Blended Learning Trends, Themes, and Future Directions : A Bibliometric Analysis 2019-2024

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ABSTRACT

An exploratory overview of blibiometric analysis on trends, themes and directions of future research on blended learning for the period 2019-2024. To conduct the analysis, we used the PRISMA approach and a systematic selection of articles from Scopus: the toolkit consisted of 200 articles and allowed us to gain an understanding of the trends in the manifestation of this concept over the past 6 years. Out of 73 blended learning themes, we found an increase in the number of publications by 2022. China is the country with the largest contribution, 45 articles indexed, while Tlili A. is the most cited author, 287, and Hwang G.-J. produced 5 articles, with the highest number. The analysis revealed that of all the learning delivery strategies, blended learning has become the most influential strategy in education policy today especially after the pandemic. Blended learning tends to overcome the problems of technological fatigue and social isolation. Therefore, long-term research is needed to determine the optimal approach in terms of technological strategy implementation and future development of support

Keywords: Blended Learning, Bibliometrik, trend, themes, future direction

1 Introduction

Blended learning is emerged as an essential approach in modern educations systems, combining traditional face-to-face instruction with online leaning modalities. Not only does it improve student engagement, but it also enhances learning outcomes [1][2]. It utilizes technological advancements to develop a learner-centered culture while also giving a more interactive and flexible learning environment [3][4]. Learning outcomes are frequently referred to as learning effectiveness. Cognitive and affective engagement are taken into account. If in the learning process, participants or learner or student tend to be active for seeking learning materials independently to understand a concept classified complex, students or participant have been considered to be cognitively involved. Affective or emotional attitude student involvement alludes to excite and delight n learning contributing overall in the increased learning effectiveness

21st century learning includes a growing demand for learning models or methods that have the ability to facilitate effective and engaging learning, or are qualified to enable learners to meet their very different needs [5]. Learning needs in the 21st century differ from previous eras due to technical, social and environmental changes. The education system must accommodate these needs, focusing on skills such as critical thinking, digital

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literacy, and cultural awareness. Ensuring individuals meet a more complex living environment [6].

Several major countries such as China, United States and India have made significant implementations in various fields of education. This is driven by technological developments and the need for flexible learning solutions. Especially during the COVID-19 pandemic [7][8][9]. This approach translates to a combination of online and offline learning methods that improve educational outcomes by using the power of both. For example, the implementation of blended learning in China is prominent in medical machinery, business English and specialized training programs, demonstrating its versatility and effectiveness.

Of course, in the process of building or implementing blended learning methods, people experience some difficulties and challenges. These include administrative difficulties, digital skill building, the use of effective instructional strategies, and the ability to manage online classes in an appropriate manner [10]. The development stage of a blended learning system, which involves creating or updating digital learning resources. This measure has proven to be particularly difficult, as it requires innovative approaches to instructional design and online interaction that are the most effective tools for improving course quality and participant recruitment. Another significant challenge is maintaining the level of student interaction with learning materials. Educators report that it is difficult to keep their students motivated to deepen the material learned, which is critical to the success of blended learning [11].

However, there are a number of limitations in previous research on blended learning that make further research possible. Firstly, most BL studies are theme- or discipline-specific, with little analysis measuring quantitative analytical knowledge as appropriate, due to the vast amount of research literature on this topic [12]. In addition, BL contributions are still dominated by developed countries, particularly Australia and the West, while developing countries such as those in Asia and the Middle East have very little to contribute even if they are developed [13]. On the other hand, since most BL research is centered on higher education, there is very little literature on BL at the primary education level. This makes overall conclusions about the use of BL in lower educational timeframes difficult to state [14][15]. A more obvious gap occurs in the aspect of theory application in BL, where many studies speak only in macro aspects on BL without looking at more specific pedagogical approaches and student-centered learning strategies [16]. Therefore, what is needed is comprehensive background research on various disciplines, developing country contexts, applications to basic education, and more practical and theoretical suggestions for inclusive and effective BL applications.

