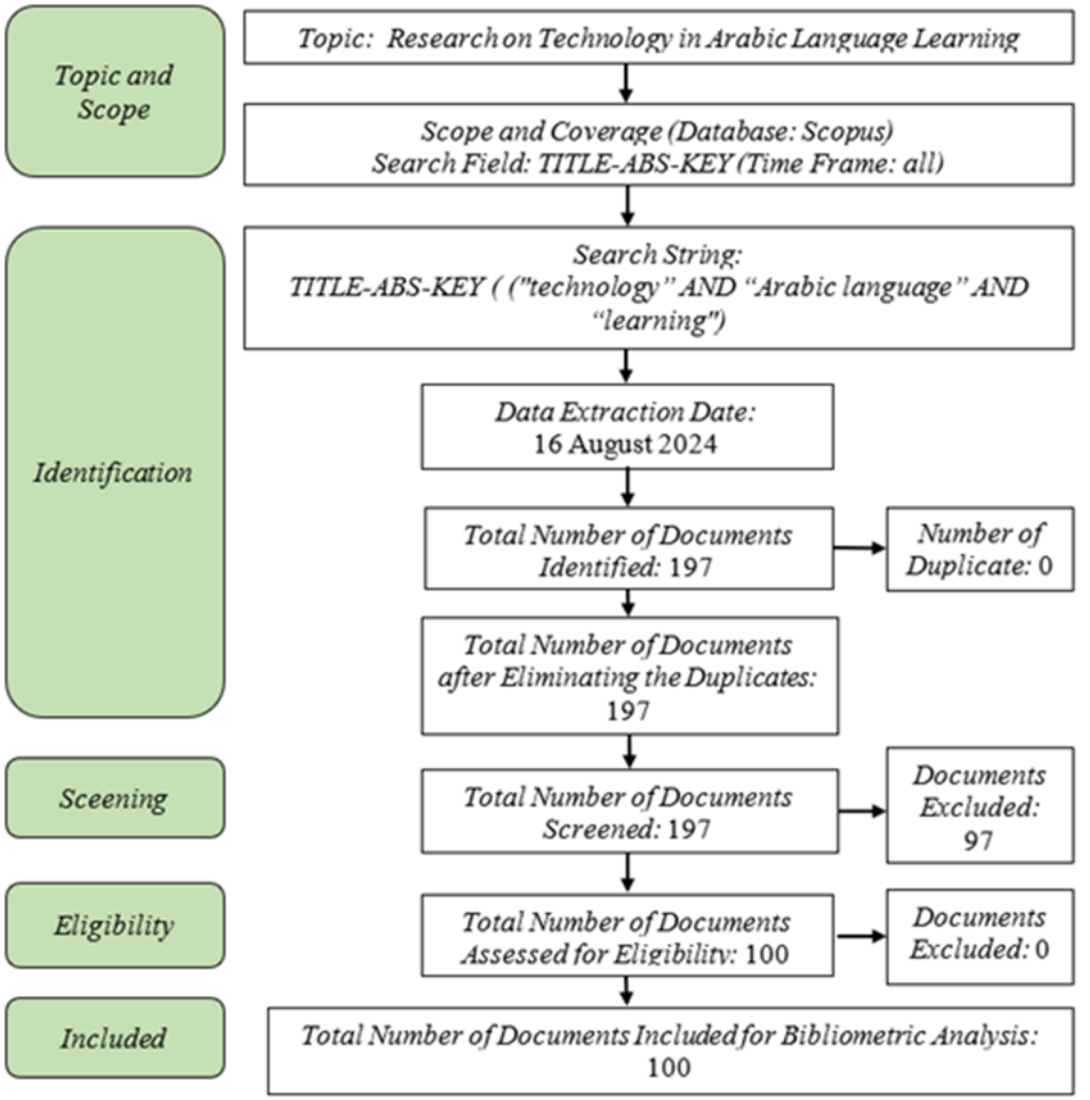

Figure 1 Data Collection Process

3.2. Data Analysis

The trends in publication and citation related to the use of technology in Arabic language learning will be examined for the period from 1993 to 2024. The authors calculated and visualized the publication counts and average yearly citations using Microsoft Excel. Furthermore, PoP software was employed to determine the h-index and g-index of each publication.

To depict the geographical distribution of the collected data, Microsoft Excel was utilized. Additionally, the VOSviewer application was used to analyze international collaboration in scientific publications. Microsoft Excel also served as a tool to classify journal rankings by quartiles. Based on the data retrieved from the Scopus database, 100 publications

will be categorized into Q1, Q2, Q3, and Q4, demonstrating that these publications meet the standards of leading journals in their respective categories.

4. Findings and Discussion

The publications related to the utilization of technology in Arabic language learning have undergone several stages in the data collection process. Through these efforts, the authors successfully identified 100 relevant publications within the time span from 1993 to 2024 that meet the research criteria. The next step is to apply a descriptive bibliometric analysis. The authors will review publication trends, citation trends, geographical distribution, journal rankings, and delve deeper into research focus in the subsequent analysis phase.

