NOBEL
Journal of Literature and Language Teaching
Volume 17, Number 1, April 2026, 32-45
DOI: https://doi.org/10.15642/NOBEL.2026.17.1.32-45

UTILIZING TECHNOLOGY TO DEVELOP DEEP LEARNING METHODS IN FOREIGN LANGUAGE EDUCATION: A BIBLIOMETRIC ANALYSIS

St. Asriati. Am[1]✉, St. Asmayanti Am[2], Rahmi[3]

Universitas Muhammadiyah Makassar, Jl.Sultan Alauddun No.259, South Sulawesi, Indonesia[1,2,3]

Article Info

Article History:
Received January 2026
Accepted March 2026
Published April 2026

Keywords:
English as a Foreign Language, teaching methods, technology, deep learning, bibliometric analysis

Abstract

This study examines how technology has been used to support deep learning in English as a Foreign Language (EFL) and maps research trends in this area through bibliometric analysis. The study used literature data retrieved from Google Scholar through the Publish or Perish database, covering publications from 2019 to 2022. A total of 110 publications were analyzed, including journal articles, books, conference proceedings, and book chapters. The analysis employed descriptive statistics to identify publication trends by year, document types, and citation counts. In addition, bibliometric mapping was conducted using VOSviewer to visualize keyword co-occurrence patterns and thematic clusters in the literature. The results show that technology plays an important role in supporting deep learning in EFL by helping teachers design learning activities and engage students more actively in the learning process. The keyword network also indicates that research in this area is closely related to language learning, teaching approaches, strategies, knowledge, and educational processes. Overall, the findings suggest that technology has strong potential to support the achievement of learning objectives in EFL contexts.

✉Correspondence:
Email: sittiasriati@unismuh.ac.id

p-ISSN 2087-0698
e-ISSN 2549-2470

INTRODUCTION

Deep learning in English as a Foreign Language (EFL) refers to a learning process that encourages learners to build meaningful understanding, reflect on knowledge, transfer what they learn to new contexts, and solve authentic language-related problems. In language education, deep learning is associated with active engagement, higher-order thinking, and the meaningful application of language knowledge rather than surface memorization alone (Ning & Zhu, 2016; Jiang, 2022). This concept is important because EFL learning requires not only knowledge of vocabulary and grammar, but also the ability to use language critically, contextually, and communicatively.

Technology has become an important part of educational development because it helps teachers plan instruction, organize learning resources, and direct learning activities more effectively. Educational improvement is expected to produce sustainable and meaningful outcomes, and the use of digital technology is often seen as one way to support this goal (Levin & Fullan, 2020; Alnajjar, 2022). In practice, technology supports not only students' learning activities but also the work of teachers, counselors, planners, and researchers in educational settings (Bhat, 2021). Although educational change is often accompanied by resistance, innovation remains necessary to improve the quality and relevance of learning in contemporary contexts (Kizi et al., 2022).

In EFL learning, technology is particularly important because it expands access to learning materials, supports interaction, and increases flexibility in the teaching and learning process. The rapid development of technology has accelerated the growth of online and remote learning, making digital platforms increasingly relevant in language education (Yusuf & Al-Banawi, 2013). Various tools, such as smartphones, tablets, laptops, and online learning platforms, can support e-learning and create more accessible learning environments (Murtiningsih, 2020). Previous studies have also shown that technology-based instruction can be as effective as conventional classroom teaching in supporting learning outcomes (Shadiev & Yang, 2020).

Several studies have highlighted the value of technology in supporting EFL learning. Technology can increase students' engagement and participation in classroom activities, and learners often perceive digital methods as helpful for improving English proficiency (Thi & Ha, 2021). In addition, EFL teachers have increasingly adapted digital tools and resources in designing classroom activities and learning experiences (Nugroho & Mutiaraningrum, 2020). These studies indicate that technology is not only a delivery tool but also a pedagogical support that can enrich classroom interaction and facilitate more meaningful learning.