This research is based on blibiometric analysis in exploring trends, themes and future directions of blended learning. Research questions were formulated with the aim to guide the systematic search, analysis and interpretation of the literature and this resulted in insights not only into trends but also themes and future directions of blended learning [17]. Some of the questions to be answered in this research include:

RQ1	What are the main themes and issues that have been addressed in the blended learning literature, what are the growth trends over the last decade, and what factors are driving the increase or decrease in publications in this area?

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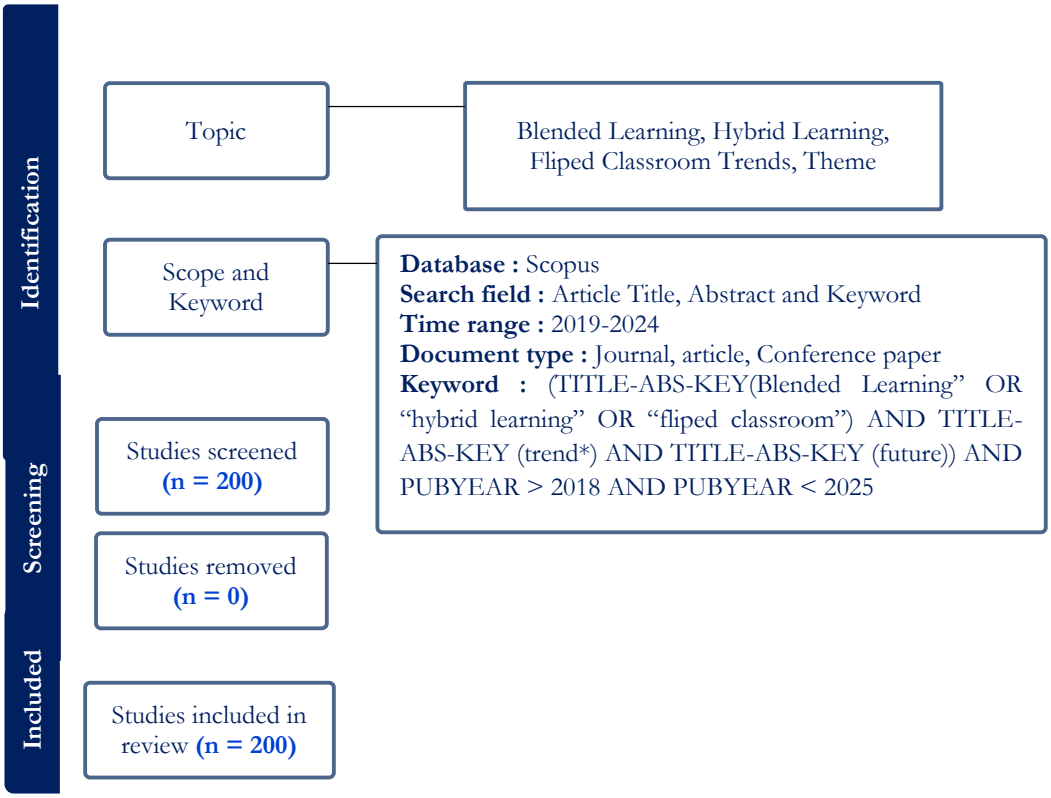
RQ2	How does blended learning affect student engagement and learning outcomes, and what instructional design models and pedagogical approaches are most effective for its implementation in various educational contexts?
RQ3	What is the geographical distribution of blended learning research, who are the most influential authors and publications, and what research directions are identified as future priorities in this field?

2 Research Methodology

The methodology used in this research is bibliometric analysis using data from the Scopus database. In the process of obtaining articles, this study adopted the prism diagram flow as a standard provision in obtaining articles. The article search was carried out with the criteria for the time range from 2019 to 2024 in the Scopus database. The keywords used were blended learning OR hybrid learning OR flip classroom AND TITLE-ABS-KEY (trend*) AND TITLE-ABS-KEY (future). The keywords aim to get an overview of the study scope of themes, trends and future directions of blended learning methods. Subject filters are then applied to narrow down the search results, taking into account factors such as time span, source type, and material type to filter out irrelevant articles. By applying these keywords, 200 articles were obtained from the Scopus database. All the articles were selected and then further analyzed using several tools such as openrefine, Microsoft excel and VOSviewer.



