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Blended Learning in Higher Education: Defining and Classifying Key Aspects

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Abstract

In modern scientific space, there are various approaches to the interpretation of blended learning (BL); however, there is a lack of a single unification of them and a definition of the main components of this form. The goal was to conduct a systematic and bibliometric analysis of scientific publications, identify and classify key aspects of BL implementation, and develop a generalized model with recommendations on the prospects for integration in higher education. A systematic literature review was conducted according to the PRISMA protocol. Data sources included Scopus, Web of Science, Open Alex, etc. VOSviewer was used for bibliometric analysis and visualization. In total, 51 articles were selected for processing and analysis. The analysis demonstrated a steady increase in the number of publications since the early 2000s, with a sharp peak in 2020–2022, which coincided with the COVID-19 pandemic. Bibliometric analysis revealed 11 clusters reflecting the multidimensionality of the discourse: pedagogical strategies and self-regulation, organizational policies, and digital analytics. BL in higher education is an integrated educational model that combines traditional classroom forms with digital online tools, aimed at increasing the flexibility, personalization, and efficiency of the educational process. The developed generalized POCM-BL model combined structural dimensions, support mechanisms, and promising directions (AI, resilience, inclusivity). The study confirmed the multidimensionality of BL, as well as its transformation from a "teaching format" into a strategic paradigm for the development of higher education. The study closed the gaps in the classification of BL aspects.

Keywords: blended learning, higher education, digital pedagogy, self-regulated learning, bibliometric analysis, institutional policy

1. Introduction

1.1 Introduce the Problem

Modern higher education is in a state of dynamic transformation, which is caused by current globalization processes, digitalization, and new requirements for the quality of the educational process. One of the leading directions of such changes is the phenomenon of blended learning, which involves the integration of traditional offline forms with online tools, platforms, and digital resources. The defined model makes it possible to increase the effectiveness of education in crisis and unstable conditions and to expand access to educational services (Castro, 2019). In this way, individualization of learning and the formation of skills of independent work, critical thinking, and digital competence in modern students takes place (Anthony et al., 2020; Smith & Hill, 2018).

1.2 Explore Importance of the Problem

Blended learning has become one of the key trends in the development of modern higher education, as it combines the advantages of traditional classroom interaction and digital technologies, providing flexibility, personalization and expanded opportunities for academic growth of students. Given the rapid digitalization and increasing demands for the quality of educational services, BL is considered an effective response to structural transformations in the field of education, including the transition to competency-based models, changing forms of academic communication and the need to form digital and self-regulatory literacy of students.

The COVID-19 pandemic has further strengthened the importance of blended formats, highlighting the issues of sustainability of educational systems, accessibility of learning and the effectiveness of digital platforms. During this period, BL has transformed from an auxiliary format into a strategic basis for the modernization of university education. At the same time, there is still no single, established definition of BL in the scientific discourse, there are disagreements regarding its structural components and implementation mechanisms, which complicates the comparison of empirical research and implementation practices.

Thus, the systematization of scientific approaches to the definition of blended learning, the harmonization of terminology and the identification of key aspects of its implementation are of crucial importance both for the theoretical understanding of the phenomenon and for the development of effective educational strategies in higher education institutions. This determines the relevance of a comprehensive analytical study that includes a systematic review, classification of BL aspects and the construction of a generalized model of its application.

1.3 Describe Relevant Scholarship

Therefore, the relevance of the study is determined by several factors. Modern challenges (pandemics and wars) have clearly demonstrated the need for adaptive and sustainable educational models. In addition, the active digital transformation of education in Ukraine and the world has influenced the formation of new opportunities for the implementation of blended formats based on Moodle, Google Classroom, Coursera, and other platforms. In addition, it has been proven that the current generation of students expects interactive and personalized educational practices that meet their needs (Sahni, 2019; Prifti, 2020). However, despite the prevalence of the concept, a research problem remains in the scientific community, which involves the lack of a single, established definition of the concept of “blended learning”, the fragmentation of existing classifications, where attention is focused mainly on technological or pedagogical aspects separately, and insufficient systematization of existing studies, which mostly present individual cases without creating a holistic model. There is also a lack of bibliometric works that visualize the structure and dynamics of the scientific discourse on blended learning. Previous studies have proposed various models of blended learning (rotation, flex, enriched virtual), revealing their advantages and challenges (Serrano et al., 2019; Islam et al., 2021). However, there is a lack of an integrated classification of key aspects, a systematic review of the literature according to the PRISMA protocol, as well as a combination of qualitative and bibliometric analyses. This work will fill these gaps and implement an integrated classification model that covers pedagogical, technological, psychological, and organizational aspects. The scientific novelty of the study also lies in the implementation of a bibliometric analysis based on VOSviewer, which will identify the main scientific clusters, leading authors, and trends and close the gap in the visualization and synthesis of the current scientific field.