4.1 Publication and Citation Trends Related to technology in Arabic language learning

The trends in publications related to the use of technology in Arabic language learning from 1993 to 2024 will be depicted in Figure 2. The data, derived from 100 publications and organized by their year of publication, will be displayed in a table format, as illustrated in Figure 2 below.

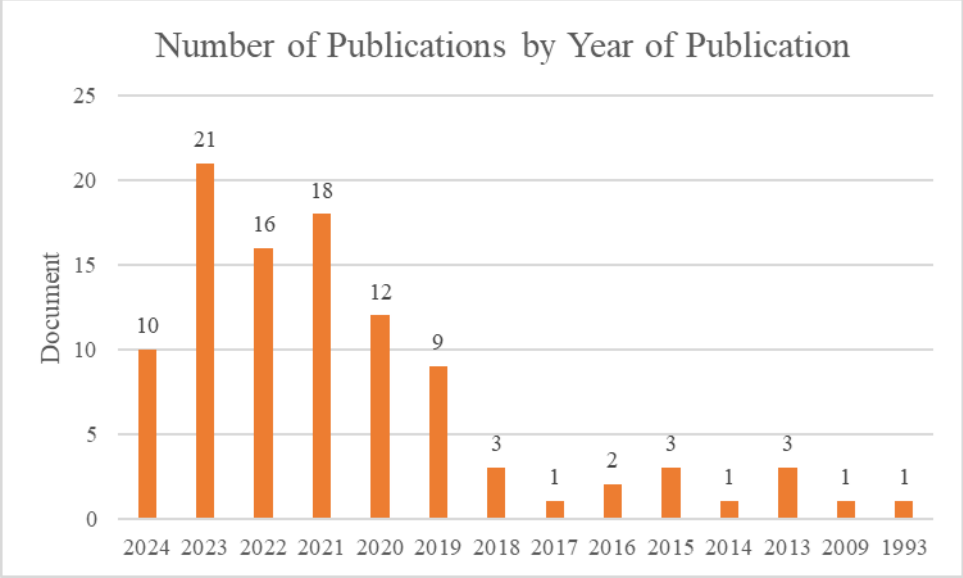

Figure 2 Number of Publications by Year of Publication

The graph above clearly shows that in 2022, a total of 21 documents were published. The earliest article on technology in Arabic language learning appeared in the Scopus database in 1993. However, there were no related publications from 1994 to 2008.

The citation trends concerning the use of technology in Arabic language learning from 1993 to 2024 will be displayed in Table 1. The 100 collected publications will show the yearly number of publications, categorized by parameters such as NCP, TC, C/P, C/CP, h-index, and g-index. This information will be organized and presented in Table 1 below.

Tabel 1. Citation Analysis of Publications

Year	TP	NCP	TC	C/P	C/CP	h	g
2024	10	3	4	0.40	1.33	1	1
2023	21	14	71	3.38	5.07	5	7
2022	15	14	135	9.13	9.64	6	11
2021	18	13	96	5.33	7.38	9	9
2020	12	11	117	9.75	10.63	7	10

2019	9	5	55	6.11	11	4	7
2018	3	2	6	2.00	3	2	2
2017	1	1	30	30.00	30	1	1
2016	2	2	18	9.00	9	2	2
2015	3	3	37	12.33	12.33	2	3
2014	1	1	16	16.00	16	1	1
2013	3	3	6	2.00	2	2	2
2012	-	-	-	-	-	-	-
2011	-	-	-	-	-	-	-
2010	-	-	-	-	-	-	-
2009	1	-	-	-	-	-	-
2008	-	-	-	-	-	-	-
2007	-	-	-	-	-	-	-
2006	-	-	-	-	-	-	-
2005	-	-	-	-	-	-	-
2004	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-
1998	-	-	-	-	-	-	-
1997	-	-	-	-	-	-	-
1996	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-
1993	1	1	1	1.00	1	1	1

Notes. TP=total of publication, NCP=number of cited publication, TC=total citations, C/P=average citations per publication, C/CP=average citations per cited pblication, h=h-index, g=g-index

From Table 1 above, it is evident that the highest number of cited publications (NCP) occurred in 2022 and 2023, both with an NCP of 14. The highest number of citations during the period from 1993 to 2024 was recorded in 2022, reaching 135 citations. Although 2023 had the most publications, with 21 publications, 2022 still provided a more significant research impact. It is worth noting that Table 1 also shows several years without any citations or publications, specifically from 1994 to 2012.

Furthermore, the highest h-index and g-index values were observed in 2022, with an h-index of 6 and a g-index of 11. This suggests that the publications from 2022 had a considerable impact on this field of research. In 2022, 14 publications were cited, accumulating a total of 135 citations, which means that, on average, each publication was cited around 11 times.

The citation trends concerning Technology in Arabic Language Learning from 1993 to 2024 are illustrated by the TC values in Table 1. The data shows that in 2022, there were 135 citations of related publications, with a notable h-index of 6 and g-index of 11 during this period. This suggests that research conducted in 2022 had a significant influence on studies in this field. Additionally, Table 2 highlights 12 articles published in 2022 that received the highest number of citations, as listed below.