Within this context, deep learning becomes highly relevant as a pedagogical orientation in EFL. Deep learning emphasizes understanding, reflection, knowledge reconstruction, and transfer of learning to real situations (Ning & Zhu, 2016). It also involves learning behaviors and strategies that help students develop comprehensive language competence, problem-solving ability, and the capacity to apply language knowledge in authentic contexts (Jiang, 2022). Therefore, technology can be seen as a means of supporting deep learning by enabling richer input, interaction, collaboration, and learner autonomy.

However, the term deep learning is also widely used in computer science to refer to computational models based on deep neural networks that identify patterns in large datasets (Torfi et al., 2020). This meaning differs from the pedagogical meaning used in the present study. In this article, deep learning is discussed as an educational concept in EFL, not as an artificial intelligence model. This clarification is important because the current literature often connects technology, language learning, and digital innovation, but does not always distinguish clearly between deep learning as a computational method and deep learning as a learning approach.

Research on technology in language education has grown rapidly, but studies that specifically map the relationship between technology and deep learning in EFL remain limited. Most previous studies have focused on the effectiveness of digital tools, online platforms, or technology-enhanced classroom activities, while fewer studies have examined how this body of research is distributed, connected, and clustered in the scholarly literature. For this reason, a bibliometric approach is useful for identifying publication trends, citation patterns, and keyword relationships in this field.

Based on this gap, the present study aims to examine how technology has been used to support deep learning in EFL and to map research trends through bibliometric analysis. The study addresses the following research question: How can technology assist teachers in developing their instructional methods? To answer this question, the study uses metadata obtained from Google Scholar and analyzes it using bibliometric mapping with VOSviewer. Through this approach, the study is expected to contribute to a clearer understanding of the development of technology-supported deep learning in English as a Foreign Language.

REVIEW OF LITERATURE

Research on technology in education has shown that digital tools are increasingly shaping teaching and learning practices. In language education, technology is used not only to deliver materials but also to support interaction, access to resources, learner participation, and

pedagogical innovation. For this reason, the present study draws on previous research to understand how technology has been discussed in relation to deep learning and EFL.

One important point of departure is the broader use of the term deep learning in technology-related research. Khalifa (2022) explains that deep learning has been widely applied in computer science fields such as computer vision, image classification, and object detection. In this context, deep learning depends on large datasets and computational models that learn patterns from data. Although this meaning differs from the pedagogical meaning used in the present study, it remains relevant because it shows that the term deep learning has strong technological associations in contemporary scholarship. This overlap helps explain why research on education and technology may draw on the same terminology, even when the conceptual focus is different.

In EFL contexts, technology has been shown to support student engagement and language development through a range of digital platforms. Al-Hammouri et al. (2022) found that YouTube videos had a significant positive effect on EFL students. Their findings showed that YouTube-supported learning was associated with interaction, listening and speaking skills, and vocabulary development, with self-efficacy acting as an important moderating factor. This study is relevant because it demonstrates how digital media can support more active and meaningful learning experiences in language classrooms.

Teachers' experiences and pedagogical choices also influence technology integration in EFL. Cahyono et al. (2023) reported that the integration of mobile devices into English teaching was shaped by teachers' experiences, expectations, and reflections. Their study suggests that technology-supported instruction is not merely a matter of tool use, but also a matter of pedagogical adaptation. In post-pandemic contexts, this becomes especially important, as teachers are expected to integrate technology into both online and offline language-learning environments.

More broadly, the spread of technology in education reflects changes in literacy practices and learning demands in the digital era. Hashim (2018) argues that technological development has expanded the role of digital literacy in education and has transformed how current generations learn. This shift is important because students increasingly learn in technology-rich environments, while teachers are challenged to design instruction that prevents passive learning and promotes stronger engagement.

Taken together, these studies show that the literature connects technology, language learning, learner engagement, and pedagogical change in meaningful ways. However, the studies also come from different conceptual strands, ranging from deep learning in

computational research to digital tools in EFL practice. It indicates a need for a broader mapping of how the literature is distributed and connected. Therefore, the present study uses bibliometric analysis to identify publication trends, citation patterns, and keyword relationships related to technology and deep learning in EFL.