1.4 State Hypotheses and Their Correspondence to Research Design

Thus, the purpose of the study is to analyze different approaches to blended learning in higher education and to classify the main aspects based on a systematic and bibliometric analysis of scientific sources.

The objectives of the study include:

1. Carrying out a systematic and bibliometric analysis of publications and highlighting key trends in defining blended learning

2. Identifying and classifying key aspects of the implementation of blended learning in higher education.

3. Developing a generalized model and providing recommendations on the prospects for the implementation of blended learning in higher education.

2. Method

2.1 Research Design

This work is based on a systematic review with elements of bibliometric analysis. The design follows the PRISMA protocol, which ensures transparency in the process of selecting scientific sources. The combination of qualitative content analysis and quantitative bibliometric analysis provides a solid foundation for the scientific discourse on blended learning in higher education. This approach was chosen to gather the most relevant sources on blended learning, analyze them, and identify the main trends in its development over recent years.

2.2 Materials and Sample

To collect the material, leading international scientometric databases were used, which made it possible to provide a wide coverage of publications in the field of pedagogy and educational technologies: Scopus, Web of Science, and Open Alex. Additionally, national institutional repositories of universities and electronic journals indexed in domestic databases (Copernicus Index, RIC (Education Resources Information Center), Google Scholar) were considered. The use of various sources made it possible to reduce the risk of publication bias and increase the completeness of the sample. The search process used formed keywords and logical operators (AND, OR, NOT) to form relevant queries. In particular, the basic keywords included: “blended learning”, “hybrid learning”, “higher education”, “technology”, “digital pedagogy”, ”online education“, ”innovation“,” development“. To expand the search, variations and derived terms (“technology-enhanced learning”, “e-learning integration”, “online-offline learning”). Google Scholar uses filters by year of publication and language, while Scopus and Web of Science use restrictions by Education and Social Sciences.

Inclusion criteria

1. Peer-reviewed scientific publications published between 2019 and 2025 demonstrate the development of the concept of blended learning over the past two decades.

2. Articles that directly address the issue of blended learning in higher education

3. Full text available for qualitative analysis.

4. Publications in English.Both theoretical (review) and empirical (experimental) studies are included.

Exclusion criteria

1. Articles that address only technical aspects of implementation (e.g., IT system architecture without pedagogical analysis).

2. Materials that address school education or corporate learning, as they fall outside the scope of the research focus.

3. Duplicate publications in different databases.

4. Short conference abstracts, editorial forewords, and unpublished manuscripts that have not been peer-reviewed.

2.3 Instruments and Procedures

PRISMA was used to record and document the stages of literature search, screening, and selection. The initial search using the specified keywords identified about 3,589 sources. At the first stage, duplicates and irrelevant records (1,145 sources) were removed. At the second stage, screening was performed through annotations, resulting in the elimination of approximately 1,200 additional publications that did not meet the topic. At the third stage, a systematic full-text analysis was performed.This stage influenced the creation of a final sample of 52 articles that met all inclusion criteria. It was this corpus that became the basis for further content analysis and bibliometric processing. The selection of 52 positions is optimal to conduct a quality review study, as it ensures sufficient diversity and representativeness of scientific approaches. In addition, the number of sources made it possible to preserve the mechanism of analytical work of each publication.Figure 1 presents the main stages of source selection and processing.