Table 2. Articles Published in 2022

No	*Author (year)*	*Title*	*Sources*	*Citation*
1	(Elsaid et al., 2022)	*A Comprehensive Review of Arabic Text Summarization*	*IEEE Access*	36

2	(Alhassun & Rassam, 2022)	*A Combined Text-Based and Metadata-Based Deep-Learning Framework for the Detection of Spam Accounts on the Social Media Platform Twitter*	Processes	22
3	(Ahmed et al., 2022)	*Freely Available Arabic Corpora: A Scoping Review*	Computer Methods and Programs in Biomedicine Update	19
4	(Duwairi & Halloush, 2022)	*Automatic recognition of Arabic alphabets sign language using deep learning*	International Journal of Electrical and Computer Engineering	14
5	(Ritonga, Febriani, et al., 2022)	*Duolingo: An Arabic Speaking Skills' Learning Platform for Andragogy Education*	Education Research International	14
6	(Bilquise et al., 2022)	*Bilingual AI-Driven Chatbot for Academic Advising*	International Journal of Advanced Computer Science and Applications	10
7	(Ghani et al., 2022)	*The Impact of Mobile Digital Game in Learning Arabic Language at Tertiary Level*	Contemporary Educational Technology	5
8	(Al-Anzi, 2022)	*Improved Noise-Resilient Isolated Words Speech Recognition Using Piecewise Diferentiation*	Fractals	4
9	(Jafri et al., 2022)	*Tac-Trace: A Tangible User Interface-Based Solution for Teaching Shape Concepts to Visually Impaired Children*	IEEE Access	3
10	(Masadeh et al., 2022)	*A Novel Machine Learning-based Framework for Detecting Religious Arabic Hatred Speech in Social Networks*	International Journal of Advanced Computer Science and Applications	3
11	(Ritonga, Zulmuqim, et al., 2022)	*SIAKAD machine learning for correcting errors in speaking Arabic*	World Journal on Educational Technology: Current Issues	3
12	(Youssef et al., 2022)	*Real-time Egyptian License Plate Detection and Recognition using YOLO*	International Journal of Advanced Computer	2

			Science and Applications	
13	(Asbulah et al., 2022)	*Teachers' Attitudes Towards the Use of Augmented Reality Technology in Teaching Arabic in Primary School Malaysia*	International Journal of Advanced Computer Science and Applications	1
14	(Mohammed & Kinyó, 2022)	*The cross-cultural validation of the technology-enhanced social constructivist learning environment questionnaire in the Iraqi Kurdistan Region*	Research and Practice in Technology Enhanced Learning	1
15	(S. N. H. A. Rahman et al., 2022)	*Empowering education transformation through IR 4.0: efforts in improving the quality of Arabic language education*	International Journal of Business and Globalisation	0

Table 2 above shows that the study conducted by Elsaid and colleagues in 2022 received 36 citations, indicating that this research had a significant impact during that year. The study, titled "A Comprehensive Review of Arabic Text Summarization," provides a thorough review of automatic text summarization techniques for the Arabic language, identifying key challenges and proposed solutions. The authors found that while automatic text summarization techniques are rapidly advancing in other languages, Arabic text summarization lags behind due to the complexity of the Arabic language, including its morphological structure, dialectal variations, and limited data resources. The article also emphasizes the need for standardized corpora, better semantic representations, and the application of more sophisticated deep learning models to improve the quality of Arabic text summarization.

The next highest-cited study is the one conducted by Alhassun and Rassam in 2022, titled "Metadata-Based Deep-Learning Framework for the Detection of Spam Accounts on the Social Media Platform Twitter." This article introduces a novel framework that combines text-based data and metadata to detect spam accounts on Twitter that use the Arabic language. The key finding of this research is that by integrating deep learning models that utilize text data from tweets with metadata (such as account age, follower count, and reply count), the framework is able to detect spam accounts with a very high accuracy of 94.27%. The framework proved to be faster and required fewer computational resources compared to other models in the literature. The study also highlights that using data from Twitter's premium API features, which are not available to the general public, offers an advantage in detection accuracy compared to other datasets that rely on free data.

4.2 Geographical Distribution and Relationships Between Countries

Figure 3 below illustrates the geographical distribution of the countries where the authors of publications related to technology in Arabic language learning originated. A total of 37 countries contributed to these publications, and the distribution of the authors' origins is depicted in the following figure.