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3 Results and Discussion

3.1 Blended Learning Literature Growth

The growth in article publications over the past five years has shown a significant increase, reflecting the dynamics of intensified research and increased attention to specific areas of study. The data indicates an annual increase in publications, starting with 25 articles in 2019 and peaking at 47 articles in 2022. The high number of publications in 2022 could reflect a surge in research activity, possibly triggered by new technological developments, increased funding, or the need to update knowledge amid global challenges. Meanwhile, despite a slight decline in 2023 with 46 articles, this number still shows a steady growth trend compared to earlier years, such as 2020 which had only 15 articles. This development highlights the importance of ongoing studies in this field and the potential contribution of researchers in enriching the scientific literature in the coming years.

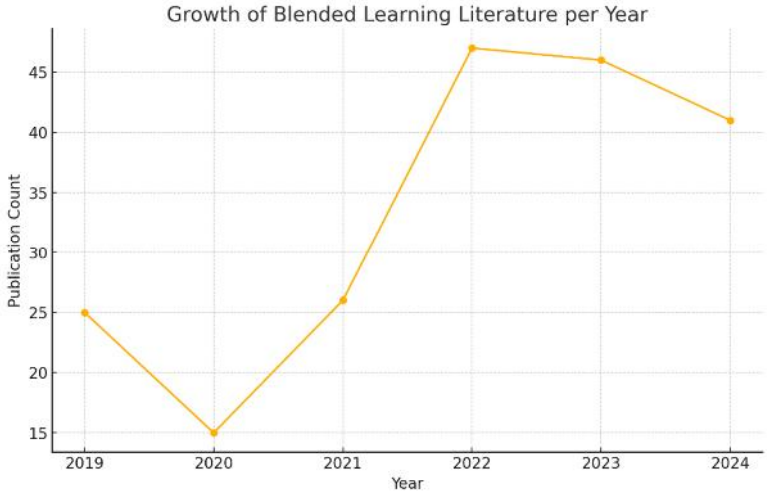

Figure 1: Literature Growth

In 2022, there was a notable surge in research on the theme of blended learning, driven by several factors. The increasing integration of technology in education, accelerated by the COVID-19 pandemic, has highlighted the need for flexible learning models that combine online and face-to-face teaching [18]. This approach, known as blended learning, has been recognized for its potential to improve educational outcomes by harnessing the strengths of both traditional and digital learning environments. The growing research interest is reflected in the increasing number of publications and citations in this area, as well as the involvement of leading researchers and institutions worldwide.

3.2 Main Themes in Blended Learning Research

Analysis of the distribution of publications on blended learning and educational technology shows the leading role of five countries: China, the United States, Malaysia, India and Australia. China dominates with 45 publications exploring the digitization of education and flipped classrooms, while the United States focuses on global education technology, including analysis in Latin America and Africa, with 25 publications. Malaysia highlighted AI-based learning adaptations and the impact of COVID-19 on language learning, showing sensitivity to the needs of inclusive education. India raised the topic of simple digital learning such as WhatsApp in education, while Australia emphasized student collaboration

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in technology-based learning. Overall, each country brought a specific focus that enriched global trends, underlining the importance of technological innovation and adaptation in modern education.

Table 1: *Themes in Blended Learning Research*

Country	Publication Count	Themes
China	45	Research hotspots and trends in digitalization in higher education A bibliometric analysis; 3D Face Reconstruction Based on a Single Image A Review; Research on flipped classrooms in foreign language teaching in Chinese higher education
United States	25	Dermoscopy in Selected Latin American Countries A Preliminary Look into Current Trends and Future Opportunities Among Dermatology Residency Programs; Concepts innovative technologies learning approaches and trend topics in education 40 A scoping literature review; Exploring the Landscape of Online Coding Education in Africa A Literature Review
Malaysia	21	Learning through Online Synchronous and Asynchronous Communication among Adolescents with Autism Spectrum Disorder A Conceptual Discourse; AIDriven Learning Management Systems Modern Developments Challenges and Future Trends during the Age of ChatGPT; The Impact of COVID19 Pandemic on Flipped Classroom for EFL Courses A Systematic Literature Review
India	16	Technical Courses and Virtual Teaching Learning Practice A Post Pandemic Study; Artificial Intelligence in Learning Development A Bibliometric Analysis of 32 Years; WhatsApp as a Tool in Blended Learning in Dental Education
Australia	14	AIDriven Learning Management Systems Modern Developments Challenges and Future Trends during the Age of ChatGPT; Student collaboration in blending digital technology in the learning of mathematics; Blended learning in undergraduate dental education a global pilot study

