A Glance at Computer-Assisted Language Learning (CALL): A Bibliometric Analysis

Patahuddin
elbazthakim@umpar.ac.id
Universitas Muhammadiyah Parepare, Indonesia
Hartono Bancong
hartonobancong@unismuh.ac.id
Universitas Muhammadiyah Makassar, Indonesia
Syawal (*Corresponding Author*)
awal.umpar@gmail.com
Universitas Muhammadiyah Parepare, Indonesia
Harni Jusuf
harnijusuf@iaingorontalo.ac.id
IAIN Sultan Amai Gorontalo, Indonesia

Abstract. Computer-assisted language Learning (CALL) is a learning method that uses computers as auxiliary media to facilitate language learning. This study aims to provide a comprehensive overview of the development of research in Computer-Assisted Language Learning (CALL) in the last five years based on the Scopus database. This quantitative study uses bibliometric analysis with the search keyword Computer-Assisted Language Learning (CALL). The results of this study highlight a significant increase in the number of articles about Computer-Assisted Language Learning (CALL) indexed by Scopus every year, starting from 142 articles in 2018 and 2023, which increased to 251. The type of publication is dominated by journal articles, followed by conference papers and reviews, and the rest in the form of books or book chapters. The largest source of publications comes from *Lecture Notes in Computer Science* (including the subseries *Lecture Notes in Artificial Intelligence* and *Lecture Notes in Bioinformatics*) with 29 publications. Our comprehensive analysis reveals a significant downward trend in citations from 2018 to 2023. Furthermore, based on the visualization using VOSviewer shows the use of AI technology in language teaching and the impact of digital media on language learning. The results of this study show that it is essential to continue to review and evaluate the factors influencing the dissemination and acceptance of CALL research. Moreover, it is crucial to reinforce the continuity between technological innovation and practical practice in various areas of life, thereby highlighting the real-world impact of CALL research.

Keywords: *Computer-assisted language learning; Bibliometric analysis; Scopus database; Adaptive learning; AI technology in language learning*

A. INTRODUCTION

Nowadays, the world has undergone tremendous change thanks to the quick development of Internet technology, which has also revolutionized access to education (Rowland et al., 2015). The Internet has rapidly developed into a vital source of knowledge and services since its inception (Praphamontripong et al., 2007). Before this, computers in language laboratories were used to teach and study languages, and their contribution to second language curricula was deemed unsuccessful (Blake, 2008). As a result, the computer lab is no longer used, and the Internet is used instead (Baten, 2007; Taylor & Gitsaki, 2003). Technology integration in education can also take the form of blended learning, which combines traditional face-to-face instruction with online learning. In blended learning, the instructor uses technology to give information to students while maintaining formal in-person or in-class interactions, and students alternate between in-person and online classes (Han and Ellis, 2020). The benefits of blended learning include expanding the scope of training, making it simple to implement, affordable, and cost-effective, meeting various demands, and improving training responsiveness (Carter, 2013). At the same time, other reasons that encourage most institutions to implement blended learning include widening participation, improving learning, flexibility of provision, well-known e-learning early adopters, and computer-aided assessment (Sharpe et al., 2006). This strategy has been shown to accomplish learning objectives for instructors and students (Yankovskaya et al., 2018) Moreover, it boosts foreign language proficiency and results (Abdullah, 2018; Noni, 2009).

A critique emphasizes that using a computer as a teaching tool is not encouraged in language learning because it is incompatible with language learning principles (Hayes, 1991). On the other hand, a large body of evidence supports the benefits of technology-assisted language acquisition. Internet technology has typically provided input and accommodated output for language learners. (Wrigglesworth & Harvor, 2018) Websites, mainly as a technology component, have been successfully used to teach four skills, including listening (Romeo, 2008), speaking (Hsu, 2016); (Hung & Huang, 2016; Hwang et al., 2016; Lin, 2015; Shih, 2010; Y. Yang et al., 2011) reading (Abdullah, 2018; Chen & Huang, 2014; Coire & Dobler, 2007). Additionally, the website has welcomed academics to research language-related topics like grammar

(Abuseileek, 2009; Baturay et al., 2010; Kılıçkaya, 2015) and pronunciation (Golonka et al., 2014), producing promising results.