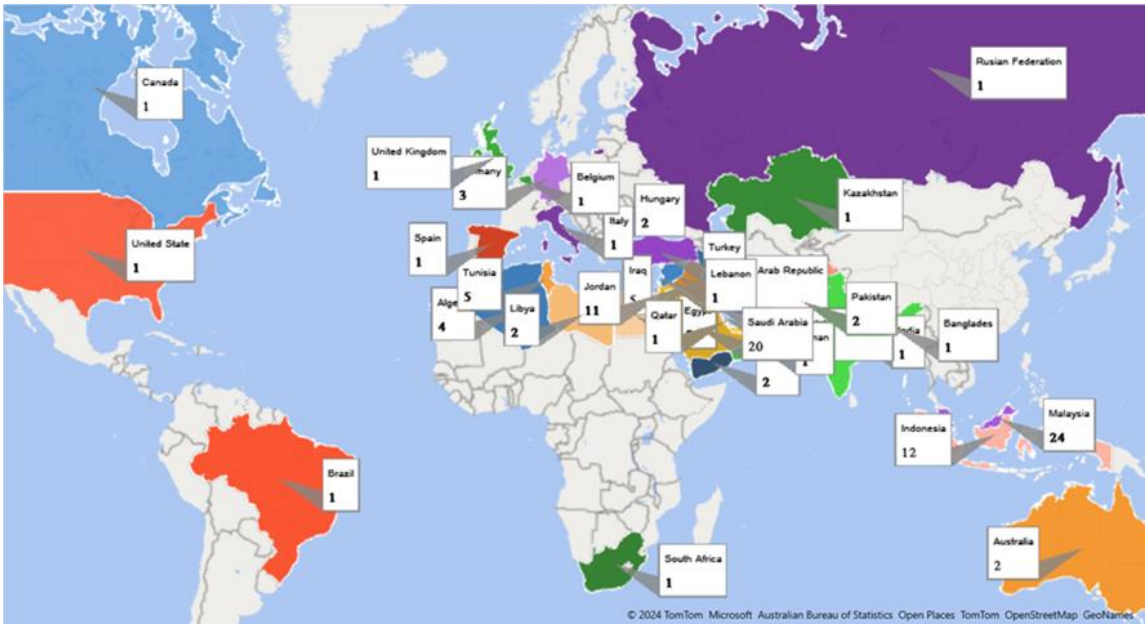

Figure 3 Geographical Distribution of Publications

Based on the data presented in Figure 3, Malaysia emerges as the leading country in research on the integration of technology in Arabic language learning, with a total of 24 publications. Saudi Arabia follows as the second-largest contributor, with 20 publications, while Indonesia ranks third with 12 publications. This geographical distribution underscores the significant role that Malaysia, Saudi Arabia, and Indonesia play in advancing research on technology-enhanced Arabic language learning.

Malaysia's leading role is consistent with previous research, such as Khoiriyah (2020), who highlighted that Arabic language education in Malaysia is generally more developed compared to other nations. Further evidence of Malaysia's contributions is provided by Kaltek Riau (2021), which discusses collaborative initiatives with APSB Malaysia in the development of an Arabic grammar learning application for non-native speakers. These efforts further emphasize Malaysia's influence in advancing pedagogical tools for Arabic language education.

The dominance of these three countries in research output reflects their strong institutional and governmental commitment to integrating technology into language education. This commitment is coupled with a focus on enhancing Arabic language proficiency through the adoption of modern tools and methodologies. These efforts contribute to the expanding body of knowledge in the field and provide a foundation for further advancements in Arabic language learning across diverse educational contexts.

The collaboration patterns between countries are depicted in Figure 4 below. In analyzing the relationships between these countries, the researcher did not impose a specific threshold. Consequently, countries with only one document are also included, even if they do not have any collaboration with other countries. The total number of countries represented in Figure 4 is 37.

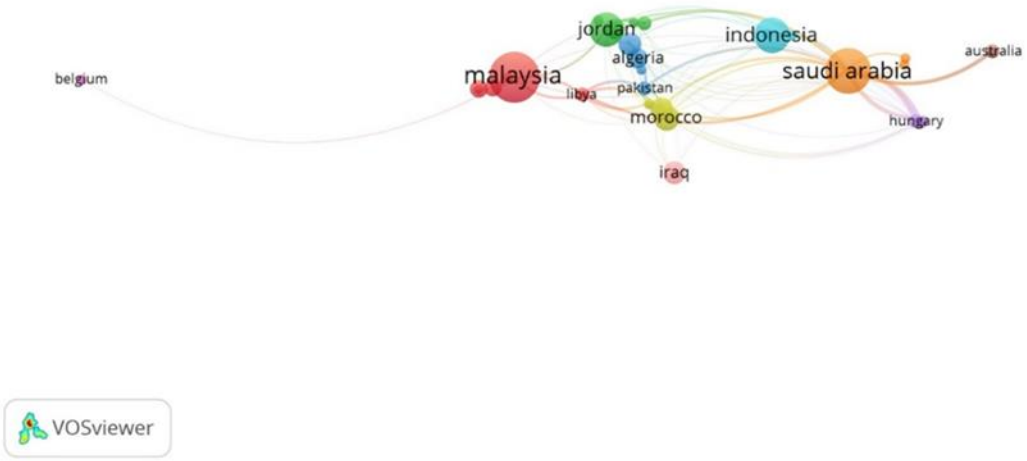

Figure 4 Collaboration Between Countries

Figure 4 demonstrates that Malaysia, Saudi Arabia, and Indonesia exhibit larger circle diameters compared to other nations, indicating a higher degree of collaboration in the field of technology-enhanced Arabic language learning. The VOSviewer visualization further highlights that Malaysia collaborates with 10 countries, Saudi Arabia with 23 countries, and Indonesia with 12 countries in this area of research.

The data presented in Figure 4 underscores the prominent role of these three countries in fostering international cooperation, collectively forming partnerships with a total of 37 nations in the context of technology in Arabic language learning. For instance, Saudi Arabia's connections with 23 countries reflect its extensive collaborative efforts in advancing this field, illustrating the strength of its cooperative relationships with other nations in integrating technology into Arabic language education.