METHOD

This study employed a bibliometric approach to map research trends on the use of technology to support deep learning in English as a Foreign Language (EFL). Bibliometric studies are useful for identifying publication patterns, citation trends, and the structure of knowledge within a research field. In general, bibliometric analysis includes descriptive and evaluative elements because it examines the growth of literature, the distribution of publications, and the influence of documents through citation data (Al Qital & Rusydiana, 2022).

The analysis was conducted as a bibliometric literature review. This approach enables researchers to organize existing scholarly knowledge, identify research trends, detect knowledge gaps, and position a study within the broader development of a field. In the present study, bibliometric analysis was used to examine how technology and deep learning have been discussed in EFL-related scholarship.

The data were collected using Publish or Perish, with Google Scholar as the source database. Google Scholar was selected because it provides broad coverage of education-related literature, including journal articles, books, conference proceedings, and book chapters. This wide coverage was considered useful for capturing a broader view of the literature on technology and EFL. However, Google Scholar also has limitations, such as less standardized metadata and possible variation in document quality compared with more selective databases, such as Scopus or Web of Science.

The search process used keywords related to the topic, including English-language learning, modern methods, classical methods, and technology. The search was limited to English-language publications published from 2019 to 2022. Based on this process, 110 publications were obtained from the Google Scholar database. These publications were then screened and prepared for bibliometric analysis.

The analysis used both descriptive statistics and bibliometric mapping. A descriptive analysis was used to identify the number of publications by year and document type, and to calculate citation counts. The bibliometric mapping was conducted using VOSviewer to visualize relationships among keywords in the dataset. More specifically, the study used

keyword co-occurrence analysis to identify terms that frequently co-occurred in the literature. This type of network analysis is useful for showing the conceptual structure of a research field.

In VOSviewer, clustering was used to group related keywords into thematic clusters. Each cluster represents a set of terms that frequently co-occur, indicating areas of research that are conceptually connected. Therefore, the interpretation of clusters in this study was based on the assumption that terms appearing together in the same network reflect shared themes or research interests in the literature.

The main bibliometric indicators used in this study were: (1) number of publications, (2) publication trends by year, (3) citation counts, (4) document types, and (5) keyword co-occurrence patterns. Through these indicators, the study aimed to identify the dominant themes, influential publications, and emerging directions in research on technology-supported deep learning in EFL.

RESULTS AND DISCUSSIONS

Distribution of Publications by Year

A total of 110 publications were identified in the dataset and classified into four document types: journal articles, books, book chapters, and conference proceedings. The yearly distribution shows that journal articles were the dominant publication type throughout the study period. In 2019, the dataset included 17 journal articles, 3 book chapters, 1 book, and 1 conference proceeding. In 2020, the number of journal articles increased substantially to 29, while books and book chapters accounted for 1 publication each, and conference proceedings increased to 2. In 2021, journal articles remained dominant, with 26 publications, followed by 3 book chapters and 3 conference proceedings, with no books identified. In 2022, the number of journal articles returned to 17, with no books or book chapters and only 1 conference proceeding.

These findings indicate that journal articles were the primary medium for disseminating research on technology and deep learning in EFL during 2019–2022. The increase in publications in 2020 and 2021 suggests that scholarly attention to this topic became stronger during this period. This pattern may indicate growing academic interest in technology-supported language learning and the need to examine new teaching approaches in changing educational contexts. In contrast, the smaller number of books, book chapters, and conference proceedings suggests that research in this area was communicated more often through journal-based publications than through other academic formats.

For more details, the following diagram of publication distribution is presented below.