However, a 2004 study that claimed web-based learning students did not outperform traditional learners (Poon et al., 2004) showed that learning with Internet technology does not always entail satisfying results. Aside from that conclusion, much research undoubtedly documents the detrimental effects of technology use in education. However, nobody can dismiss technology since many studies have reported technology's prospects (Abdullah, 2018; Greenhow et al., 2009; Y. Yang et al., 2011; S. et al., 2001). If carefully considered, these conflicting findings highlight the fact that numerous important factors influence the success of teaching and learning, including, but not limited to, the use of instructional technology (Maki & Maki, 2002), motivation (ChanLin, 2009), learning design (Li et al., 2016), and student feedback. It is evident that the claim that technological integration results in improved performance is not unquestionably accurate (Troyan, 2012). According to (Haertel and Means, 2003), technology is an amplifier of educational practices rather than a direct cause of change.

Meanwhile, bibliometric analysis is emerging as a valuable quantitative approach to understanding research dynamics in various fields (Sidiq, 2019). This Bibliometric analysis aims to provide deeper insights into developing computer-assisted language learning. By applying this approach, we strive to identify dominant research patterns, contributions from multiple sources, and gaps that need to be filled in this field for future research. Thus, bibliometric analysis paves the way (Hicksa et al., 2011). The aim is to explore various publications, including journal articles, books, and relevant conferences, through bibliometric analysis (Academia, 2023); it will analyse publication trends, top authors, and popular topics in the literature (Purnomo, 2019).

In this research, a bibliometric analysis of the literature on computer-assisted language learning is expected to provide a comprehensive picture of the status of research in computer-assisted language learning. This will reveal some of the following research questions: How many publications on computer-assisted language learning have been published in Scopus from 2018 – 2023; What are the Types of publications on computer-assisted language learning published in Scopus from 2018 – 2023; What are the top 20 sources of Scopus-indexed publications on computer-

assisted language learning published in Scopus from 2018 – 2023; How many Citation per-year on computer-assisted language learning published in Scopus from 2018 – 2023; and how is the map of Visualization viewed from Density Visualization on computer-assisted language learning published in Scopus from 2018 – 2023

B. RESEARCH METHOD

This study analyzed the data obtained from the Scopus database with the keyword "computer-assisted language learning" from 2018 to 2023. The search was narrowed to the last five years, and the data was collected on June 20, 2024. The search found 1251 "computer-assisted language learning" publications within the publication title. The Scopus database is a widely used source for evaluating scientific research. It is one of the largest data centers in the world and provides accurate information about the metadata of each scientific article, including publication date, abstracts, and references (Wan Mohammad & Mohd Azmi, 2023). The obtained data is analyzed using Microsoft Excel and then visualized using VOSviewer. VOSviewer is a software tool for constructing and visualising bibliometric networks to map scientific research publications on computer-assisted language learning. VOSviewer is designed explicitly for co-occurrence analysis and pays special attention to the graphical representation of bibliometric maps (van Eck & Waltman, 2020). Its functionality is handy for displaying large bibliometric maps in an easy-to-interpret manner (van Eck & Waltman, 2020).

