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Blended learning research in Indonesia (2018–2023): A bibliometric analysis of trends, challenges, and opportunities

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Abstract

The bibliometric analysis of blended learning research in Indonesia from 2018 to 2023 reveals a transformative landscape influenced by the COVID-19 pandemic. This study examines scientific production, thematic evolution, and research dynamics surrounding blended learning, utilizing advanced bibliometric techniques and visualization tools. The findings indicate a significant surge in publications during 2020–2021, reflecting the educational sector's rapid adaptation to unprecedented disruptions. Through comprehensive keyword network analysis and citation patterns, the study uncovers multidimensional perspectives on blended learning, emphasizing technological integration, pedagogical innovation, and socio-cultural considerations. The research highlights a complex interplay between technological advancements, educational methodologies, and systemic challenges. Furthermore, the study spans multiple disciplines, including social sciences, physics, computer science, and engineering, demonstrating the interdisciplinary nature of blended learning implementation. Despite remarkable progress, critical barriers persist, including limitations in digital infrastructure, unequal technological access, and inadequate educator preparedness. These challenges underscore the need for strategic interventions to enhance the effectiveness of blended learning. By providing nuanced insights into Indonesia's evolving educational landscape, this analysis highlights both opportunities and obstacles in implementing blended learning strategies across diverse educational contexts.

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Blended learning, hybrid learning, e-learning, bibliometric analysis, Indonesia.

INTRODUCTION

The outbreak of the Covid-19 pandemic has led to significant disruptions across various sectors globally, with education being one of the most affected. In particular, the closure of educational institutions necessitated a rapid transition from traditional face-to-face teaching to online and remote learning (Adrianus Sihombing *et al.*, 2021). This shift posed several challenges for educators and students, highlighting deficiencies in digital infrastructure, technology access, and pedagogical approaches. The pandemic underscored the urgent need for flexible and adaptable learning models (Janse Van Vuuren *et al.*, 2023). Among the proposed solutions, blended learning has emerged as a promising approach that can address both short-term disruptions and long-term educational needs (Kumari, 2023).

Blended learning, which combines face-to-face instruction with online components, offers a flexible educational model to enhance learning outcomes, engagement, and overall student satisfaction (Tabassum *et al.*, 2024). It allows for a more personalized and learner-centred approach by allowing students to engage with in-person and digital content. The benefits of blended learning are well-documented, particularly in its ability to support diverse learning styles and foster

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deeper learning experiences (Saarsar, 2018). While blended learning is not a novel concept, the Covid-19 pandemic accelerated its adoption, particularly as educational institutions scrambled to transition to online platforms. This rapid shift highlighted the importance of having a robust curriculum capable of integrating digital tools while ensuring that learning objectives are met despite the challenges posed by the pandemic (Hermanto & Srimulyani, 2021).

Curriculum development is a critical element in ensuring the success of blended learning. As educational systems increasingly move toward hybrid or fully online environments, curricula must be adapted to incorporate both digital technologies and traditional face-to-face interactions. Integrating blended learning into the curriculum requires careful consideration of learning outcomes, instructional design, and technology. Adapting curricula, particularly during times of crisis, must also ensure equity in access to technology and support for both students and educators (Gul & Khilji, 2021). Given the growing significance of blended learning, the need to understand how curricula can evolve to meet the demands of this model is an essential area of focus for researchers and policymakers.

In Indonesia, the rapid adoption of blended learning during the Covid-19 pandemic presents opportunities and challenges. The country's educational landscape, characterized by significant disparities in access to digital resources between urban and rural areas, faced additional complications in transitioning to digital learning environments (Jayanthi & Dinaseviani, 2022). Moreover, issues such as limited digital literacy, inadequate infrastructure, and socio-economic disparities have further complicated the implementation of blended learning in Indonesia (Ratnaningsih *et al*., 2024). Despite these challenges, blended learning has garnered increasing attention in the Indonesian academic community, with researchers and educators exploring ways to adapt teaching methods to the evolving demands of the digital age.

Based on the previous discussion, this study aims to provide a bibliometric analysis of the research trends on blended learning in Indonesia, focusing on articles indexed in the Scopus database. By using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), a recognised method for conducting systematic literature reviews (Liberati *et al*., 2009), this study seeks to identify the most significant developments in blended learning research in Indonesia. The analysis uses Vos Viewer and Bibliometrix software to map out key trends, influential authors, and the evolution of research topics related to blended learning. Through this approach, the study will provide a comprehensive overview of the state of blended learning research in Indonesia, identifying the key themes and gaps in the literature, while highlighting the implications for future research and practice. By analyzing the trends in publication over time, this study aims to identify the factors that have contributed to this growth and the potential sustainability of blended learning research in Indonesia post-pandemic (Oktaria *et al*., 2023).

Additionally, this study explores the key subject areas associated with blended learning research, including social sciences, computer science, physics, and educational technology, highlighting their prevalence in Indonesian research and the interdisciplinary nature of blended learning. It also identifies influential authors and journals shaping the field, offering insights into research dissemination and impact. Through a comprehensive bibliometric analysis, the study examines emerging trends, challenges, and opportunities, shedding light on strengths, limitations, and areas for further investigation. The findings serve as a valuable resource for policymakers, educators, and researchers working to integrate blended learning effectively, particularly in contexts with digital infrastructure challenges. Additionally, this research contributes to the global discourse on blended learning's evolving role in education, offering insights for developing nations striving to bridge the digital divide while ensuring accessibility and quality.

METHOD

This study employs a bibliometric analysis approach to examine trends in blended learning research in Indonesia (Aria & Cuccurullo, 2017). Bibliometric analysis is a quantitative method

to evaluate academic literature's patterns, structures, and relationships. This approach allows for identifying prominent authors, influential journals, and key research topics and the evolution of these themes over time. To ensure a comprehensive analysis, the study focuses on data from the Scopus database, a widely recognised and extensive source of peer-reviewed literature across various academic disciplines. Scopus was chosen for its high indexing standards and broad coverage of education, technology, and social sciences—key areas related to blended learning.