4.3 Other Subfield Distribution of Journal Rankings

Regarding journal rankings pertinent to Technology in Arabic Language Learning, the Scimagojr website provides information based on quartile (Q) values. These rankings are depicted in the figure below.

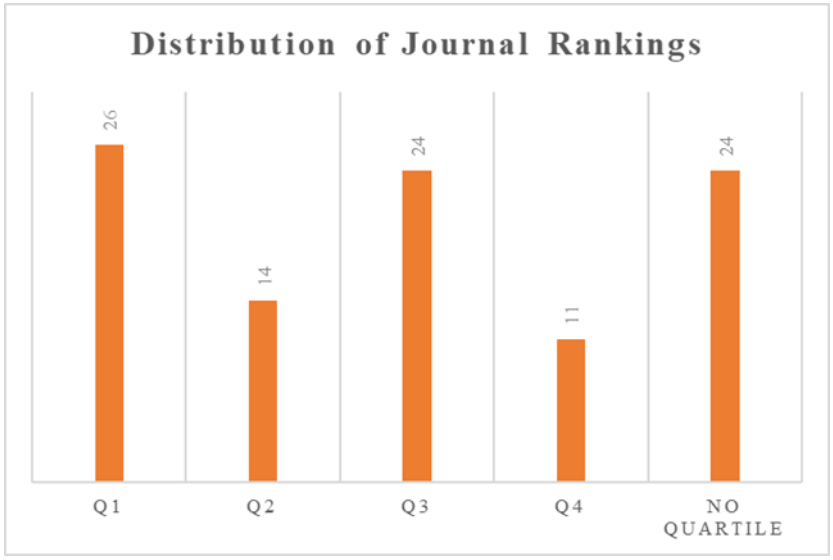

Figure 5 Ranking Based on Journal Quratil Score

Based on Figure 5, it can be seen that the majority of publications related to Technology in Arabic Language Learning are found in the highest-ranked journals, specifically in Q1, with a total of 26 publications. The second-largest number of publications is found in Q3 journals and in the No Quartile category, with 24 publications each. Additionally, there are 14 publications in Q2-ranked journals and 11 publications in Q4 journals. The high number of publications in Q1 journals indicates that this research attracts significant attention from scholars and holds a strong reputation in its field.

The journal ranking distribution is assessed based on quartile (Q) values. Out of 100 publications, 26 were published in Q1-ranked journals. This is presented by the author in Table 3 below, which includes only journals with more than 3 publications. For more detailed information, please refer to Table 4 below.

Table 3. Journals with the Most Articles

Journals	Number of Articles	Quartile Rank
IEEE Access	6	Q1
International Journal of Advanced Computer Science and Applications	5	Q3
International Journal of Interactive Mobile Technologies	4	Q3
Journal of Language and Linguistic Studies	6	No Quartil

In Table 3 above, it is evident that the top three journals have each published six and five articles related to Technology in Arabic Language Learning. Furthermore, the listed journals can be used as a reference for future publications in the same field.

4.4 Research Focus Related to technology in Arabic language learning

At this point, the researchers have set a threshold where each keyword must be present in at least two publications. With this requirement, all identified keywords are displayed using VOSviewer. A total of 84 keywords were identified, as depicted in Figure 6 below.

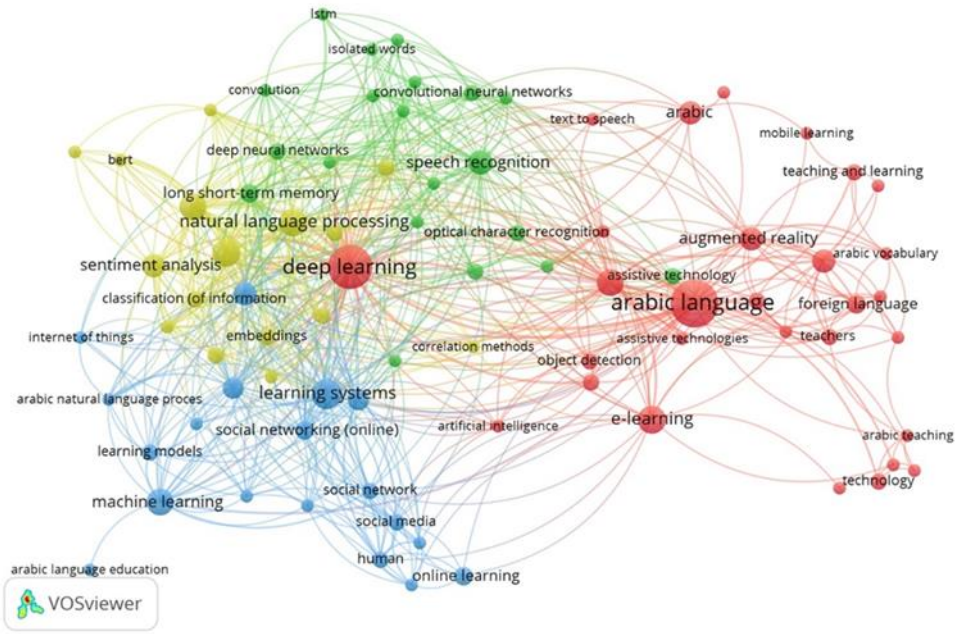

Figure 6 Research Focus

The description of the findings can be in the form of tables and images with sequential numbers, furthermore, look our example;

The research focus is highlighted by the number of clusters presented in Figure 6 above. There are four separate clusters that represent studies related to Technology in Arabic Language Learning. These clusters are distinguished by different colors: red, green, blue, and yellow. Each cluster signifies a segmentation of the research focus into four primary aspects.