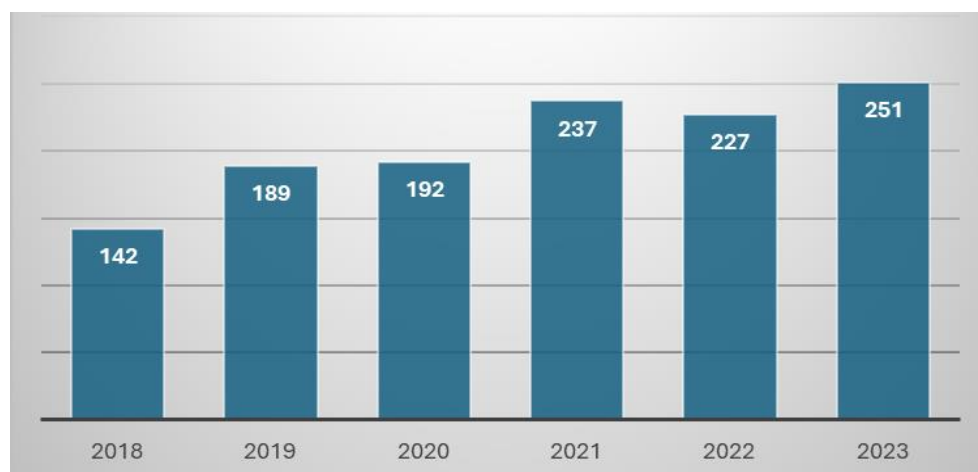## C. FINDINGS AND DISCUSSIONS

Findings

Figure 1. Publication by year

Figure 1. illustrates the number of publications on Computer-Assisted Language Learning indexed by Scopus published per year from 2018 to 2023. In 2018, the number of publications recorded was 142, the lowest figure in the period analyzed. However, in the following year, 2019, there was a significant increase with 189 publications, indicating an increase of around 33% compared to the previous year. The upward trend continued in 2020, with a minor increase to 192 publications, an increase of only 1.6% from 2019. The period between 2020 and 2021 showed a more drastic surge in publications. In 2021, the number of publications jumped to 237, an increase of about 23.4% compared to the previous year. 2022 marked a slight decline, with total publications reaching 227, down 4.2% from 2021. However, this decline appears to be temporary as in 2023, the number of publications again increased significantly, reaching 251 publications, up about 10.6% from 2022, making it the year with the highest number of publications in the period analyzed. In conclusion, figure 1 shows an upward trend in publications year-over-year, except for a slight decline in 2022. The giant spikes occurred between 2020 and 2021, and although there were minor fluctuations in 2022, the upward trend continued again in 2023. This data shows increased interest or ability to publish publications over time, highlighting the positive dynamics in publication production during the six years.

Table 1. Types of Publications

Year	Article	Conf. Paper	Review
2018	82	42	11
2019	103	67	12
2020	119	47	20
2021	143	61	23
2022	142	57	16
2023	146	42	46

Based on the distribution of various publications indexed by Scopus on Computer-Assisted Language Learning, the data collected is the type of publication above ten publications per year, including journal articles, conference papers, and reviews from 2018 to 2023. The data shows that in 2018, the total publications comprised 82 journal articles, 42 conference papers, and 11 reviews. Journal articles dominated this year's publication type, followed by relatively few conference papers and reviews. The year

2019 showed significant improvements in all categories. Journal articles rose to 103, conference papers increased to 67, and reviews slightly increased to 12. In 2020, the number of journal articles increased to 119, while conference papers saw a modest decline to 47. Review reviews have jumped significantly to 20, almost double the previous year. The upward trend in journal articles continued until 2021, reaching 143. The number of conference papers also increased to 61, and reviews continued to rise to 23, showing steady growth in all categories.

However, in 2022, the number of journal articles decreased slightly to 142, only one publication lower than the previous year. Conference papers also dropped to 57, while reviews dropped to 16. However, this trend did not last long because 2023 showed significant changes. Journal articles slightly increased to 146, while conference papers dropped significantly to 42. In contrast, the number of reviews jumped dramatically to 46, almost triple from the previous year, and was the highest number of reviews in the period analyzed. Overall, this data shows that journal articles remain the most dominant type of publication each year, with fluctuations that tend to be positive. Conference papers have undergone several variations, with a significant decline in 2023. The review shows an upward trend, with the most significant spike occurring in 2023. This data shows that the dynamics and focus on publications have changed over six years, with increasing attention to reviews in the last year analyzed.

Table 2. The top 20 sources of Scopus-indexed publications

No	Sources	Amount
1	Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)	29
2	Proceedings of the Annual Conference of the International Speech Communication Association, INTERSPEECH	26
3	Computer Assisted Language Learning	25
4	Computers in Biology and Medicine	24
5	ACM International Conference Proceeding Series	23
6	IEEE Journal of Biomedical and Health Informatics	19
7	CALL-EJ	19
8	PLoS ONE	18
9	Computer Methods and Programs in Biomedicine	16
10	Foreign Language Annals	15
11	International Journal of Emerging Technologies in Learning	14
12	Journal of Physics: Conference Series	13

13	CEUR Workshop Proceedings	12
14	Language Learning and Technology	12
15	ReCALL	11
16	Advances in Intelligent Systems and Computing	11
17	Medical Image Analysis	10
18	Journal of Digital Imaging	9
19	Diagnostics	8
20	Artificial Intelligence in Medicine	8