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework was employed to guide the systematic selection and inclusion of studies (Liberati *et al*., 2009). PRISMA provides a transparent and structured process for conducting systematic reviews and ensures methodological rigour. This framework guarantees that only high-quality, relevant articles are included, reducing bias and increasing the reliability of the findings. By following the PRISMA methodology, the study ensures that the selection of articles is both comprehensive and replicable.

The data collection process involved searching the Scopus database using the keywords "blended learning," "hybrid learning," "e-learning," and "COVID-19". These keywords were selected based on their relevance to blended learning research and their prevalence in the academic literature related to educational technology and pandemic-related shifts in learning environments. The search was limited to articles published between 2013 and 2023, allowing for an analysis of trends over the past decade, focusing on the impact of COVID-19, which triggered significant interest in blended learning models globally.

The inclusion criteria for this study were articles that focused on blended learning, hybrid learning, or related educational models, specifically those that referenced or applied to the Indonesian context. Only peer-reviewed articles published in English were included, and only studies available in full-text format were considered. Articles that did not meet these criteria or were not indexed in Scopus were excluded. This process resulted in 180 articles that met the inclusion criteria and were analysed for the bibliometric study.

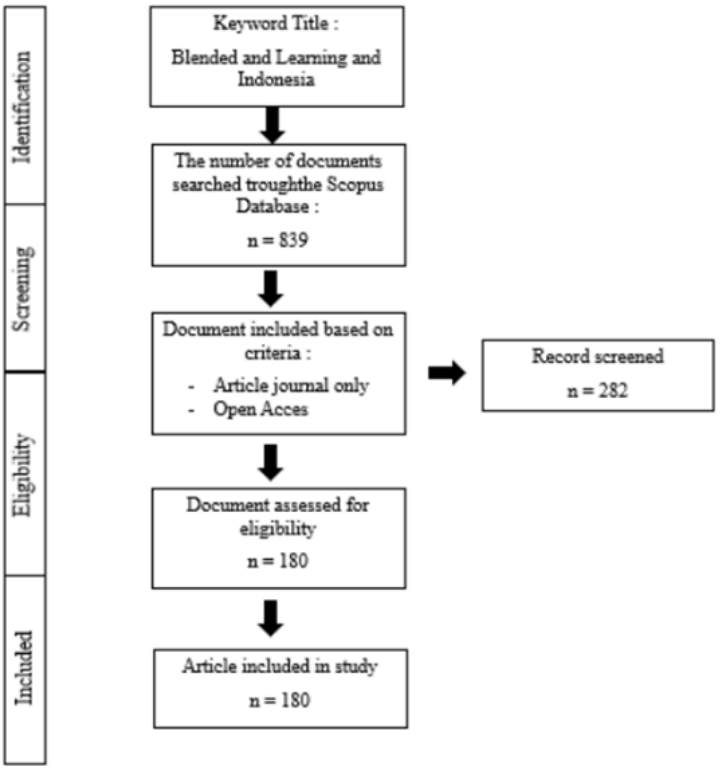


Figure 1 The PRISMA flow diagram

Vos Viewer and Bibliometric were used for data analysis as they facilitate the visualisation of keyword co-occurrence, co-authorship networks, and citation relationships (Van Eck & Waltman, 2010). This software enabled the construction of a network of related research topics, authors, and journals, making it possible to identify significant research clusters and trends visually. Bibliometric, an R-based package, was employed for statistical analysis, providing insights into the temporal distribution of publications, key authors, and citation patterns (Aria & Cuccurullo, 2017). This tool also allowed for analysing the most frequently used keywords, highlighting central research themes in blended learning. These tools provided qualitative and quantitative insights into the landscape of blended learning research in Indonesia.

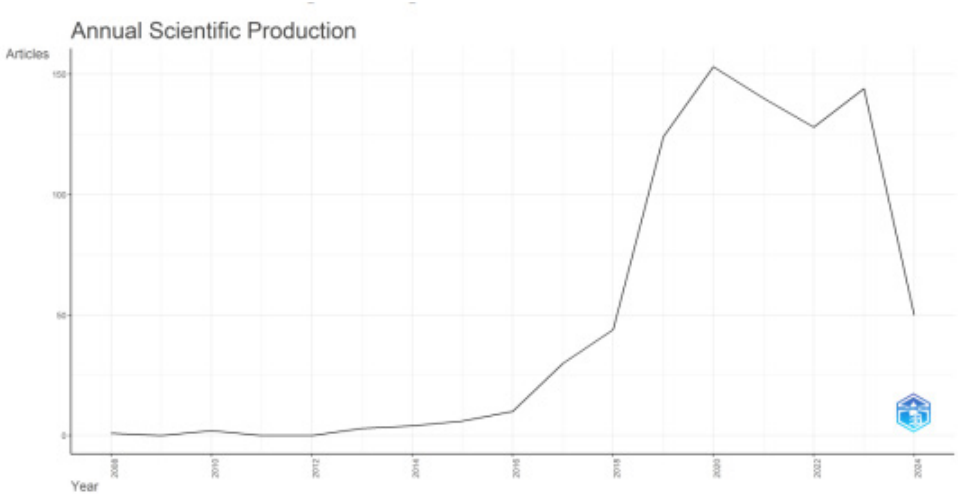
The study analysed publication trends over time to identify key shifts, particularly in response to the Covid-19 pandemic. The temporal distribution of articles from 2013 to 2023 was carefully examined to determine the extent to which blended learning research had increased, especially post-2020, when the pandemic accelerated the adoption of blended learning worldwide. This period saw a significant spike in publications, which was then assessed in the context of how the pandemic influenced the focus of educational research in Indonesia. Several factors strategically justify the exclusive use of Scopus as the database source: its position as one of the largest peer-reviewed literature repositories, comprehensive coverage of high-quality academic publications, particularly in educational technology, and its advanced bibliometric data extraction capabilities that seamlessly integrate with analytical tools.

RESULT AND DISCUSSION

A. Temporal trends in blended learning research

The examination of annual scientific production highlights a significant increase in publications focusing on blended learning within Indonesia, particularly from 2020 onwards. This surge coincides with the global disruption caused by the Covid-19 pandemic, catalysing a rapid and necessary transformation in educational methodologies. Blended learning emerged as an adaptable and effective solution to mitigate the challenges of school closures and the abrupt shift to remote learning (Atmojo & Nugroho, 2020). The substantial rise in research activity reflects an intensified academic interest in understanding, refining, and implementing blended learning models to respond to these unprecedented disruptions.