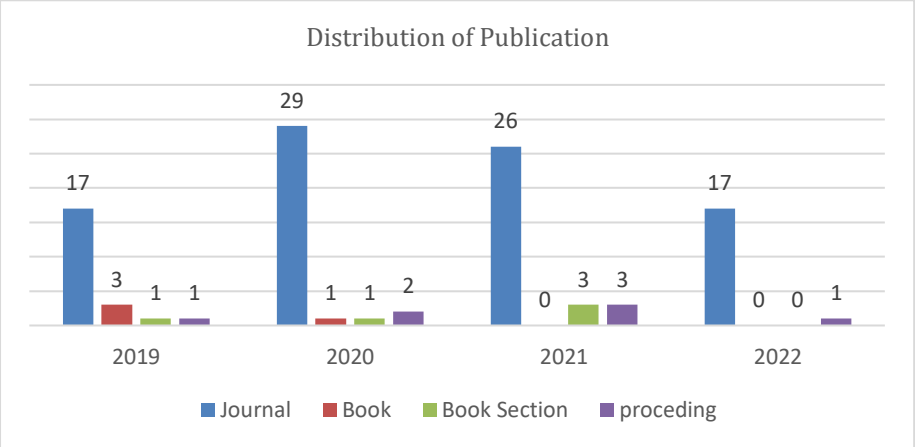

Figure 1: Distribution of Publication

Citation Analysis

Citation analysis was used to identify the most influential publications in the dataset. Among the 110 documents analyzed, the most highly cited work was The Role of English as a Global Language by Parupalli, Srinivas Rao (2019), with 297 citations. It was followed by Self-Determination and Classroom Engagement of EFL Learners: A Mixed-Methods Study of the Self-System Model of Motivational Development by Dincer, Noels, and Lascano (2019), which received 91 citations. The third most cited work was Benefits and Challenges of Blended Learning amid COVID-19 from EFL Students by Dahmash (2020), with 59 citations. The fourth was The Challenges of E-learning Through Microsoft Teams for EFL Students at Van Lang University in COVID-19 by Tam Ly Nhat Duong and Nhi Huyen Uyen Nguyen (2021), with 36 citations. The fifth was Strategies of Successful English Language Learners among Private School Students by Stella Ang, Mohamed Amin Embi, and Melor Md. Yunus (2019), with 27 citations.

These citation patterns are significant because they show which topics have received the greatest scholarly attention in the field. Highly cited works are often influential because they address broad and relevant issues, provide useful conceptual frameworks, or discuss topics that are widely applicable across educational contexts. In this dataset, the most-cited studies focus on global English, learner motivation, blended learning, e-learning challenges, and successful language-learning strategies. It suggests that the literature on technology and EFL is shaped not only by technological tools themselves, but also by broader pedagogical concerns such as student engagement, learning environments, and language-learning effectiveness.

The high citation counts of these works may also reflect their visibility and accessibility within Google Scholar, especially when the topics are closely related to current educational needs and widely discussed teaching practices. Therefore, citation frequency in this study should be understood not only as an indicator of quality but also as a sign of relevance, influence, and topic visibility within the scholarly community.

For more details, the following table presents the top five cited publications.

Table 1. Citation Analysis: Top Five Authors, Documents, and Sources

Position	Title	Author	Year	Source	Citated
1.	The Role of English as A Global Language	Rao, Parupalli Srinivas	2019	Google Scholar ISSN: 2456-2696	297
2.	Self-Determination and Classroom Engagement of EFL Learners: A Mixed-Methods Study of the Self-System Model of Motivational Development	Dincer, Ali; Yeşilyurt, Savaş; Noels, Kimberly A.; Vargas Lascano, Dayuma I.	2019	Google Scholar, DOI: 10.1177/2158244019853913	91
3.	'I Couldn't Join the Session': Benefits and Challenges of Blended Learning amid COVID-19 from EFL Students	Dahmash, Nada Bin	2020	Google Scholar, DOI: 10.5539/ijel.v10n5p221	59
4.	The Challenges of E-learning Through Microsoft Teams for EFL Students at Van Lang University in COVID-19	Nguyen, Huyen Uyen Nhi; Duong, Ly Nhat Tam	2021	Google Scholar	36
5.	Strategies of Successful English Language Learners among Private School Students	Ang, Stella; Embi, Mohamed Amin; Yunus, Melor Md.	2017	Google Scholar	27

Keyword Co-occurrence and Network Visualization

To identify relationships among key terms in the literature, keyword co-occurrence analysis was conducted using VOSviewer. The minimum threshold was set at five occurrences per keyword. Based on this threshold, 44 items were connected in the network and grouped into five clusters. In this visualization, larger nodes indicate more frequent keyword occurrences, and the links between nodes represent stronger relationships among co-occurring terms in the dataset.