Table 2 shows the top 20 sources of Scopus-indexed publications on Computer Assisted Language Learning between 2018 and 2023. The largest source of publications comes from *Lecture Notes in Computer Science* (including the subseries *Lecture Notes in Artificial Intelligence* and *Lecture Notes in Bioinformatics*) with 29 publications. This shows a strong dominance in computer science, artificial intelligence, and bioinformatics. This was followed by the Proceedings of the Annual Conference of the International Speech Communication Association, INTERSPEECH, with 26 publications showing high interest and activity in voice communication and language technology. *Computer Assisted Language Learning* came in third place with 25 publications, highlighting the importance of technology in language learning. Meanwhile, *Computers in Biology and Medicine* recorded 24 publications, underlining the application of computers in biology and medicine. The fifth position is filled by *the ACM International Conference Proceeding Series*, which has 23 publications showing the various research in computer science and information technology represented in this conference.

The IEEE Journal of Biomedical and Health Informatics* and *CALL-EJ* each recorded 19 publications, demonstrating a balanced interest in biomedical health informatics and computer-aided language education. *PLoS ONE*, a well-known multidisciplinary journal, has 18 publications, reflecting a broad spectrum of published research. *Computer Methods and Programs in Biomedicine* recorded 16 publications emphasizing computer methods and programs in biomedicine. *Foreign Language Annals,* with 15 publications, indicate significant research in foreign language teaching. Other prominent sources include *the International Journal of Emerging Technologies in Learning*, with 14 publications pointing to emerging new technologies in learning. *The Journal of Physics: Conference Series* has 13 publications, underlining the contributions in physics presented at the conference. *CEUR Workshop Proceedings* and *Language*

Learning and Technology have 12 publications each, reflecting vital research in language learning science and technology workshops.

Sources with slightly lower but still significant publication counts include *ReCALL* and *Advances in Intelligent Systems and Computing*, with 11 publications each emphasizing intelligent systems and technology in learning. *Medical Image Analysis* has ten publications demonstrating the importance of medical image analysis in research. *Sources that have a lower but still significant* number of publications include *the Journal of Digital Imaging* (9 publications), *Diagnostics* (8 publications), and *Artificial Intelligence in Medicine* (8 publications), which each focus on digital imaging, medical diagnostics, and AI applications in medicine. Overall, this data shows a rich diversity in the sources of publications used to advance research across various disciplines, with a strong focus on computer science, language technology, biomedical, and education. The top sources underscore research trends in applied technologies, language communication, and medical applications, providing an in-depth picture of the dynamic and evolving academic landscape.
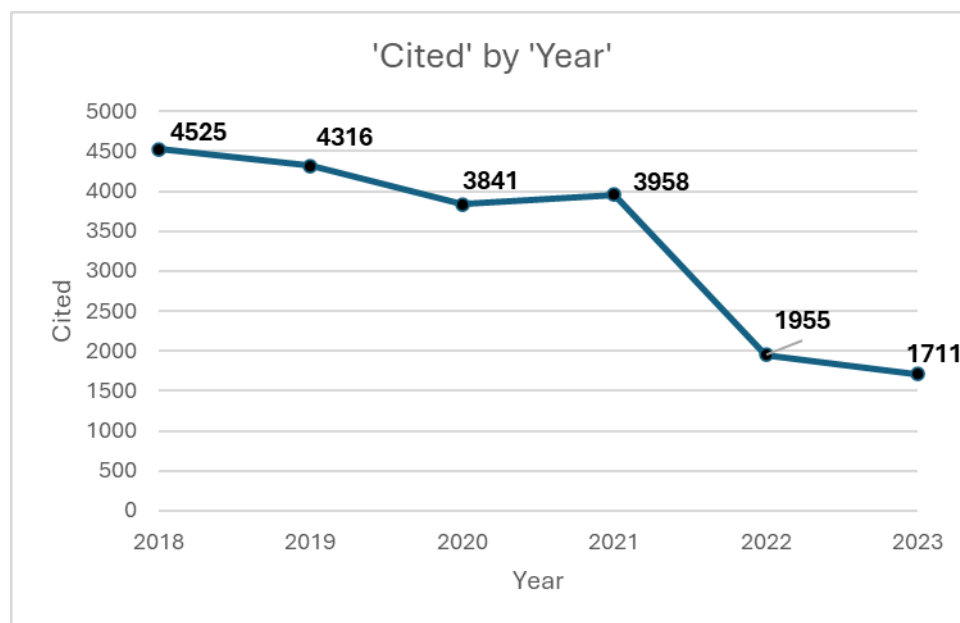