3.3 Network Analysis and Co-citation

Through the analysis of 200 articles using co-occurrence techniques, it was found that the most dominant keyword in the related literature was “Blended Learning,” with a total of 73 publications or equivalent to 7.55%. This keyword was followed by “online learning,” which was recorded to appear in 37 publications or about 3.8%. These findings are part of the top 20 keywords analyzed using VOSviewer software, which is instrumental in

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identifying patterns of relationships between keywords in research around online learning and blended learning. These results show the trends of topics that are of primary interest to researchers, as well as the relevance of "Blended Learning" in the context of contemporary educational research.

Table 2: *Dominant Keyword Literature*

Author Keyword	Total Publication	Percentage (%)	Author Keyword	Total Publication	Percentage (%)
Blended learning	73	7.55%	Education	9	0.93%
Online learning	37	3.83%	Artificial Intelligence	8	0.82%
Flipped classroom	35	3.62%	Teacher education	6	0.62%
Higher education	22	2.27%	Research trend	5	0.51%
Systematic review	18	1.86%	Learning outcomes	5	0.51%
Bibliometric analysis	16	1.65%	Learning analytics	5	0.51%
E-learning	15	1.55%	medical education	5	0.51%
Learning Management Systems	13	1.34%	trend analysis	5	0.51%
COVID-19	13	1.34%	inverted classroom	4	0.41%
Flipped learning	10	1.03%	social media	4	0.41%

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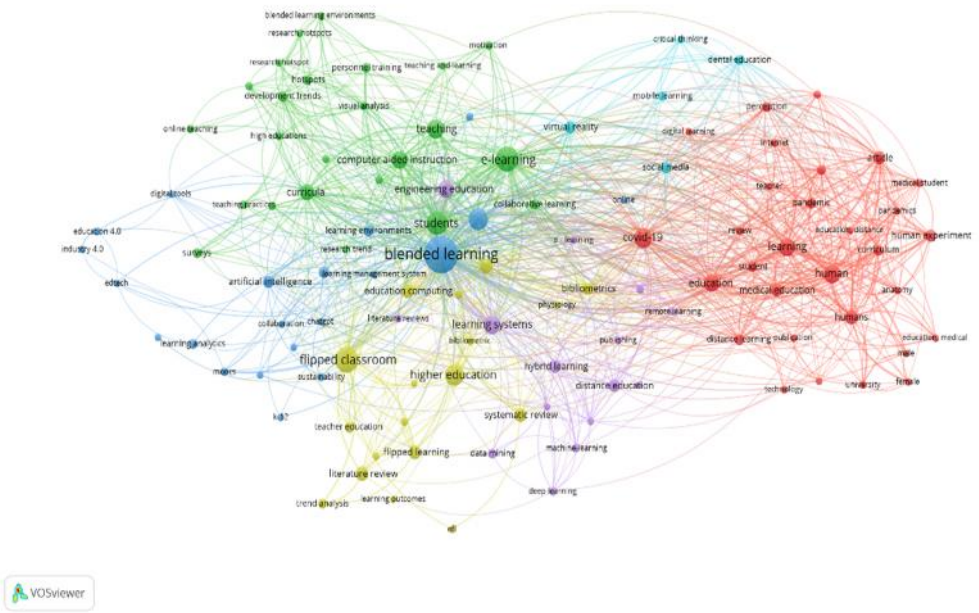