Figure 2 Annual average citation trends



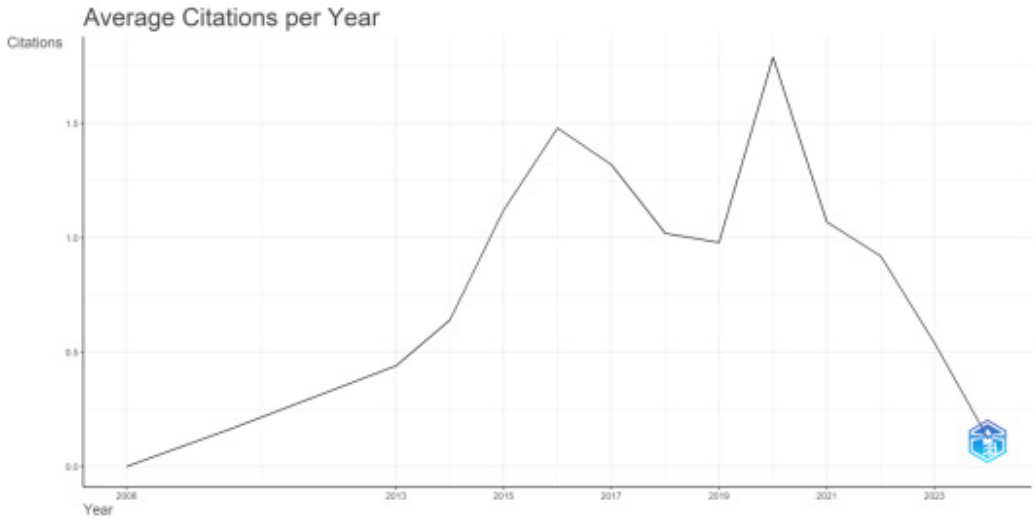
The data in Figure 2 reveals a pronounced peak in research output during 2020 and 2021, underscoring the urgency of adapting to pandemic-induced educational challenges. This peak can be attributed to the need for immediate practical solutions and heightened governmental and institutional support for research in this area (Cahyadi *et al.*, 2021). Following this peak, a

slight decline in research productivity in subsequent years likely signals a stabilisation phase as researchers and institutions adjust to the "new normal" and prioritise long-term sustainability over immediate responses. Such trends underscore the crucial role of global crises in spurring educational innovation and research advancement, further reinforcing the value of resilience and adaptability in educational systems (Lien & Timmermans, 2024).

B. Average citations per year

Figure 3, depicting the average citations per year, provides further insight into the influence and reach of blended learning research within academic discourse. The data illustrate a steady increase in average citations beginning in 2013, followed by a sharp rise between 2018 and 2019. This increase coincides with the broader recognition of blended learning's potential and alignment with global educational shifts toward digital and hybrid models (Ashraf et al., 2021).

Figure 3 Average citation per year



The peak in citations during 2019 suggests that foundational studies conducted during this period became widely referenced as the field matured and expanded. This period likely served as a pivotal moment when researchers consolidated prior findings and applied them to practical contexts, particularly as the Covid-19 pandemic emerged. However, a decline in average citations post-2021 aligns with the normalisation of research activity in the post-pandemic phase. This suggests a potential narrowing in the field's immediate relevance as institutions adapt to blended learning, emphasising the importance of renewed focus on innovative and longitudinal studies to sustain scholarly engagement.

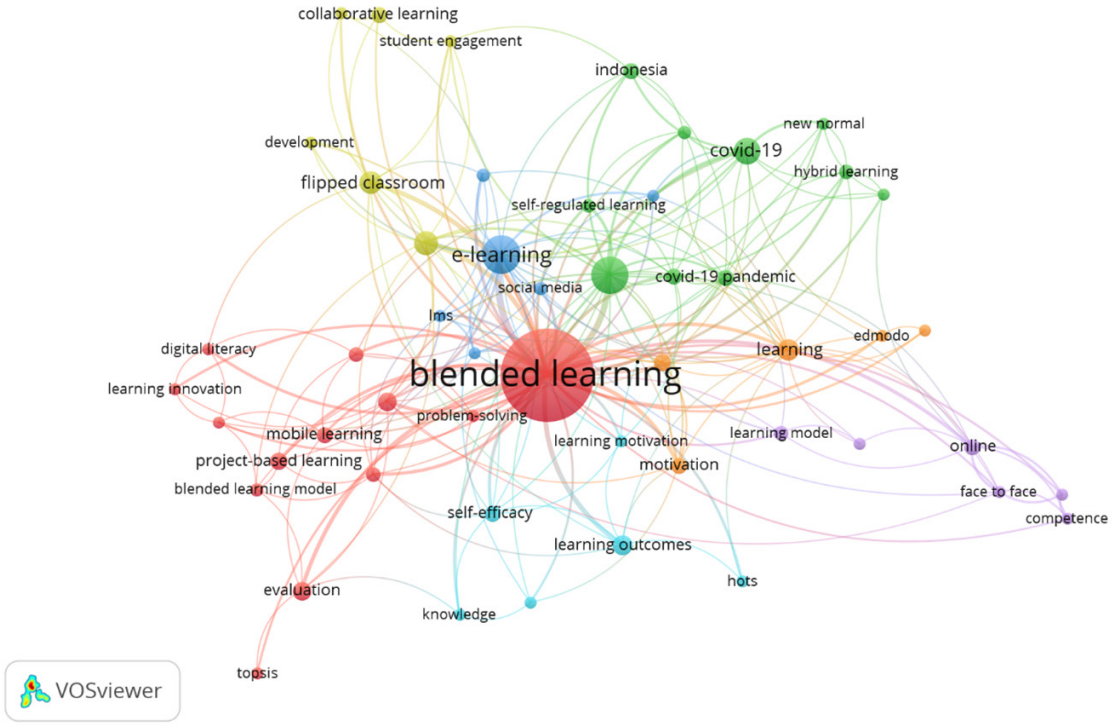
C. Keyword and conceptual network

The keyword co-occurrence map sheds light on the thematic focus of blended learning research in Indonesia, with "blended learning" prominently positioned at the centre of the network. This centrality signifies its critical role as the primary focus of investigation. The map also highlights strong associations with related terms such as "e-learning," "COVID-19 pandemic," "motivation," and "learning outcomes." These associations suggest a comprehensive and multi-dimensional exploration of blended learning, integrating aspects of technology, pedagogy, and student-centred approaches.