Figure 2. Citation per-year

The citation trend for Computer Assisted Language Learning in articles indexed by Scopus from 2018 to 2023 shows that in 2018, the number of citations received reached its peak with 4525 citations. This is the highest number in the period analyzed, indicating that publications from previous years received significant recognition and

impact this year. However, in the following year, 2019, the number of citations decreased to 4316, experiencing a decrease of 209 citations, or around 4.6%. This decline continued in 2020, when the number of citations dropped to 3841, a decrease of 475 citations or around 11% compared to 2019. In 2021, this downward trend reversed with a slight increase in citations to 3958, an increase of about 3% compared to 2020. This increase indicates a slight recovery in recognition and relevance of publications from the previous year. However, the downward trend occurred again in 2022, with a drastic decrease in citations, reaching only 1955. This is a sharp decline, almost half of the number of citations in the previous year, marking a decline of 50.6%. This decline continued into 2023, with the number of citations decreasing to 1711, about 12.5% lower than in 2022.

The comprehensive analysis reveals a significant downward trend in citations from 2018 to 2023. While there was a slight increase in 2021, the overall trend remained downward. The sharp decline from 2021 to 2023 may indicate a change in research focus, the number of publications cited, or a change in citation behaviour within the scientific community. This decline could also reflect a change in the quality or relevance of research published in previous years. Further analysis is crucial to understand the factors that led to this decline and how these trends may impact future research.
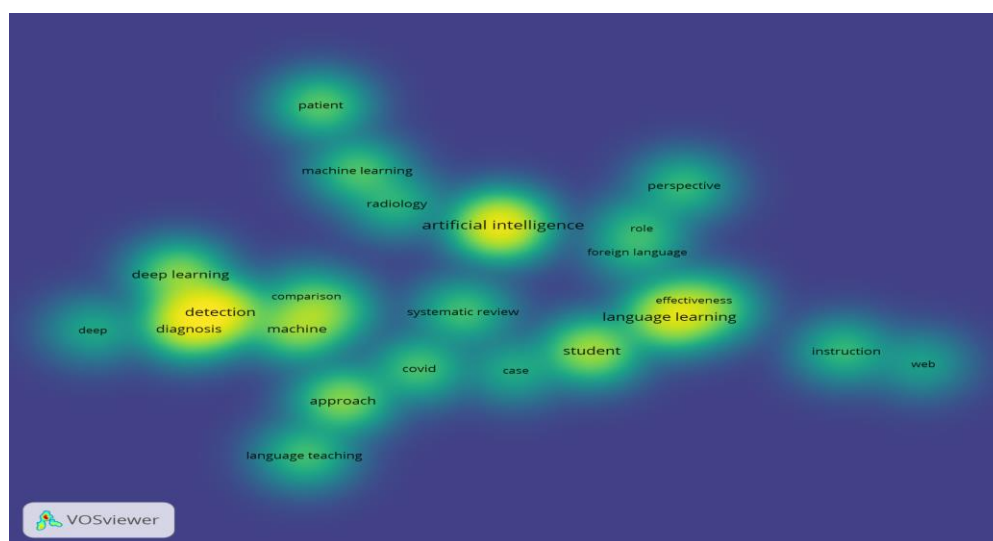

Figure 3. Density Visualization

Figure 3 presents a visualization of the Density visualization (heatmap) of the VOSviewer software application of terms that often appear in research on computer-

assisted language learning indexed by Scopus between 2018 and 2023. The colours on the map indicate the frequency and strength of the relationship between the terms, with lighter colours indicating higher frequencies or connectivity. Based on this data, information was obtained that Artificial Intelligence (AI) appears to be the term that appears most often and is connected to many other terms such as machine learning, deep learning, and detection. This shows that AI played a crucial role in research on computer-assisted language learning indexed by Scopus between 2018 and 2023. In addition, language learning is also prominent and has a high frequency, indicating that language learning is one of the main focuses in research on computer-assisted language learning. It is closely related to other terms such as student, effectiveness, and language teaching, signifying attention to the effectiveness and methods of language teaching. On the other hand, terms such as detection and diagnosis are prominent in this map, especially in artificial intelligence and machine learning contexts. This suggests that the use of AI in detection and diagnosis, likely in medical contexts such as radiology or COVID-19, is a significant research topic. The interconnectedness with terms such as radiology and patient focus on AI medical applications to improve patient diagnosis and management.