The first cluster, shown in red, contains 13 items related to methods and approaches in language learning, including approaches, English language, language teaching, methodology,

second language, strategy, teaching English, and theory. This cluster suggests that a substantial portion of the literature concerns pedagogical approaches and theoretical perspectives in language education. The prominence of these terms indicates that research on technology in EFL is closely linked to questions of teaching method and instructional design. This interpretation is consistent with the view that digital techniques can stimulate learner engagement in EFL settings (Thi & Ha, 2021).

The second cluster, shown in green, contains 11 items related to instructional models and implementation contexts, such as blended learning, EFL students, flipped classroom approach, integration, opinion, researcher, and university. This cluster highlights the importance of technology integration in specific learning environments and shows that much of the literature focuses on how different models of technology-supported instruction are applied in practice. The presence of terms such as blended learning and the flipped classroom approach indicates that the field is interested in flexible pedagogical models that combine technological tools with student-centered learning. This interpretation can also be linked to communicative teaching approaches that emphasize meaningful interaction in and beyond the classroom (Parab, 2020).

The third cluster, shown in blue, includes 11 items related to instructional implementation and classroom research, such as application, control group, effect, experimental group, instruction, knowledge, participant, telegram, term, and test. This cluster suggests that part of the literature is empirical and intervention-based, focusing on the effects of particular tools or instructional treatments on learners. It also shows that researchers have examined technology use through classroom-based studies and comparison groups. This finding aligns with Atmojo and Nugroho (2020), who reported that teachers used a range of digital platforms, including learning management systems, messaging tools, video conferencing tools, content creators, and streaming resources in online EFL teaching.

The fourth cluster, shown in yellow, consists of items related to technology in the educational process, including activity, computer technology, educational process, foreign language teaching, process, type, and vocabulary. This cluster indicates that the literature also considers the practical use of technology in classroom activities and language development. Its presence reinforces the view that technology is not treated only as a supporting tool, but as part of the broader instructional process in foreign language teaching.

The fifth cluster, shown in purple, includes more general terms such as article, concept, education, edutainment, and review. Although smaller than the other clusters, this group suggests that some publications are more conceptual or review-oriented and contribute to broader discussions of educational technology.

Overall, the network visualization shows that research on technology and deep learning in EFL is distributed across interconnected themes involving pedagogy, instructional models, empirical classroom practice, and educational processes. The clustering pattern indicates that the field is multidisciplinary and that discussions of technology in EFL extend beyond tools to include strategy, participation, and knowledge development.