Key subthemes identified in the network include "flipped classroom," "mobile learning," and "self-regulated learning," indicating that researchers are actively exploring diverse strategies

to optimise blended learning. These connections highlight efforts to address specific challenges, such as maintaining student motivation, enhancing digital literacy, and ensuring equitable access to technology. Furthermore, the inclusion of terms like "competence," "problem-solving," and "collaborative learning" emphasises the broader educational objectives that blended learning seeks to achieve, particularly in fostering critical thinking and lifelong learning skills among students.

Figure 4 Keyword and its network

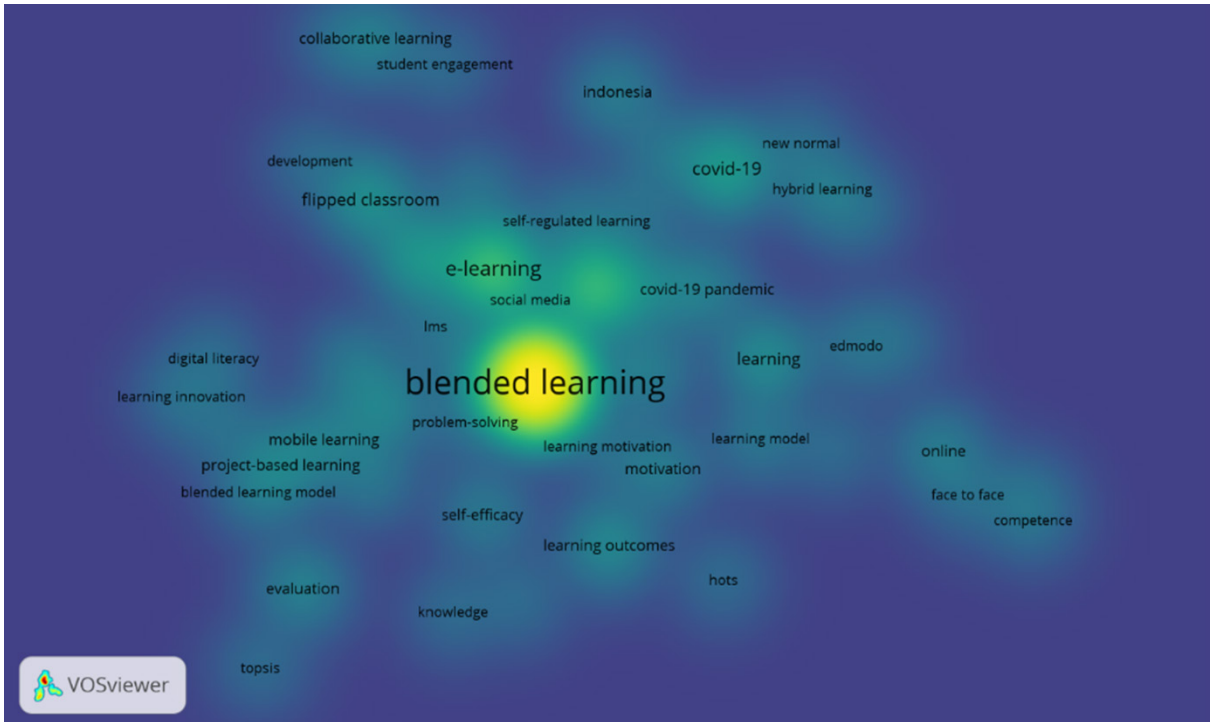


The keyword visualisation from the VOSviewer heatmap reveals the centrality of "blended learning" and its interconnected themes. Terms such as "motivation," "learning outcomes," and "e-learning" signify a research focus on understanding and enhancing the efficacy of blended learning models. Meanwhile, related terms such as "flipped classroom," "self-regulated learning," and "mobile learning" indicate the adoption of diverse methodologies aimed at complementing blended learning strategies.

Notably, the heatmap highlights emerging areas of interest, such as 'digital literacy' and 'project-based learning,' reflecting the evolving demands of the educational landscape. The prominence of these themes suggests that blended learning is not a static or one-size-fits-all approach but rather a dynamic and evolving concept that continuously adapts to shifts in pedagogical priorities, technological advancements, and learner needs. The growing emphasis on digital literacy underscores students' and educators' need to develop essential skills for navigating and critically engaging with digital resources, tools, and online platforms. As technology is increasingly embedded in education, fostering digital competency is crucial for ensuring effective participation in modern learning environments.

Similarly, the rise of project-based learning within the blended learning framework highlights the shift toward student-centred, experiential learning models. Project-based learning enhances engagement by integrating real-world problem-solving, collaboration, and interdisciplinary approaches. It deepens understanding, making it well-suited for blended environments that leverage in-person and digital resources. These thematic clusters reinforce the idea that blen-

Figure 5 Potential topics based on the theme



ded learning is not merely a combination of face-to-face and online instruction but a flexible and adaptive methodology designed to meet diverse educational challenges. It evolves to incorporate technological innovations, respond to the needs of different learners, and align with broader educational goals, such as fostering critical thinking, collaboration, and lifelong learning skills.