This density visualization also shows that the terms machine learning and deep learning often appear and are connected to AI, medical topics, and language learning. This shows the widespread use of machine learning techniques in research, developing new technologies, and practical applications in the medical and educational fields. This visualization also shows that the word covid appears concerning several terms, suggesting that research focuses on the pandemic and its impact. The term systematic review is also seen, suggesting that much of the research is a thorough review of the existing literature, especially perhaps in COVID-19 and its use in AI research. Furthermore, terms such as student, instruction, and web related to language learning show significant research exploring the effectiveness of educational technology and teaching methods in language learning. This may include using web-based tools and modern instructional approaches to enhance language learning. Other clusters that emerge from this visualization include perspective, comparison, and role, highlighting the existence of research that focuses not only on the development of specific technologies or applications but also on the critical evaluation and comparison of

methods and their role in various contexts. What is difficult is the term "systematic review," which indicates the existence of a structured approach to evaluating and analyzing existing literature and providing comprehensive insights on various topics. Overall, this thermal map depicts a rich and diverse research landscape, with a strong focus on the use of AI in various fields, particularly in medical detection and language learning. The strong interconnectedness between the terms suggests that AI and learning technology are highly interconnected and rapidly evolving topics.

The findings of this study provide an overview of how essential media supports learning foreign languages. Many media are appropriate for students and can be adapted to the teacher's teaching methods. One of the media is AI, the most popular learning tool nowadays. Besides that, providing space for teachers to play a role and be intelligent in applying technology in learning is an ideal contribution to learning foreign languages. The learning experience by utilising technology is not limited to AI, which allows teachers and students to participate in real-world and authentic experiences. (Rasmussen & Northrup, 1999)

D. CONCLUSION

Based on data from the Scopus database, publications on Computer-Assisted Language Learning (CALL) between 2018 and 2023 show an interesting trend. There has been a significant increase in the number of publications, sources, and types of documents, reflecting the growing interest in applying technology in language learning. However, there is a striking difference in citations, with the number of citations to CALL publications consistently declining over that period. This decline may indicate a challenge in recognising and disseminating the impact of such research within the scientific community despite the increase in the production of scientific literature. This phenomenon of declining citations may be attributed to the complexity of adopting and integrating CALL research findings into broader educational practices, or it may be related to the rapidly evolving nature of technology, making older publications feel less relevant over time. In this context, it is essential to continue to review and evaluate the factors influencing the dissemination and acceptance of CALL research results and identify strategies to increase the impact and scientific use of such findings.

The study also revealed that between 2018 and 2023, searches with the keyword "Computer-Assisted Language Learning" (CALL) in the Scopus database highlighted several key trends. One of these trends is a significant increase in interest in applying artificial intelligence in the context of language learning. This method includes developing applications that support interactive language teaching and utilizing technology to improve the efficiency and effectiveness of second language learning. Additionally, the study highlights the use of AI in diagnosis and detection in health sciences, demonstrating the growing adoption of this technology to improve the accuracy of medical diagnosis and disease management. The research also emphasizes the importance of developing responsive and adaptive language learning methods, which can adapt the curriculum and teaching strategies according to the individual needs of learners. This approach is driven by advances in AI-based learning technology, which allows for personalising learning experiences and using data analytics to refine learning strategies. Therefore, this research underscores not only the evolution of CALL in the context of educational technology but also its far-reaching implications in the domains of health and language teaching, reinforcing the continuity between technological innovation and practical practice in various areas of life.