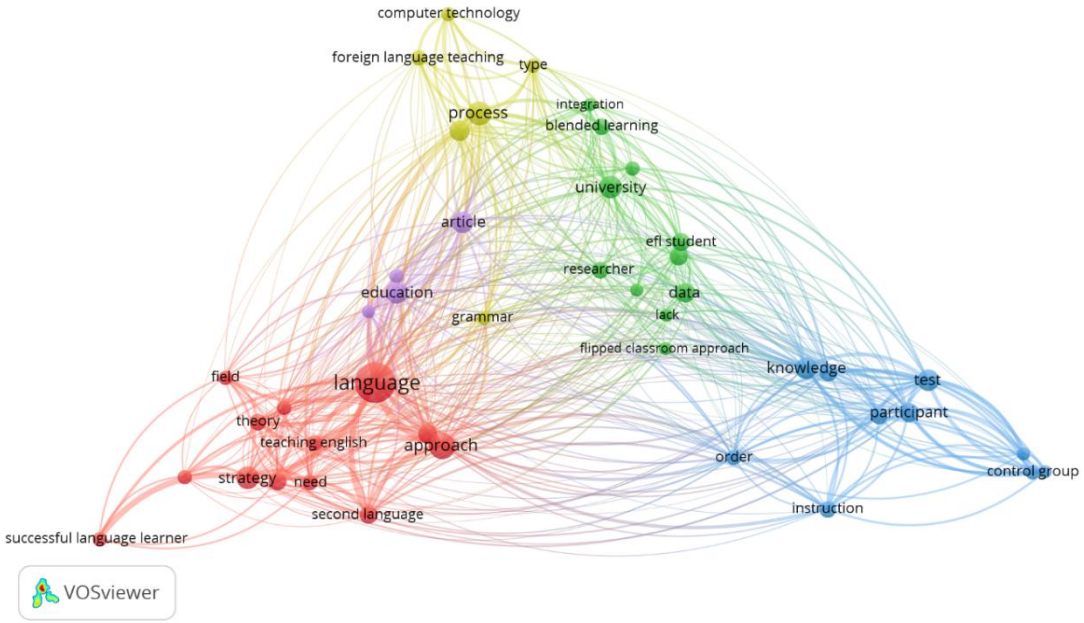

Figure 2: Network Visualization

Density Visualization

The density visualization provides a broader view of which topics are most strongly represented in the dataset. In this type of visualization, colors range from blue to green to yellow, with brighter areas indicating higher keyword density. Larger, brighter areas indicate where research activity is more concentrated.

The density map indicates that the most prominent topics in the literature are related to language, approach, process, strategy, knowledge, and participants. These terms appear in brighter areas, suggesting they occupy central positions in the research network. This finding is important because it shows that the literature primarily focuses on how technology supports language learning processes, teaching strategies, and learner participation.

By contrast, terms such as successful language learners, control groups, fields, instruction, computer technology, foreign language learning, type, second language, and flipped classroom approach appear less densely represented. These less prominent terms may indicate

underexplored areas that still offer room for future investigation. Therefore, the density visualization not only describes the current structure of the literature but also helps identify possible directions for further research.