D. Most relevant sources and authors

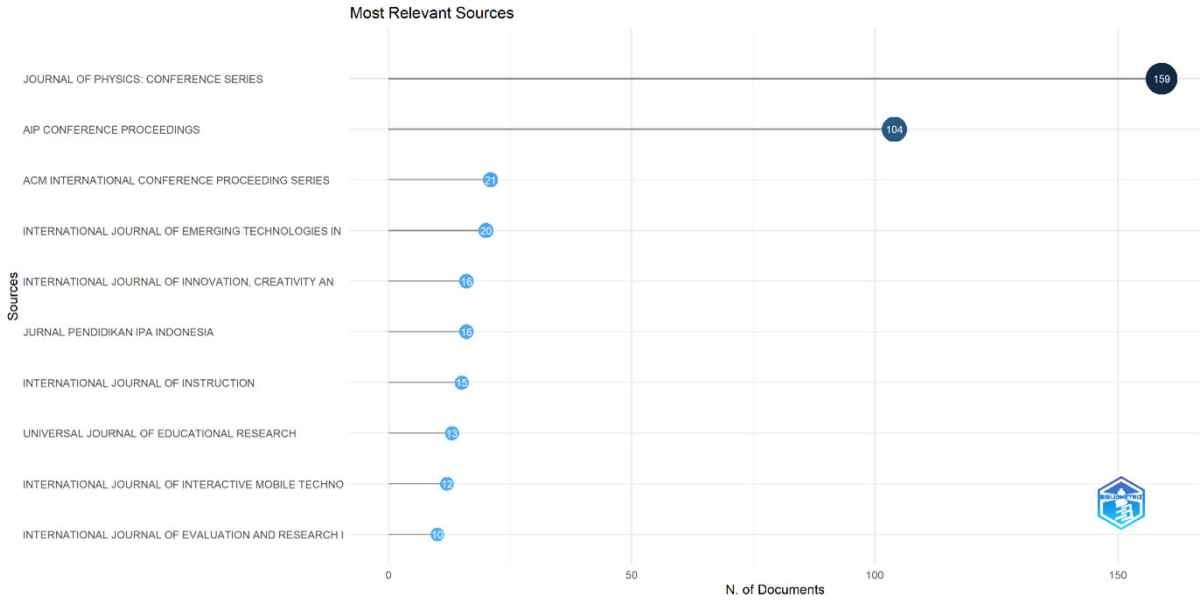
The analysis of publication sources reveals that the Journal of Physics: Conference Series and AIP Conference Proceedings are among Indonesia's most prolific outlets for blended learning research. This trend can be attributed to the strong alignment between these journals' focus on technological applications in education and the core principles of blended learning.

Blended learning, which combines traditional face-to-face teaching with online and digital learning tools, fundamentally depends on the seamless integration of technology to enhance both the learning experience and educational outcomes. This approach not only facilitates greater flexibility and accessibility for learners but also promotes engagement through interactive digital resources, adaptive learning platforms, and data-driven instructional strategies. Given the centrality of technology in blended learning, scholarly discussions and research in this area often explore emerging trends such as artificial intelligence in education, virtual and augmented reality applications, and adaptive learning analytics.

Both the Journal of Physics: Conference Series and AIP Conference Proceedings are highly regarded for their focus on technological advancements and their role in shaping the future of education. These platforms are ideal venues for disseminating research that investigates innovative methods for integrating technology into pedagogy, offering insights into best practices, challenges, and the evolving landscape of digital learning environments.

The co-authorship network further illustrates strong collaborations among key researchers, highlighting the interconnected nature of academic inquiry in blended learning. These collaborations reflect a collective effort to explore, refine, and advance knowledge in this evolving field, underscoring the necessity of shared expertise in addressing its multifaceted challenges.

Figure 6 Most relevant source



Such academic partnerships are particularly valuable in fostering interdisciplinary approaches, as blended learning draws insights from education, psychology, instructional design, computer science, and emerging technologies. By bringing together scholars from diverse backgrounds, these collaborations facilitate the exchange of ideas, methodologies, and best practices, enriching the research landscape and ensuring that blended learning strategies are grounded in comprehensive, evidence-based frameworks.

Additionally, strong co-authorship networks enhance the dissemination of research findings across different domains, promoting cross-disciplinary applications and broadening the impact of innovative pedagogical models. The collaboration among prominent authors strengthens the credibility and rigour of blended learning research and underscores the importance of teamwork in tackling complex educational challenges. These challenges from digital equity and personalised learning to the integration of artificial intelligence and adaptive learning technologies require innovative, context-sensitive solutions best developed through collective scholarly efforts.

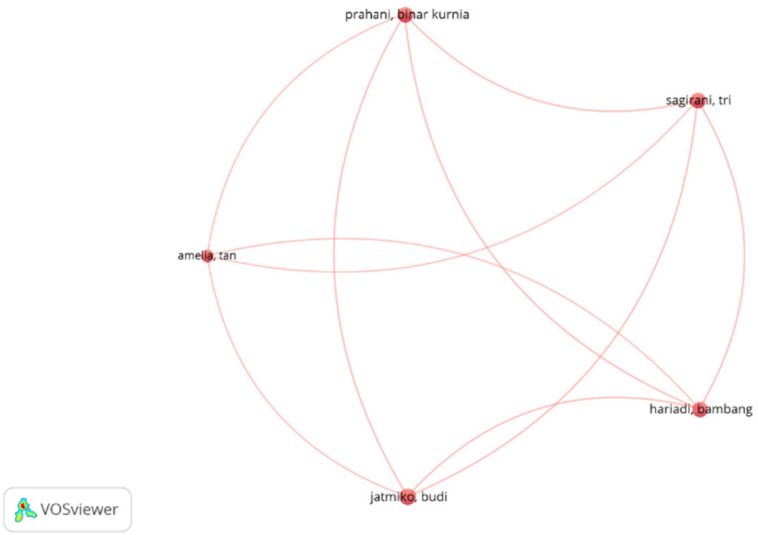
E. Research domains

The analysis of research domains highlights the interdisciplinary nature of blended learning studies in Indonesia. Social sciences dominate the field, accounting for 27.3% of the research, which reflects a strong focus on the pedagogical, socio-cultural, and psychological aspects of blended learning. This emphasis aligns with the need to understand how blended learning impacts student engagement, motivation, and overall learning experiences within specific socio-cultural contexts (Tabassum *et al*., 2024).

Other significant domains contributing to blended learning research include physics and astronomy (19.5%), computer science (14.7%), and engineering (9.2%). The strong representation of these fields underscores the technological and applied dimensions of blended learning, particularly in the development, deployment, and assessment of digital tools, platforms, and pedagogical methodologies.