Figure 2: Patterns of Relationships Between Keywords

This visualization reveals that “Blended Learning” serves as a central topic in modern educational discourse, acting as a bridge for various technology-based learning approaches. The impact of the COVID-19 pandemic accelerated the transition towards online learning and distance education, especially in the realm of medical education, which is evident from the strong link between “Covid-19” and topics such as “Medical Education” and “Remote Learning”. Furthermore, technological developments such as artificial intelligence, learning analytics, and education technology (EdTech), as reflected in the blue cluster, show a significant shift towards digitalization and personalization of education. In addition, innovative methods such as the “Flipped Classroom” are emerging in response to the need for a more flexible and learner-centered approach to learning. Overall, this visualization indicates that the main trends driving the transformation of education today are the adoption of advanced technologies and hybrid approaches to adapt to the challenges of the digital age and the influence of the global pandemic.

3.4 Student Engagement and Learning Outcomes

Blended learning, an approach that combines face-to-face learning with online learning, has grown rapidly especially after the COVID-19 pandemic. This approach offers flexibility and strong potential to increase student participation and motivation[19] [20], personalize the learning experience[21], engagement, and academic achievement. With the support of technologies such as metaverse, blended learning presents a more interactive and immersive learning experience, allowing students to engage in a rich and dynamic educational environment. The use of avatars in virtual worlds, digital field trips, and online collaboration create a more engaging and enjoyable learning process, supporting increased student motivation and autonomy in self-directed learning [22].

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Blended learning also expands students' access to a variety of resources and learning environments tailored to individual needs, which encourages active engagement and participation. This learning environment blends face-to-face and virtual activities in a balanced way, creating a framework that supports various learning styles and allows students to engage in collaborative activities and creative projects. In the long term, this approach has great potential to improve students' academic achievement and professional competence. Future research is expected to explore the impact of blended learning and explore the role of new technologies to further enrich this adaptive educational experience.

Table 3: Most Cite Article

Author Name	Article Title	Citation Count
Zhang X	The metaverse in education: Definition, framework, features, potential applications, challenges, and future research topics [20]	222
Luan H	A Review of Using Machine Learning Approaches for Precision Education [21]	136
Engelbrecht J	Transformation of the mathematics classroom with the internet [22]	107
Markova O.M	Implementation of cloud service models in training of future information technology specialists[19]	70
Ashraf M.A	A systematic review of systematic reviews on blended learning: Trends, gaps and future directions [2]	69

3.5 Instructional Design and Pedagogy

Designing an effective blended learning (BL) course requires thorough consideration of various pedagogical and technological aspects. Blended learning, often referred to as hybrid learning, dual-mode instruction, and flipped learning, combines face-to-face learning environments with online components to create a cohesive and holistic educational experience, maximizing the advantages of both traditional and digital learning methods to provide greater flexibility and accessibility to learners. However, the implementation of blended learning is not free from challenges, such as individual differences in behaviour, preferences, and attitudes towards technology that may affect BL adoption and effectiveness. The COVID-19 pandemic has further emphasized the importance of well-designed BL course designs, as the need to shift between online and offline learning is increasingly relevant, emphasizing the urgency for educators and curriculum designers to consider pedagogical elements that support engagement, active participation, and adaptation in dynamic blended learning environments [23].

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Strategies for effective blended learning design include pedagogical approaches and technological infrastructure. Pedagogical design should incorporate a variety of learning activities, such as problem solving, quizzes and group work, to increase student engagement. In addition, the use of varied instructional materials, such as videos, animations and e-books, can support students' various learning styles. On the technology side, a robust ICT infrastructure, including adequate internet access and necessary hardware, is essential to support BL implementation, especially in developing regions. Addressing the lack of ICT skills among teachers and students also requires adequate training and resources to ensure successful and sustainable adoption [2].