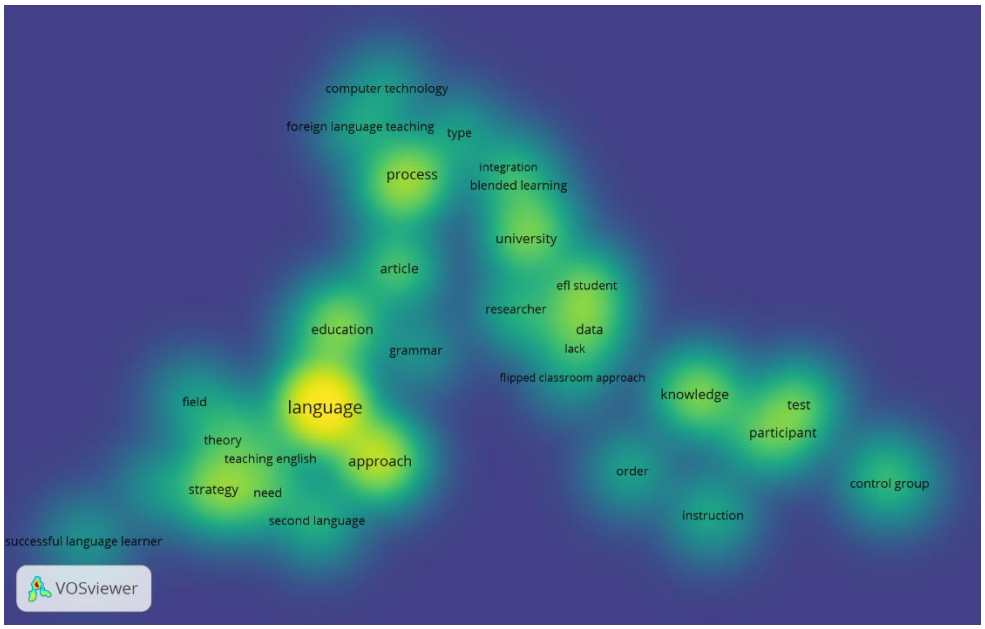

Figure 3: Density Visualization

CONCLUSION

This study examined how technology has been used to support deep learning in English as a Foreign Language (EFL) through a bibliometric analysis of publications indexed in Google Scholar from 2019 to 2022. The findings show that journal articles dominated research on this topic and that publication activity increased notably in 2020 and 2021. The keyword co-occurrence analysis further revealed that the literature is strongly associated with themes such as language, approach, process, strategy, knowledge, and participant-related terms. These patterns suggest that technology is widely discussed in relation to teaching methods, learning processes, and pedagogical practices in EFL.

The study also indicates that technology has strong potential to support deep learning in EFL. Based on the bibliometric mapping, technology is connected not only with instructional tools but also with broader educational processes, including learner engagement, strategy use, and classroom interaction. In this sense, technology can support teachers in developing more meaningful learning environments and can help students engage more actively in language learning.

This study contributes to the literature by providing a structured overview of publication trends, citation patterns, and thematic relationships related to technology-supported deep

learning in EFL. The findings help clarify how this field has developed and which topics have received the greatest scholarly attention.

However, this study has several limitations. First, the analysis included only publications indexed in Google Scholar via Publish or Perish. Although this database offers broad coverage, it may contain less standardized metadata and varying document quality. Second, the analysis was limited to publications from 2019 to 2022, thereby excluding earlier and more recent developments.

Future research should expand the scope of analysis to include other major databases, such as Scopus and Web of Science. Further studies may also focus on topics that appeared less frequently in the present dataset, such as successful language learners, control groups, instruction, computer technology, second language learning, and flipped classroom approaches. Exploring these less-represented themes may provide a more detailed understanding of how technology can support deep learning in EFL.

Acknowledgments (Optional)

The researchers are indebted to the Nobel Journal of Literature and Language Teaching for evaluating the article and providing appropriate feedback for improvement.

REFERENCES

Al-Hammouri, Q., Ghaith, M. M., Abueita, J. D., Ababneh, E., Altaher, A. M., Al-Gasawneh, J., & Mansour, A. (2022). The influence of using Youtube videos on EFL learners: The moderating role of technological self-efficacy. *Xinan Jiaotong Daxue Xuebao/Journal of Southwest Jiaotong University*, *57*(5), 598–609. https://doi.org/10.35741/issn.0258-2724.57.5.48

Alnajjar, E. A. M. (2022). The impact of a proposed science curriculum based on digital technologies on students' achievement and motivation towards learning science. *Webology*, *19*(1), 434–446. https://doi.org/10.14704/web/v19i1/web19031

Al Qital, S., & Rusydiana, A. S. (2022). Islamic economic crisis: A systematic review using bibliometric analysis. *Journal of Islamic Economics (JoIE)*, *2*(2), 126–149. https://doi.org/10.21154/joie.v2i2.5075

Ang, S., Embi, M. A., & Yunus, M. M. (2017). Strategies of successful English language learners among private school students. *Jurnal Pendidikan Humaniora*, *5*(2), 47–57. https://doi.org/10.17977/2442-3890.1179

Atmojo, A. E. P., & Nugroho, A. (2020). EFL classes must go online! teaching activities and challenges during Covid-19 pandemic in Indonesia. *Register Journal*, *13*(1), 49–76. https://doi.org/10.18326/rgt.v13i1.49-76

Bhat, S. A. (2021). The positive and negative impact of new technology on accelerated learning during Covid-19 pandemic. *International Journal of Applied Research*, *7*(8), 41–44. https://doi.org/10.22271/allresearch.2021.v7.i8a.8821

Cahyono, B. Y., Khotimah, K., Batunan, D. A., & Imamyartha, D. (2023). Workable approaches in EFL teaching mediated by mobile technology during the pandemic and post-pandemic: Indonesian EFL teachers' experiences and expectations. *Call-Ej*, *24*(1), 137–158. https://old.callej.org/journal/24-1/Cahyono-Khotimah-Batunan-Imamyartha2023.pdf