In physics and astronomy, for instance, blended learning is leveraged to enhance conceptual understanding through interactive simulations, virtual laboratories, and computational modelling, which enable students to visualise complex phenomena beyond traditional classroom

Figure 7 Most relevant author



constraints. Similarly, blended learning is crucial in programming education, software development training, and cybersecurity instruction in computer science, as it integrates hands-on coding exercises, virtual environments, and AI-driven personalised learning pathways. Engineering education also benefits significantly from blended approaches, incorporating virtual prototyping, remote-controlled experimentation, and interdisciplinary problem-solving to bridge theoretical knowledge with real-world application.

This disciplinary diversity highlights the versatility and adaptability of blended learning as an educational framework capable of addressing challenges unique to various fields. While the core principles of blended learning remain consistent—such as integrating digital resources, active learning strategies, and learner-centred design—their implementation must be tailored to align with each discipline's specific learning objectives, skill requirements, and industry expectations.

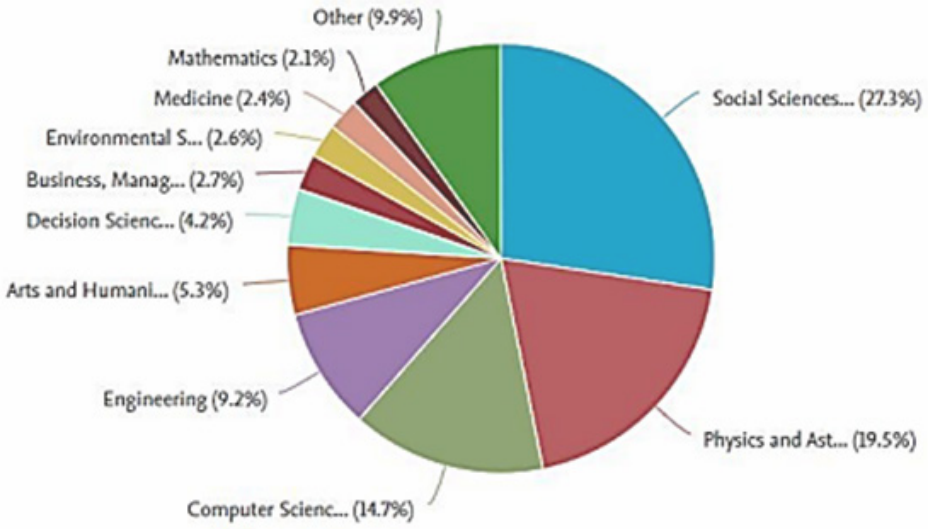
However, this diversity also underscores the necessity for field-specific strategies catering to different academic domains' distinct pedagogical needs. For instance, while a physics course may prioritise virtual simulations and interactive problem-solving, a computer science curriculum may require coding sandboxes, AI-powered tutoring systems, and real-time collaboration tools. On the other hand, engineering programs might emphasise remote-access laboratories, CAD modelling, and industry-linked project-based learning.

Thus, as blended learning expands across disciplines, ongoing research must focus on refining and customising its methodologies to ensure that they effectively support the unique demands of each field. By doing so, educators can maximise the impact of blended learning, fostering more profound engagement, skill mastery, and real-world applicability across diverse academic and professional landscapes (Zhang, 2017).

F. Challenges and opportunities in research

The bibliometric analysis highlights both opportunities and challenges in implementing blended learning within Indonesia. On the positive side, blended learning has proven to be a highly effective approach for enhancing student motivation, engagement, and learning outcomes (Ashraf *et al*., 2021; Kumari, 2023; Zhang, 2017). The integration of digital tools allows for personalized and flexible learning experiences, broadening access to high-quality educational resources. This adaptability is particularly beneficial for students in remote or underserved areas, where traditional education models may face significant barriers (Ashraf *et al*., 2021).

Figure 8 Domain by subject area



Despite these advantages, several challenges persist. Infrastructure limitations and digital literacy gaps remain critical barriers to the effective implementation of blended learning (Tang & Chaw, 2016). The digital divide is particularly pronounced in rural areas, where limited access to technology and the internet hinders the equitable adoption of blended learning. These disparities exacerbate existing inequalities in education and highlight the urgent need for targeted interventions to bridge the digital gap.

G. Discussion

The Covid-19 pandemic has accelerated education transformation in Indonesia, with blended learning being one of the primary responses to the crisis. A positive perspective on the pandemic's impact sees it as an accelerator of urgent educational innovation (Hermanto & Srimulyani, 2021). As schools closed and shifted to online learning, many educational institutions introduced blended learning methods to maintain the educational process. Blended learning—which combines face-to-face instruction with online elements—became a solution ensuring the continuity of education and enhancing flexibility and accessibility for students across Indonesia (Pakaya *et al*., 2024). The pandemic accelerated the adoption of technology in the education sector, which had previously faced challenges in implementation. Research shows that transitioning to blended learning could introduce newer, more innovative educational models, allowing for more diverse and interactive content delivery (Ashraf *et al*., 2021).

However, a counter perspective views the pandemic as a "forced transformation," driven more by emergency needs than by ongoing efforts for sustainable change. The sudden implementation of blended learning often overlooks infrastructure readiness, pedagogical preparedness, and adequate training for educators and students (García-Morales *et al*., 2021). In the long term, the biggest challenge is sustaining and maintaining the quality of blended learning once the pandemic subsides. Adopting this model may not be sustainable without proper investment in educator training and technology development, especially in regions with limited access to technology.

One of the key issues in implementing blended learning in Indonesia is accessibility and the digital divide, particularly between urban and rural areas. On the one hand, there is an argument that blended learning has the potential to equalise education in Indonesia (Wakijah *et al*., 2023). By utilising digital platforms, students in remote areas who previously lacked access to quality learning materials can now access them online. Furthermore, using technology in blended learning allows for more flexible learning tailored to individual needs, providing more

significant opportunities for students from various socio-economic backgrounds to obtain better education (Tabassum *et al*., 2024).

However, the major challenge remains the stark digital divide in Indonesia. The technology infrastructure in many regions is still limited, with uneven internet access between large cities and rural areas (Jayanthi & Dinaseviani, 2022). This hinders the effectiveness of blended learning, particularly in underdeveloped regions. Students in rural areas often struggle to access online learning materials due to limited internet connectivity or inadequate hardware that cannot support digital-based learning. For example, studies have shown that over 30% of schools in Indonesia faced significant internet access issues during the pandemic (Lestari *et al*., 2024). This divide exacerbates existing educational inequalities, and if not addressed seriously, it could worsen the gap between urban and rural students.