REFERENCES

Abdullah, M. (2018). Reading speed and comprehension enhancement in hybrid learning delivery mode. *Advances in Language and Literary Studies*, *9*(3). https://doi.org/10.7575/aiac.alls.v.9n.3p.25

Abuseileek, A. F. (2009). The effect of using an online-based course on learning grammar inductively and deductively. *ReCALL*, *21*(3). https://doi.org/10.1017/S095834400999005X

Baten, L. (2007). Review of Chapelle, Carol A. (2003) English language learning and technology: lectures on applied linguistics in the age of information and communication technology. *ITL - International Journal of Applied Linguistics*, *154*. https://doi.org/10.1075/itl.154.12bat

Baturay, M. H., Daloglu, A., & Yildirim, S. (2010). Language practice with multimedia supported web-based grammar revision material. *ReCALL*, *22*(3). https://doi.org/10.1017/S0958344010000182

Blake, R. J. (2008). Brave new digital classroom: Technology and foreign language learning. In *Brave New Digital Classroom: Technology and Foreign Language Learning*. https://doi.org/10.5860/choice.46-6326

Carter, L. (2013). The other blended learning: A Classroom-centered approach. *Canadian Journal of University Continuing Education*, *33*(1). https://doi.org/10.21225/d5ds3w

ChanLin, L. J. (2009). Applying motivational analysis in a web-based course.

Innovations in Education and Teaching International, *46*(1). https://doi.org/10.1080/14703290802646123

Chen, C. M., & Huang, S. H. (2014). Web-based reading annotation system with an attention-based self-regulated learning mechanism for promoting reading performance. *British Journal of Educational Technology*, *45*(5). https://doi.org/10.1111/bjet.12119

Coire, J., & Dobler, E. (2007). Exploring the online reading comprehension strategies used by sixth-grade skilled readers to search for and locate information on the Internet. *Reading Research Quarterly*, *42*(2). https://doi.org/10.1598/rrq.42.2.2

Golonka, E. M., Bowles, A. R., Frank, V. M., Richardson, D. L., & Freynik, S. (2014). Technologies for foreign language learning: A review of technology types and their effectiveness. In *Computer Assisted Language Learning* (Vol. 27, Issue 1). https://doi.org/10.1080/09588221.2012.700315

Greenhow, C., Robelia, B., & Hughes, J. E. (2009). Learning, teaching, and scholarship in a digital age: Web 2.0 and classroom research: What path should we take now? *Educational Researcher*, *38*(4). https://doi.org/10.3102/0013189X09336671

Haertel, G. D., & Means, B. (2003). *Evaluating educational technology: effective research designs for improving learning* (1st ed.). Teachers College Press.

Han, F., & Ellis, R. A. (2020). Initial development and validation of the perceptions of the blended learning environment questionnaire. *Journal of Psychoeducational Assessment*, *38*(2). https://doi.org/10.1177/0734282919834091

Hayes, E. (1991). Review: The complete theory-to-practice handbook of adult literacy: Curriculum design and teaching approaches. *Adult Learning*, *3*(3). https://doi.org/10.1177/104515959100300313

Hicksa, D., Woutersb, P., Waltmanb, L., Rijckeb, S. de, & ... (2011). Bibliometrik: Manifesto Leiden untuk metrik penelitian Diana Hicks. *Leidenmanifesto.Org*. http://www.leidenmanifesto.org/uploads/4/1/6/0/41603901/bibliometrik_-_manifesto_leiden_untuk_metrik_penelitian.pdf

Hsu, H. C. (2016). Voice blogging and L2 speaking performance. *Computer Assisted Language Learning*, *29*(5). https://doi.org/10.1080/09588221.2015.1113185

Hung, S. T. A., & Huang, H. T. D. (2016). Blogs as a learning and assessment instrument for English-speaking performance. *Interactive Learning Environments*, *24*(8). https://doi.org/10.1080/10494820.2015.1057746

Hwang, W. Y., Shadiev, R., Hsu, J. L., Huang, Y. M., Hsu, G. L., & Lin, Y. C. (2016). Effects of storytelling to facilitate EFL speaking using Web-based multimedia system. *Computer Assisted Language Learning*, *29*(2). https://doi.org/10.1080/09588221.2014.927367

Kılıçkaya, F. (2015). Computer-based grammar instruction in an EFL context: improving the effectiveness of teaching adverbial clauses. *Computer Assisted Language Learning*, *28*(4). https://doi.org/10.1080/09588221.2013.818563

Li, N., Marsh, V., & Rienties, B. (2016). Modelling and managing learner satisfaction: Use of learner feedback to enhance blended and online learning experience. *Decision Sciences Journal of Innovative Education*, *14*(2). https://doi.org/10.1111/dsji.12096

Lin, H. (2015). A meta-synthesis of empirical research on the effectiveness of computer-mediated communication (CMC) in SLA. *Language, Learning and Technology*, *19*(2).