Table 4: Most Cite Article Pedagogical Approaches & Technological Infrastructure

Author Name	Article Title	Citation Count
Turan Z	Flipped classroom in English language teaching: a systematic review [24]	196
Kushairi N	Flipped classroom in the second decade of the Millenia: a Bibliometrics analysis with Lotka's law [25]	69
Ashraf M.A	A systematic review of systematic reviews on blended learning: Trends, gaps and future directions [2]	69
Zainuddin Z	A systematic review of flipped classroom empirical evidence from different fields: what are the gaps and future trends?[26]	47
Koh J.H.L.	Four pedagogical dimensions for understanding flipped classroom practices in higher education: A systematic review [23]	41

3.6 Geographic Distribution of Research

The geographical distribution of publications in this study shows the dominance of several key countries in scientific contributions. China led the way with a total of 66 publications, followed by the United States which produced 51 publications, collectively reflecting both countries' significant role in international research in this area. India and Malaysia contributed 36 publications each, showing a balanced interest and commitment to knowledge development in the Asian region. Taiwan and Indonesia also stood out with 31 and 21 publications respectively, demonstrating the active presence of other Asian countries in research. Contributions from Russia, Australia, Hong Kong and Turkey with 14 to 20 publications each further highlight the international nature of the study. This data illustrates a wide geographical diversity, where research is driven by a variety of unique national contexts and demonstrates the importance of cross-border collaboration in strengthening the global scientific literature.

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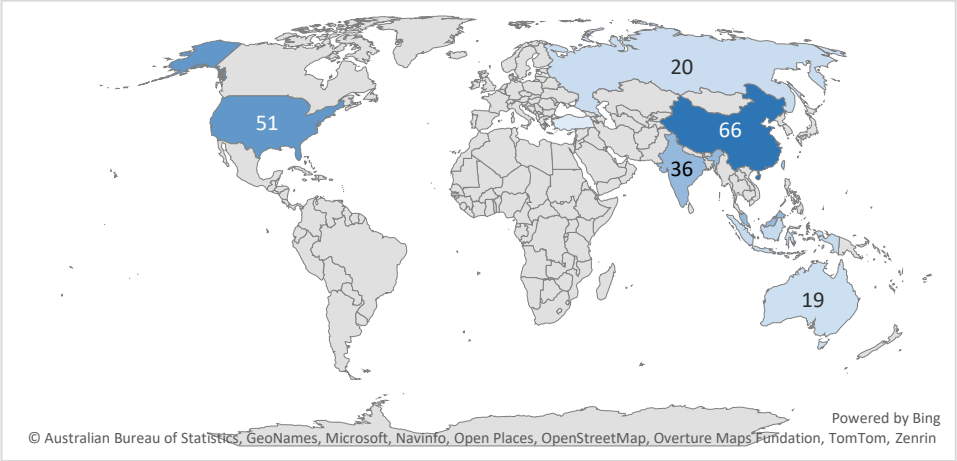

Figure 3: Article Geographical Distribution

3.7 Most Influential Authors and Publications

Berdasarkan hasil analisis, diperoleh informasi profil penulis yang paling produktif dalam publikasi ilmiah pada topik tertentu selama periode studi yang dianalisis. Hwang G.-J., sebagai penulis dengan kontribusi terbesar, telah menerbitkan total 5 artikel, menunjukkan peran aktifnya dalam penelitian yang terus berkembang di bidang ini. Penulis lainnya, yaitu Huang R., Wang Y., Sun L., dan Zhang X., masing-masing memiliki 3 publikasi, yang juga mencerminkan kontribusi substansial mereka terhadap literatur. Kehadiran beberapa penulis dengan publikasi berulang menyoroti jaringan ilmiah yang kuat dan keterlibatan mendalam dari beberapa individu dalam memajukan diskusi ilmiah terkait. Keterlibatan tinggi ini tidak hanya memperkaya literatur yang ada tetapi juga memperlihatkan upaya kolaboratif dan konsistensi dalam penelitian, yang dapat menjadi fondasi bagi inovasi atau penelitian lanjutan di masa mendatang. Temuan ini mengindikasikan bahwa penulis-penulis ini berperan penting dalam memperkuat basis pengetahuan yang terus berkembang dan berdampak pada arah penelitian berikutnya dalam bidang tersebut.