One of the most common arguments supporting blended learning is its impact on student academic achievement (Tabassum *et al*., 2024). Numerous studies have shown that blended learning can enhance motivation and learning outcomes, as this approach allows for more personalised, flexible, and interactive learning (Pakaya *et al*., 2024). With access to online learning materials, students can learn at their own pace, review content when necessary, and access a broader range of learning resources. Blended learning fosters increased student engagement by facilitating collaborative learning and enhanced communication through digital tools (Purwanti & Nurwati, 2023).

However, despite the positive evidence regarding the effectiveness of blended learning, it is important to note that variability in effectiveness often arises across different educational contexts. Not all students or educators experience the same benefits from this model. Some studies show that student motivation in classes with many online elements may decline, especially if they lack strong self-management skills (Eckhaus & Davidovitch, 2023). Moreover, the success of blended learning heavily depends on the quality of instructional design and the technical skills of educators in leveraging technology. In many cases, digital skills gaps among educators have been a major barrier to optimising the potential of blended learning (Tang & Chaw, 2016). Therefore, while blended learning holds significant potential, its effectiveness is highly context-dependent and relies on the readiness of the various elements.

Educator technology readiness and ability are crucial for successfully implementing blended learning (Anjarini & Suyoto, 2022). Continuous training for educators is essential to ensure they can effectively utilise technology in teaching. Without adequate training, educators may feel overwhelmed by technology, leading to resistance to change. Therefore, developing educators' capacity to leverage digital platforms and design compelling blended learning experiences is a critical element that needs attention from governments and educational institutions.

However, the additional burden educators face in mastering new technologies is also a significant challenge. Online and blended learning requires additional skills, such as managing virtual classrooms and creating digital content (Rahmi *et al*., 2024). In many regions, educators already face heavy workloads, and resistance to technological changes may arise due to a lack of time, training, or support (Nurshavira & Wahyuningsih, 2023). Therefore, providing comprehensive and ongoing training and technical support should be prioritised in the development of blended learning in Indonesia (Byrka, 2017).

Ongoing research on the effectiveness of blended learning is essential to ensure that this model can evolve optimally. One important research agenda is longitudinal studies that can evaluate the long-term impact of blended learning on academic achievement and student skills (Halverson *et al*., 2017). In addition, comparative research across disciplines and regions is also important to understand how different educational contexts influence the implementation of blended learning and what challenges are faced in different areas (Kumari, 2023).

Implementing blended learning in Indonesia presents several opportunities and challenges that must be carefully managed. While there are many positive potentials, such as improved

access to education and greater flexibility in learning, there are also significant challenges related to unequal opportunities, infrastructure limitations, and educator readiness. The success of blended learning in the Indonesian context will depend heavily on systematic efforts to address these challenges through educator training, infrastructure provision, and inclusive curriculum design. Further research is needed to evaluate the effectiveness and long-term impact of blended learning and explore new approaches that can reduce the digital divide and enhance the overall quality of education.

CONCLUSION

Blended learning has significantly shaped Indonesia's education landscape, demonstrating its potential as a flexible and resilient solution, particularly during the Covido-19 pandemic. However, its long-term success depends on addressing systemic challenges such as digital equity, educator preparedness, and infrastructure gaps. Bibliometric analysis reveals a surge in research publications in 2020–2021, reflecting the urgent shift to digital learning. Keyword trends highlight the interdisciplinary nature of blended learning, with key themes like 'e-learning,' 'motivation,' and 'learning outcomes' emphasising student engagement. Emerging areas such as digital literacy and project-based learning indicate evolving priorities in response to contemporary educational demands.

Despite progress, challenges persist, particularly in digital access and educator readiness. The digital divide, especially in rural areas, remains a significant obstacle, and many educators require further training to integrate technology into their teaching effectively. Addressing these issues through targeted investments in infrastructure, professional development, and policy reforms is crucial. Citation analysis shows peak scholarly engagement around 2019, followed by a decline post-2021, signalling the need for renewed research focus. Furthermore, future studies should emphasise long-term, context-sensitive strategies, including adaptive learning models and the integration of emerging technologies. Future research must prioritise inclusive, technology-driven approaches tailored to Indonesia's diverse educational needs to ensure sustainable impact. Strengthening digital infrastructure, enhancing teacher training, and developing adaptive learning strategies will be essential in fostering a resilient and equitable education system.

REFERENCES

Anjarini, T., & Suyoto, S. (2022). Pelatihan Model Pembelajaran Berbasis Blended Learning pada Era Merdeka Belajar bagi Guru di SD Muhammadiyah Purworejo. *Jurnal Pelayanan dan Pengabdian Masyarakat Indonesia, 1*(4), pp. 66–73. https://doi.org/10.55606/jppmi.v1i4.72

Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, 11(4), 959–975. https://doi.org/10.1016/j.joi.2017.08.007

Ashraf, M. A., Yang, M., Zhang, Y., Denden, M., Tlili, A., Liu, J., Huang, R., & Burgos, D. (2021). A Systematic Review of Systematic Reviews on Blended Learning: Trends, Gaps and Future Directions. *Psychology Research and Behavior Management*, Volume 14, 1525–1541. https://doi.org/10.2147/PRBM.S331741

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

Byrka, M. F. (2017). Blended Learning Strategy in Teacher Training Programs. *Information Technologies and Learning Tools, 62*(6), 216–224. https://doi.org/10.33407/itlt.v62i6.1802

Cahyadi, A., Hendryadi, Widyastuti, S., Mufidah, V. N., & Achmadi. (2021). Emergency remote teaching evaluation of the higher education in Indonesia. *Heliyon, 7*(8), e07788. https://doi.org/10.1016/j.heliyon.2021.e07788

Eckhaus, E., & Davidovitch, N. (2023). The Effects of Learning Method, Motivation, and Self-Discipline on Students' Retrospective Perceptions of Online Learning. *Interciencia*. https://doi.org/10.59671/

iMVn3

García-Morales, V. J., Garrido-Moreno, A., & Martín-Rojas, R. (2021). The Transformation of Higher Education After the COVID Disruption: Emerging Challenges in an Online Learning Scenario. *Frontiers in Psychology, 12*, 616059. https://doi.org/10.3389/fpsyg.2021.616059