Maki, W. S., & Maki, R. H. (2002). Multimedia comprehension skill predicts

differential outcomes of web-based and lecture courses. *Journal of Experimental Psychology: Applied*, *8*(2). https://doi.org/10.1037/1076-898X.8.2.85

Noni, N. (2009). The Use of Computer assisted language learning (CALL) to improve students' english achievement based on modes of teaching delivery. *Jurnal Pendidikan Dan Pembelajaran*, *16*, 101–106.

Poon, W. C., Low, K. L. T., & Yong, D. G. F. (2004). A study of Web-based learning (WBL) environment in Malaysia. *International Journal of Educational Management*, *18*(6). https://doi.org/10.1108/09513540410554031

Praphamontripong, U., Gokhale, S., Gokhale, A., & Gray, J. (2007). An Analytical approach to performance analysis of an asynchronous web server. *Simulation*, *83*(8). https://doi.org/10.1177/0037549707080891

Purnomo, A. (2019). Manfaat penelitian bibliometrik untuk Indonesia dan Internasional. *Bina Nusantara University*, *December 2019*.

Rasmussen, K. L., & Northrup, P. T. (1999). Situated learning online: Assessment strategies for online expeditions. *Assessment for Effective Intervention*, *25*(1). https://doi.org/10.1177/073724779902500108

Romeo, K. (2008). A web-based listening methodology for studying relative clause acquisition. *Computer Assisted Language Learning*, *21*(1). https://doi.org/10.1080/09588220701865508

Rowland, C., Whiting, J., & Smith, J. (2015). *What do you need to create and maintain web accessibility?* https://doi.org/10.1108/s2056-769320150000002002

Sharpe, R., Benfield, G., Roberts, G., & Francis, R. (2006). The undergraduate experience of blended e-learning: A review of UK literature and practice. *The Higher Education Academy*, *October*. https://doi.org/10.1111/j.1470-3327.2005.00614.x

Shih, R. C. (2010). Blended learning using video-based blogs: Public speaking for English as a second language students. *Australasian Journal of Educational Technology*, *26*(6). https://doi.org/10.14742/ajet.1048

Sidiq, M. (2019). *Panduan analisis bibliometrik sederhana*. https://doi.org/10.13140/RG.2.2.15688.37125

Taylor, R. P., & Gitsaki, C. (2003). Teaching well in a computerless classroom. *International Journal of Phytoremediation*, *21*(1). https://doi.org/10.1076/call.16.4.275.23412

Troyan, F. J. (2012). Standards for foreign language learning: Defining the constructs and researching learner outcomes. *Foreign Language Annals*, *45*(SUPPL.1). https://doi.org/10.1111/j.1944-9720.2012.01182.x

van Eck, N. J., & Waltman, L. (2020). VOSviewer manual version 1.6.16. *Univeristeit Leiden*, *November*, 1–52.

Wan Mohammad, W. N. S., & Mohd Azmi, N. N. (2023). Building information modeling (BIM)-Based information management platform in the construction industry. *International Journal of Academic Research in Business and Social Sciences*, *13*(4). https://doi.org/10.6007/ijarbss/v13-i4/16922

Wrigglesworth, J., & Harvor, F. (2018). Making their own landscape: smartphones and student designed language learning environments. *Computer Assisted Language Learning*, *31*(4). https://doi.org/10.1080/09588221.2017.1412986

Yang, S. C. (2001). Language learning on the world wide web: An investigation of EFL learners' attitudes and perceptions. *Journal of Educational Computing Research*, *24*(2). https://doi.org/10.2190/VDJC-FGTQ-79FH-M615

Yang, Y., Wang, Q., Woo, H. L., & Quek, C. L. (2011). Using facebook for teaching and learning: A review of the literature. *International Journal of Continuing Engineering Education and Life-Long Learning*, *21*(1). https://doi.org/10.1504/IJCEELL.2011.039695

Yankovskaya, A. E., Dementev, Y. N., Lyapunov, D. Y., & Yamshanov, A. V. (2018). Learning outcomes evaluation based on mixed diagnostic tests and cognitive graphic tools. *Advances in Intelligent Systems and Computing*, *677*. https://doi.org/10.1007/978-3-319-67843-6_11