1. The first cluster (colored red) consists of 29 items. In this cluster, the keywords "deep learning and e-learning" play a central role, indicating that these keywords, along with Technology in Arabic Language Learning, form the primary focus of the research.
2. The second cluster (colored green) consists of 20 items, with the keyword "speech recognition" being the focal point in this cluster. This suggests that the research focuses on "speech recognition" within the context of Technology in Arabic Language Learning.
3. The third cluster (colored blue) consists of 19 items, with the keywords "learning systems and machine learning" dominating this cluster. This indicates that the research is centered on "learning systems" in relation to Technology in Arabic Language Learning.
4. The fourth cluster (colored yellow) consists of 16 items, and the keywords "natural language processing and language processing" dominate this cluster. This shows that these keywords, along with Technology in Arabic Language Learning, are key areas of focus in the research.

The first research focus is on Deep Learning and e-learning, as seen in the study conducted by Elnagar et al (2019), which focuses on text classification in Arabic, particularly in the tasks of single-label text classification (SANAD) and multi-label text classification (NADiA). This study introduces a new, rich, and neutral dataset for both tasks, which is freely available to the research community in the field of Arabic computational linguistics. Additionally, the study compares various deep learning models for Arabic text classification without requiring data preprocessing. Meanwhile, research examining the application of e-learning in Arabic has been conducted by several researchers, such as Astuti (2018), Khomsah

& Muassomah (2021), and Ramadhan et al (2023), all of whom have explored the implementation of e-learning in the Arabic language.

The second research focus is on Speech Recognition, as seen in the study conducted by A. Rahman et al (2024), which examines the development and challenges in Arabic Speech Recognition (ASR). The study highlights that ASR systems for the Arabic language are still lagging behind those for other languages due to the complexity of its grammatical and phonetic structure. Various approaches, such as machine learning and deep learning, have been used in the development of ASR. However, significant challenges remain, such as the need for models that align with the unique characteristics of the Arabic language and the difficulty in obtaining adequate training data. The article recommends the development of more advanced and specific ASR architectures for Arabic and emphasizes the need for further research in feature extraction, language modeling, and acoustic modeling to make Arabic ASR systems more effective.

The third research focus is on learning systems and machine learning, as seen in the study conducted by Meddeb et al (2021), This article identifies challenges in personalized intelligent learning systems for Arabic-speaking users, particularly related to the complexity of natural language processing (NLP) in Arabic. To address these challenges, the authors developed a smart learning recommendation system that utilizes deep neural networks. The key findings indicate that this system successfully improves the quality of learning by providing relevant and accurate recommendations, thereby supporting a more efficient and tailored learning experience in a smart campus environment. Meanwhile, the research on machine learning conducted by Fouadi et al (2022), aimed to develop Sentiment Analysis in Arabic, with results showing that the Support Vector Machines (SVM) and Logistic Regression (LR) models achieved the highest accuracy, reaching approximately 92% and 93% in classifying positive and negative sentiments.

The latest research focus is on Natural Language Processing, as seen in the study conducted by Kaddoura & Nassar (2024). This article discusses the development of a comprehensive dataset for Word Sense Disambiguation (WSD) in the Arabic language, which is crucial for natural language processing (NLP). The dataset includes 100 polysemous words with 367 unique meanings, supplemented by 3,670 contextual sentence samples. Given the complexity of Arabic morphology and syntax, as well as the challenges of polysemy, the authors also utilized GPT-3.5-turbo to generate synthetic sentences to represent rare meanings, thereby reducing bias in NLP models. This dataset is expected to be an essential resource for the development and evaluation of NLP techniques in Arabic, particularly in sentiment analysis and text classification. The findings demonstrate significant efforts in addressing the challenges of word sense disambiguation in Arabic to improve the accuracy of NLP models.

5. Conclusion

This bibliometric analysis provides a comprehensive overview of the research development on the use of technology in Arabic language learning from 1993 to 2024. The study addresses key research questions by mapping publication trends, citation impact, and international collaborations, with Malaysia, Saudi Arabia, and Indonesia emerging as leading contributors. The findings indicate that 2023 witnessed the highest number of publications, while 2022 marked the peak of citation impact, demonstrating the influence of research published in that year. Moreover, the dominance of Q1 journals highlights the academic relevance and importance of this field.

The study identifies four primary research areas: Deep Learning and e-learning, Speech Recognition, Learning Systems and Machine Learning, and Natural Language Processing. These areas reflect the increasing role of advanced technologies in improving Arabic language pedagogy. However, this study is limited by its reliance on data from the Scopus database,

which may exclude relevant studies indexed in other sources. Additionally, the bibliometric approach does not provide qualitative insights into the effectiveness of these technologies in actual learning environments.