Gul, R., & Khilji, G. (2021). Exploring the need for a responsive school curriculum to cope with the Covid-19 pandemic in Pakistan. *PROSPECTS*, *51*(1–3), 503–522. https://doi.org/10.1007/s11125-020-09540-8

Halverson, L. R., Spring, K. J., Huyett, S., Henrie, C. R., & Graham, C. R. (2017). Blended Learning Research in Higher Education and K-12 Settings. In M. J. Spector, B. B. Lockee, & M. D. Childress (Eds.), *Learning, Design, and Technology* (pp. 1–30). Springer International Publishing. https://doi.org/10.1007/978-3-319-17727-4_31-1

Hermanto, Y. B., & Srimulyani, V. A. (2021). The Challenges of Online Learning During the Covid-19 Pandemic. *Jurnal Pendidikan dan Pengajaran*, *54*(1), 46. https://doi.org/10.23887/jpp.v54i1.29703

Janse Van Vuuren, C., Muller, A., & Strydom, F. (2023). Flexible curriculum design for quantitative skills development: Building on the insights gained during COVID-19. *Perspectives in Education*, *41*(1), 137–154. https://doi.org/10.38140/pie.v41i1.6337

Jayanthi, R., & Dinaseviani, A. (2022). Kesenjangan Digital dan Solusi yang Diterapkan di Indonesia Selama Pandemi COVID-19. *Jurnal Iptekkom: Jurnal Ilmu Pengetahuan & Teknologi Informasi*, *24*(2), 187–200. https://doi.org/10.17933/iptekkom.24.2.2022.187-200

Kumari, Dr. D. (2023, October 27). Mapping of Research Output on Blended Learning: A Bibliometric Study. *Proceedings of the 6th International Conference on Research in Social Sciences and Humanities*. the 6th International Conference on Research in Social Sciences and Humanities. https://doi.org/10.33422/6th.icrsh.2023.10.103

Lestari, Y. E., Pudin, Y. A., & Wibowo, V. M. (2024). The Impact of Digital Learning Policies on Educational Equity in Rural Indonesian Schools. *International Journal of Educational Evaluation and Policy Analysis, 1*(2), pp. 13-19 https://doi.org/10.62951/ijeepa.v1i2.74

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Health Care Interventions: Explanation and Elaboration. *PLoS Medicine*, *6*(7), e1000100. https://doi.org/10.1371/journal.pmed.1000100

Lien, L., & Timmermans, B. (2024). Crisis-induced innovation and crisis-induced innovators. *Industry and Innovation, 31*(2), 183–217. https://doi.org/10.1080/13662716.2023.2228739

Nurshavira, A. A., & Wahyuningsih, A. S. (2023). Beban Kerja Guru Sekolah Dasar pada Masa Pandemi. *Indonesian Journal of Public Health and Nutrition*, *3*(2), 147–158. https://doi.org/10.15294/ijphn.v3i2.61448

Oktaria, S. D., Badeni, B., & Alexon, A. (2023). Blended Learning Is a Great Solution for Future Learning Model after Covid-19 in Indonesia. *International Journal of Multicultural and Multireligious Understanding*, *10*(5), 31. https://doi.org/10.18415/ijmmu.v10i5.4605

Pakaya, M. H. Y., Nurhamdin, T. O., & Kaaba, T. (2024). Blended Learning During the Pandemic: A Bibliometric Analysis of Students' Perceptions. *Journal of English Teaching and Linguistic Issues (JETLI), 2*(2), 87–96. https://doi.org/10.58194/jetli.v2i2.1840

Purwanti, H., & Nurwati, N. (2023). Implementasi Kurikulum Merdeka Belajar dengan Blended Learning pada Pembelajaran Dasar-Dasar Kuliner. *Ideguru: Jurnal Karya Ilmiah Guru, 8*(3), pp. 380–387, https://doi.org/10.51169/ideguru.v8i3.547

Rahmi, U., Ramadhani Fajri, B., & Azrul, A. (2024). Effectiveness of Interactive Content with H5P for Moodle-Learning Management System in Blended Learning. *Journal of Learning for Development, 11*(1), 66–81. https://doi.org/10.56059/jl4d.v11i1.1135

Ratnaningsih, S., Hady, Y., & Nisa, M. (2024). Adaptation of the Learning Process for Students in the Post New Normal Era: Learning Management System (LMS) Innovation Efforts in Indonesia. *International Journal of Religion*, *5*(7), 356–366. https://doi.org/10.61707/gb9xwq11

Saarsar, P. (2018). *Enhancing Educational Outcomes through Blended Learning: A Comprehensive Review*. 05, pp. 197–205.

Sihombing, A.A., Anugrahsari, S., Parlina, N., & Kusumastuti, Y. S. (2021). Merdeka Belajar in an Online Learning during The Covid-19 Outbreak: Concept and Implementation. *Asian Journal of University*

Education, 17(4), 35. https://doi.org/10.24191/ajue.v17i4.16207

Tabassum, B., Moin, M., Abbas, Q., Kumbhar, M. I., & Khan, M. H. N. (2024). The Impact of Blended Learning on Student Performance. *Journal of Education and Social Studies,* 5(2), 360–371. https://doi.org/10.52223/jess.2024.5217

Tang, C. M., & Chaw, L. Y. (2016). *Digital Literacy: A Prerequisite for Effective Learning in a Blended Learning Environment?* 14(1).

Van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, *84*(2), 523–538. https://doi.org/10.1007/s11192-009-0146-3

Wakijah, S., Sukardi, T., Sudira, P., Pramu, P., Iskandar, R., & Haq, R. (2023). Students' readiness in following online learning during the Covid-19 pandemic. *Jurnal Pendidikan Vokasi*, *13*(1), 19–26. https://doi.org/10.21831/jpv.v13i1.52030

Zhang, W. (2017). Review on Blended Learning: Identifying the Key Themes and Categories. *International Journal of Information and Education Technology*, *7*(9), 673–678. https://doi.org/10.18178/ijiet.2017.7.9.952