Dahmash, N. Bin. (2020). 'I couldn't join the session': Benefits and challenges of blended learning amid COVID-19 from EFL students. *International Journal of English Linguistics*, *10*(5), 221–230. https://doi.org/10.5539/ijel.v10n5p221

Dincer, A., Yeşilyurt, S., Noels, K. A., & Vargas Lascano, D. I. (2019). Self-determination and classroom engagement of EFL learners: A mixed-methods study of the self-system model of motivational development. *Sage Open*, *9*(2), 1–15. https://doi.org/10.1177/2158244019853913

Hashim, H. (2018). Application of technology in the digital era education. *International Journal of Research in Counseling and Education*, *1*(2), 1. https://doi.org/10.24036/002za0002

Jiang, R. (2022). Understanding, investigating, and promoting deep learning in language education: A survey on Chinese college students' deep learning in the online EFL teaching context. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.955565

Khalifa, N. E., Loey, M., & Mirjalili, S. (2022). A comprehensive survey of recent trends in deep learning for digital images augmentation. *Artificial Intelligence Review*, *55*(3), 2351–2377. https://doi.org/10.1007/s10462-021-10066-4

Kizi, S. G. N., Najmiddinovna, R. Z., & Najmiddinovna, R. K. (2022). Innovative approaches in foreign language teaching. *International Journal of Social Science & Interdisciplinary Research*, *11*(05), 19–21. https://gejournal.net/index.php/IJSSIR/article/view/453

Levin, B., & Fullan, M. (2020). Learning about system renewal. *Educational Management Administration and Leadership*, *36*(2), 289–303. https://doi.org/10.1177/1741143207087778

Murtiningsih, T. (2020). Utilizing online learning to enhance English skills on intensive English class. *International Journal of Educational Best Practices*, *4*(2), 48. https://doi.org/10.31258/ijebp.v4n2.p48-59

Nguyen, H. U. N., & Duong, L. N. T. (2021). The challenges of E-learning through Microsoft Teams for EFL students at Van Lang university in COVID-19. *AsiaCALL Online Journal*, *12*(4), 18–29.

Ning, Y., & Zhu, X. (2016). Deep learning in effective English teaching strategy of senior high. *Proceedings of the 2016 4th International Education, Economics, Social Science, Arts, Sports and Management Engineering Conference (IEESASM 2016)*, 1281–1285. https://doi.org/10.2991/ieesasm-16.2016.281

Nugroho, A., & Mutiaraningrum, I. (2020). EFL teachers beliefs and practices about digital learning of English. *EduLite: Journal of English Education, Literature and Culture*, *5*(2), 304. https://doi.org/10.30659/e.5.2.304-321

Parab, V. V. (2020). Global technique of teaching English through English: Pedagogy, proficiency and performance. *A Global Journal of Interdisciplinary Studies*, *875*(Ii), 49–66. https://www.gapinterdisciplinarities.org/res/articles/49-66.pdf

Rao, P. S. (2019). The role of English as a global language. *Research Journal Of English (RJOE)*, *4*(1), 65–79.

Shadiev, R., & Yang, M. (2020). Review of studies on technology-enhanced language learning and teaching. *Sustainability (Switzerland)*, *12*(2). https://doi.org/10.3390/su12020524

Thi, N., & Ha, T. (2021). Implementing digital techniques to stimulate EFL students' engagement: A case study in Vietnam. *International Journal of TESOL & Education*, *1*(3), 105–129. Retrieved from http://eoi.citefactor.org/10.11250/ijte.01.03.007

Torfi, A., Shirvani, R. A., Keneshloo, Y., Tavaf, N., & Fox, E. A. (2020). Natural language processing advancements by deep learning: A survey. *IEEE*, 1–23. Retrieved from http://arxiv.org/abs/2003.01200

Yusuf, N., & Al-Banawi, N. (2013). The impact of changing technology and working. *Contemporary Issues in Education Research*, *6*(2), 173–180. https://files.eric.ed.gov/fulltext/EJ1073195.pdf