Table 5: Most Influencial Author

Author	Publication Count	Title Article
Hwang G.-J.	5	Findings and implications of flipped science learning research: A review of journal publications Critical research advancements of flipped learning: a review of the top 100 highly cited papers Advancement and the foci of investigation of MOOCs and open online courses for language learning: a review of journal publications from 2009 to 2018 Research focuses and findings of flipping mathematics classes: a review of journal

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		publications based on the technology-enhanced learning model Roles and research trends of flipped classrooms in nursing education: a review of academic publications from 2010 to 2017
Huang R.	3	Technology-enhanced instructional practice during covid-19 pandemic and implications for new normal: Experience from China Is Metaverse in education a blessing or a curse: a combined content and bibliometric analysis A systematic review of systematic reviews on blended learning: Trends, gaps and future directions
Sun L.	3	Hot topics and frontier evolution in college flipped classrooms based on mapping knowledge domains Exploring the transformative power of blended learning for Business English majors in China (2012–2022) – A bibliometric voyage An Empirical Exploration of Teaching Existence in a Blended Learning Environment - Taking Advanced Mathematics as an Example
Wang Y.	3	The metaverse in education: Definition, framework, features, potential applications, challenges, and future research topics Inverted Classroom Teaching of Physiology in Basic Medical Education: Bibliometric Visual Analysis Flipped Classroom Teaching System Design under the Background of Subject Reform Based on Information Technology
Zhang X.	3	The metaverse in education: Definition, framework, features, potential applications, challenges, and future research topics Hot topics and frontier evolution in college flipped classrooms based on mapping knowledge domains Exploring the transformative power of blended learning for Business English majors in China (2012–2022) – A bibliometric voyage

Citation analysis shows that certain articles stand out as the most influential publications in this field of study. Article with the title Is Metaverse in education a blessing or a curse? Tlili A.'s work occupies the top spot with 287 citations, indicating the strong appeal and relevance of metaverse-related topics in education. This was followed by Zhang X. with his article, The metaverse in education: Definition, framework, potential, and challenges, which collected 222 citations, providing a deep conceptual foundation on the use of the metaverse in the educational environment. The article Flipped classroom in English language teaching: A systematic review by Turan Z., with 196 citations, shows an

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increase in interest in the flipped classroom approach in English language teaching. The articles written by Luan H., A Review of Using Machine Learning Approaches for Predicting Student Performance, and Engelbrecht J. with his work Transformation of the mathematics classroom with digital technology, were also included in the top five, receiving 136 and 107 citations, respectively. These findings illustrate a pattern of citations that lead to the themes of digital education and technology, reflecting the academic community's interest in digital innovations that impact contemporary educational practices.

Table 6: Most Cite Article

Author	Title	Cited By
Tlili A.	Is Metaverse in education a blessing or a curse: a combined content and bibliometric analysis	287
Zhang X.	The metaverse in education: Definition, framework, features, potential applications, challenges, and future research topics	222
Turan Z.	Flipped classroom in English language teaching: a systematic review	196
Luan H.	A Review of Using Machine Learning Approaches for Precision Education	136
Engelbrecht J.	Transformation of the mathematics classroom with the internet	107

3.8 Most Influential Authors and Publications

Blended learning, which combines traditional face-to-face instruction with online learning, has become increasingly prevalent, especially with the advent of digital tools and platforms. This approach aims to increase learning engagement and provide a flexible learning experience. The integration of digital tools such as Learning Management Systems (LMS) and mobile applications plays a critical role in supporting blended learning environments. These responses explore the effectiveness of specific technologies, user experiences, and integration challenges based on the context provided. Cloud technology is essential in the transformation of educational practices, especially in blended learning environments. They facilitate the presentation of educational materials and collaboration between students and educators. The use of cloud-based tools in blended learning is beneficial for training software engineering specialists, providing a flexible and accessible platform for learning [19]. LMS platforms are an integral part of organizing and delivering educational content in blended learning settings. They support a combination of online and in-person instruction, enhancing the overall learning experience [27]. As educational institutions shift back to in-person learning, the sustainability of the blended learning model remains a concern. Continued integration of digital tools is essential to sustain the benefits of blended learning in a post-pandemic world [20]. The explanation above refers to the five articles with the highest citations that discuss the interaction of technology used in the table below