For future research, we recommend exploring underrepresented regions and fostering cross-border collaborations to enhance the development of sophisticated Arabic learning technologies. Further studies should also focus on the integration of emerging AI-driven tools, adaptive learning systems, and immersive technologies to maximize the effectiveness of Arabic language instruction. These advancements will contribute to the ongoing transformation of language education in the digital era.

6. REFERENCES

Administrator. (2021). *PCR Gandeng APSB Malaysia Kembangkan Aplikasi Pembelajaran Gramatikal Bahasa Arab untuk non arabic Speaker*. POLITEKNIK CALTEX RIAU.

Ahmed, A., Ali, N., Alzubaidi, M., Zaghouani, W., Abd-alrazaq, A. A., & Househ, M. (2022). Freely Available Arabic Corpora: A Scoping Review. *Computer Methods and Programs in Biomedicine Update*, *2*(October 2021), 100049. https://doi.org/10.1016/j.cmpbup.2022.100049

Al-Anzi, F. S. (2022). Improved Noise-Resilient Isolated Words Speech Recognition Using Piecewise Diferentiation. *Fractals*, *30*(8). https://doi.org/10.1142/S0218348X22402277

Alhassun, A. S., & Rassam, M. A. (2022). A Combined Text-Based and Metadata-Based Deep-Learning Framework for the Detection of Spam Accounts on the Social Media Platform Twitter. *Processes*, *10*(3). https://doi.org/10.3390/pr10030439

Asbulah, L. H., Sahrim, M., Soad, N. F. A. M., Rushdi, N. A. A. M., & Deris, M. A. H. M. (2022). Teachers' Attitudes Towards the Use of Augmented Reality Technology in Teaching Arabic in Primary School Malaysia. *International Journal of Advanced Computer Science and Applications*, *13*(10), 465–474. https://doi.org/10.14569/IJACSA.2022.0131055

Astuti, W. (2018). Pemanfaatan media berbasis e-learning dalam pembelajaran bahasa arab. *Ihtimam*, *1*(2), 121–136.

Bilquise, G., Ibrahim, S., & Shaalan, K. (2022). Bilingual AI-Driven Chatbot for Academic Advising. *International Journal of Advanced Computer Science and Applications*, *13*(8), 50–57. https://doi.org/10.14569/IJACSA.2022.0130808

Duwairi, R. M., & Halloush, Z. A. (2022). Automatic recognition of Arabic alphabets sign language using deep learning. *International Journal of Electrical and Computer Engineering*, *12*(3), 2996–3004. https://doi.org/10.11591/ijece.v12i3.pp2996-3004

Elnagar, A., Al-debsi, R., & Einea, O. (2019). Arabic text classification using deep learning models. *Information Processing and Management*, *57*(1), 102121. https://doi.org/10.1016/j.ipm.2019.102121

Elsaid, A., Mohammed, A., Ibrahim, L. F., & Sakre, M. M. (2022). A Comprehensive Review of Arabic Text Summarization. *IEEE Access*, *10*, 38012–38030. https://doi.org/10.1109/ACCESS.2022.3163292

Fouadi, H., Moubtahij, H. El, Lamtougui, H., & Yahyaouy, A. (2022). SENTIMENT ANALYSIS OF ARABIC COMMENTS USING MACHINE LEARNING AND DEEP LEARNING. *Indian Journal of Computer Science and Engineering*, *June*. https://doi.org/10.21817/indjcse/2022/v13i3/221303003

Ghani, M. T. A., Hamzah, M., Daud, W. A. A. W., & Romli, T. R. M. (2022). The Impact of Mobile Digital Game in Learning Arabic Language at Tertiary Level. *Contemporary Educational Technology*, *14*(1). https://doi.org/10.30935/cedtech/11480

Jafri, R., Althbiti, S. M. M., Alattas, N. A. A., Albraiki, A. A. A., & Almuhawwis, S. H. A.

(2022). Tac-Trace: A Tangible User Interface-Based Solution for Teaching Shape Concepts to Visually Impaired Children. *IEEE Access*, *10*(October), 131153–131165. https://doi.org/10.1109/ACCESS.2022.3228455

Kaddoura, S., & Nassar, R. (2024). A comprehensive dataset for Arabic word sense disambiguation. *Data in Brief*, *55*, 2–8. https://doi.org/10.1016/j.dib.2024.110591

Khoiriyah, H. (2020). Deskripsi Pengembangan Kurikulum Pembelajaran Bahasa Arab Di Malaysia. *Al-Lisan: Jurnal Bahasa*, *6*(1), 96–115.

Khomsah, A. F., & Muassomah, M. (2021). PENERAPAN E-LEARNING DALAM PEMBELAJARAN BAHASA ARAB DI MASA PANDEMI. *Tarbiyatuna: Jurnal Pendidikan Ilmiah*, *6*(1), 1–14.