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Table 7: Most Influential Authors and Publications

Authors Name	Article Title	Citation Count
Zhang X.; Chen Y.; Hu L.; Wang Y.	The metaverse in education: Definition, framework, features, potential applications, challenges, and future research topics	222
Luan H.; Tsai C.-C.	A Review of Using Machine Learning Approaches for Precision Education	136
Markova O.M.; Semerikov S.O.; Striuk A.M.; Shalatska H.M.; Nechypurenko P.P.; Tron V.V.	Implementation of cloud service models in training of future information technology specialists	70
Ashraf M.A.; Yang M.; Zhang Y.; Denden M.; Tlili A.; Liu J.; Huang R.; Burgos D.	A systematic review of systematic reviews on blended learning: Trends, gaps and future directions	69
Yu-Fong Chang J.; Wang L.-H.; Lin T.-C.; Cheng F.-C.; Chiang C.-P.	Comparison of learning effectiveness between physical classroom and online learning for dental education during the COVID-19 pandemic	59

3.9 Future Research Directions

Future research may consider longitudinal studies to understand the long-term effects of blended learning on students' skills and competencies, especially given the shifts that occurred during the COVID-19 pandemic. Blended learning, which combines face-to-face and bold learning, has become the norm during the pandemic, with video conferencing platforms such as Zoom and Google Meet becoming the primary tools in the learning process [20]. While this method offers flexibility and availability, some issues have been identified, including video conferencing fatigue, lack of motivation, and desocialization. Longitudinal studies can help explore how these issues affect the development of students' skills and competencies in the long term. In addition, with the continuation of the trend of autonomous learning in blended form, it is important to understand how this combination of learning can support or hinder continuous learning and student competency development after the pandemic. This kind of research can also provide insight into how learning strategies can be tailored to maximize the benefits of blended learning, while minimizing the negative impacts that may arise from intensive use of technology. Thus, longitudinal studies will not only provide empirical data on the long-term effectiveness of blended learning, but may also inform future educational policies and teaching practices.

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Tabel 8 : Top 5 Most Cited Articles on Blended Learning Outcomes and Future

Primary Author	Cited By	Keywords
Tlili A.	287	Artificial Intelligence; Avatar; Cyber worlds; Digital twin; Metaverse; Mirror world; Virtual worlds
Zhang X.	222	Augmented reality; extended reality; Metaverse; metaverse for learning; metaverse in education; Virtual reality
Turan Z.	196	EFL; English language teaching; Flipped classroom; Flipped learning; Systematic review
Luan H.	136	Individual differences; Individualized learning; Machine Learning; Personalized learning; Precision education
Engelbrecht J.	107	Blended learning; Collaboration; Humans-with-media; Hyper-personalisation; Learning environments; Learning management system; Mathematics teacher education; Mathematics teaching; MOOC

4 Conclusions

This study presents a comprehensive bibliometric analysis of future trends, themes, and directions of blended learning research over the period 2019 to 2024. Based on data collection from the Scopus database, 200 relevant articles were obtained, of which 73 specifically focused on the theme of blended learning, showing a significant increase in publication trends in 2022. From a geographical perspective, China tops the rankings with a total of 45 publications related to blended learning, demonstrating a dominant contribution to the development of this theme at the global level. In terms of author influence, Tlili A. is recorded as the author with the highest number of citations, at 287 citations, reflecting the significant impact of her works in this field. Meanwhile, Hwang G.-J. identified as the most prolific author, with contributions in the form of five articles indexed by Scopus during the period 2019 to 2024. These findings provide important insights for academics and practitioners about the dynamics of blended learning research and the direction of its future development.

Future research on blended learning should focus on longitudinal studies to evaluate the long-term impact of these methods on students' skills and competencies, especially post-pandemic. Blended learning, while flexible, presents challenges such as technology fatigue, decreased motivation, and social isolation, which have the potential to affect skill development. In-depth research is needed to understand how blended learning can support or hinder continuous learning and student autonomy. In addition to providing empirical data, the results of this study are expected to produce more effective pedagogical strategies and educational policies in optimizing blended learning for the development of student competencies in the future.

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