Li, W., & Zhao, Y. (2015). Bibliometric analysis of global environmental assessment research in a 20-year period. *Environmental Impact Assessment Review*, *50*, 158–166. https://doi.org/10.1016/j.eiar.2014.09.012

Masadeh, M., Davanager, H. J., & Muaad, A. Y. (2022). A Novel Machine Learning-based Framework for Detecting Religious Arabic Hatred Speech in Social Networks. *International Journal of Advanced Computer Science and Applications*, *13*(9), 767–776. https://doi.org/10.14569/IJACSA.2022.0130991

Mayulu, H., Sawitri, E., Daru, T. P., Tricahyadinata, I., & Rorimpandey, B. (2022). Strategi Sukses Belajar Era Digital di Perguruan Tinggi. *INOVASI: Jurnal Ekonomi, Keuangan Dan Manajemen*, *18*(4), 750–757.

Meddeb, O., Maraoui, M., & Zrigui, M. (2021). Personalized Smart Learning Recommendation System for Arabic Users in Smart Campus. *International Journal of Web-Based Learning and Teaching Technologies*, *16*(6), 1–21. https://doi.org/10.4018/IJWLTT.20211101.oa9

Mohammed, S. H., & Kinyó, L. (2022). The cross-cultural validation of the technology-enhanced social constructivist learning environment questionnaire in the Iraqi Kurdistan Region. *Research and Practice in Technology Enhanced Learning*, *17*(1). https://doi.org/10.1186/s41039-022-00199-7

Moher, D. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement (Chinese edition). *Journal of Chinese Integrative Medicine*, *7*(9), 889–896. https://doi.org/10.3736/jcim20090918

Nasution, N. S., & Lubis, L. (2023). Urgensi Pembelajaran Bahasa Arab dalam Pendidikan Islam. *Jurnal Simki Pedagogia*, *6*(1), 181–191. https://doi.org/10.29407/jsp.v6i1.227

Rahman, A., Kabir, M. M., Mridha, M. F., Alatiyyah, M., Alhasson, H. F., & Alharbi, S. S. (2024). Arabic Speech Recognition: Advancement and Challenges. *IEEE Access*, *12*(March), 39689–39716. https://doi.org/10.1109/ACCESS.2024.3376237

Rahman, S. N. H. A., Ramli, Z., Bujang, N. A., Ajmain, M. T., Mahpuz, A. N., Roslan, N. R. I. M., Mohamad, A. M., & Hehsan, A. (2022). Empowering education transformation through IR 4.0: efforts in improving the quality of Arabic language education. *International Journal of Business and Globalisation*, *30*(3–4), 293 – 302. https://doi.org/10.1504/IJBG.2022.123609

Ramadhan, R., Hilmi, D., & Azhari, A. (2023). PENGGUNAAN E-LEARNING DALAM PEMBELAJARAN BAHASA ARAB : FITUR DAN POLA PENGAJARAN. *Tarbiyatuna: Jurnal Pendidikan Ilmiah*, *8*(1), 47–58.

Ritonga, M., Febriani, S. R., Kustati, M., Khaef, E., Ritonga, A. W., & Yasmar, R. (2022). Duolingo: An Arabic Speaking Skills' Learning Platform for Andragogy Education. *Education Research International*, *2022*. https://doi.org/10.1155/2022/7090752

Ritonga, M., Zulmuqim, Z., Bambang, B., Kurniawan, R., & Pahri, P. (2022). SIAKAD machine learning for correcting errors in speaking Arabic. *World Journal on Educational Technology: Current Issues*, *13*(4), 996–1004. https://doi.org/10.18844/wjet.v13i4.6270

Safrudin, R., Nandang, A., Siregar, S. D. P., Musthafa, I., Fauzi, M. F., Alby, M. H. F., &

Suyono. (2024). Development of Arabic Language Learning Research : A Bibliometric Study on Scopus (2009-2024). *Al-Ta'rib Jurnal Ilmiah Program Studi Pendidikan Bahasa Arab*, *12*(2), 321–338. https://doi.org/10.23971/altarib.v12i2.8929

Safrudin, R., Sanah, S., & Siregar, S. D. P. (2024). Research Trends on Writing Skill in Arabic Language; A Bibliometric Analysis Ramadhan. *Aphorisme: Journal of Arabic Language, Literature, and Education*, *5*(2), 94–114. https://doi.org/10.37680/aphorisme.v5i2.5442

Santi Maudiarti. (2018). Penerapan E-Learning Di Perguruan Tinggi. *PERSPEKTIF Ilmu Pendidikan*, *32*(1), 53–68.

Shabur, A., & Amadi, M. (2023). Perkembangan Pendidikan Bahasa Arab di Era Digital : Sistematic Literature Review. *Jurnal Motivasi Pendidikan Dan Bahasa*, *1*(3).

van Nunen, K., Li, J., Reniers, G., & Ponnet, K. (2018). Bibliometric analysis of safety culture research. *Safety Science*, *108*(November 2016), 248–258. https://doi.org/10.1016/j.ssci.2017.08.011

Youssef, A. R., Ali, A. A., & Sayed, F. R. (2022). Real-time Egyptian License Plate Detection and Recognition using YOLO. *International Journal of Advanced Computer Science and Applications*, *13*(7), 853–858. https://doi.org/10.14569/IJACSA.2022.0130799