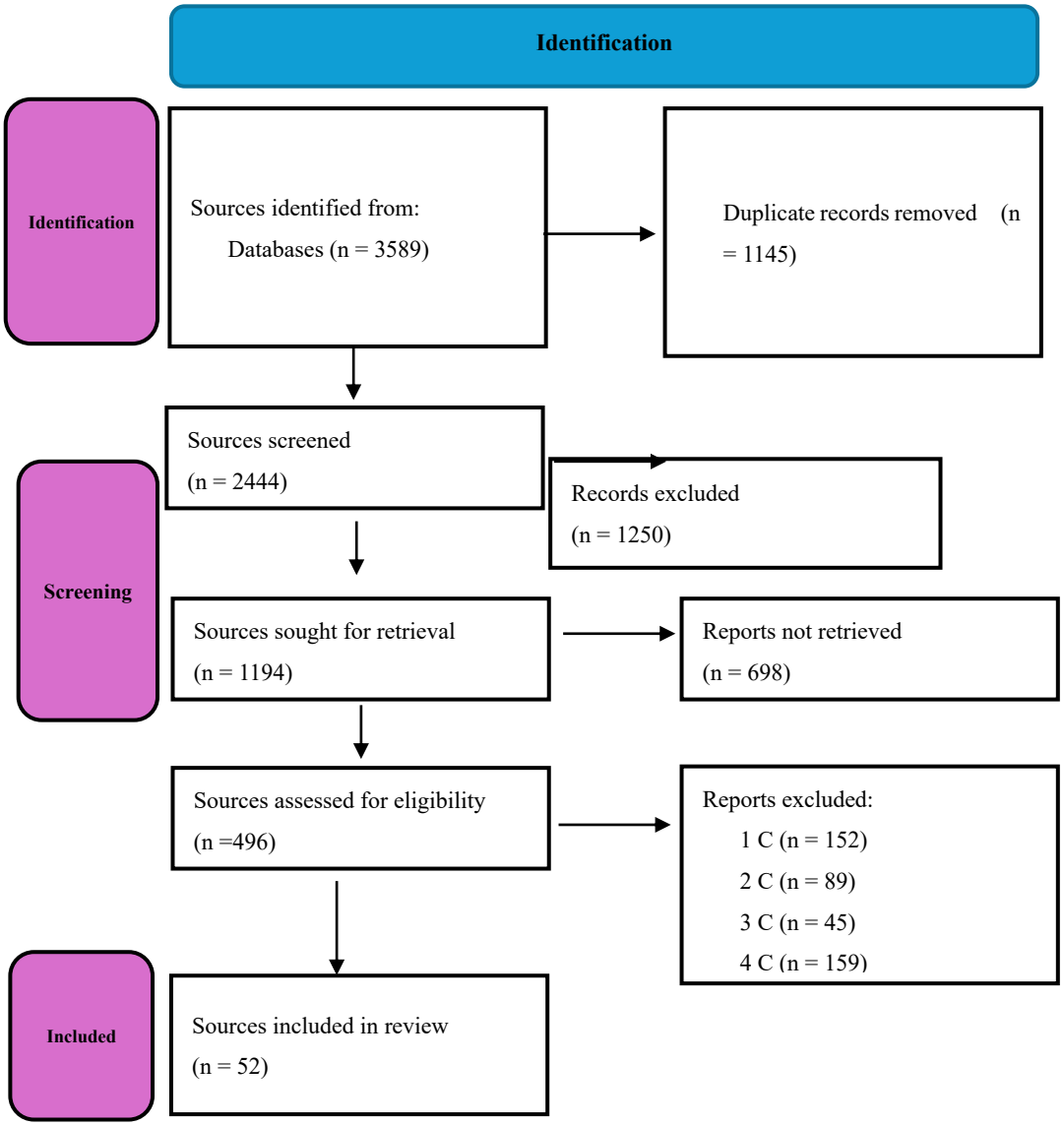

Figure 1. Identification of sources via databases

Moreover, the VOSviewer program was also used to build bibliometric maps (co-citation, shared use of keywords. This, in turn, made it possible to identify scientific clusters and leading research directions.

Thus, the research procedure was as follows:

1. Primary search for keywords in selected databases.
2. Elimination of duplicates and articles that do not meet the criteria.
3. Full-text analysis of selected works.
4. Analysis of the main definitions and approaches to blended learning.
5. Bibliometric analysis of the array of publications in VOSviewer.
6. Synthesis of results into a classification model.
7. Generalization and implementation of the main final theses.

2.4 Data Analysis

Data analysis consisted of three stages. First, content analysis of selected literature identified definitions, key aspects — pedagogical, technological, organizational, psychological — and conceptual models of blended learning. Bibliometric analysis with VOSviewer then highlighted major keywords and research clusters. Finally, integrating qualitative and bibliographic data allowed for classifying core aspects of blended learning and pinpointing scientific gaps for future study.

3. Results

Over the past two decades, BL has evolved from an adjunct to a key paradigm in higher education, as clearly reflected in the dynamics of publications in major academic databases. An analysis of the modern databases has shown a steady increase in the number of scientific publications devoted to BL in higher education, starting from the early 2000s. A particularly sharp jump was recorded in 2020–2022, which can be explained by the surge in the COVID-19 pandemic.

In total, 451 relevant publications were found in the sample, covering more than 90 countries around the world. The leaders in the number of scientific works are USA – 1640 documents; China – 1244 documents; UK – 865 documents; Australia – 818 documents; India – 425 documents.

Together, these five countries form more than half of the global corpus of research on blended learning. The group of active research centers also includes Indonesia (414), Malaysia (399), Germany (372), Canada (362), and Spain (353). In total, more than 30 countries have at least 100 published papers on this topic. Figure 2 shows the geographical distribution of publications in a bar chart format (top 15 countries) (See Figure 2).

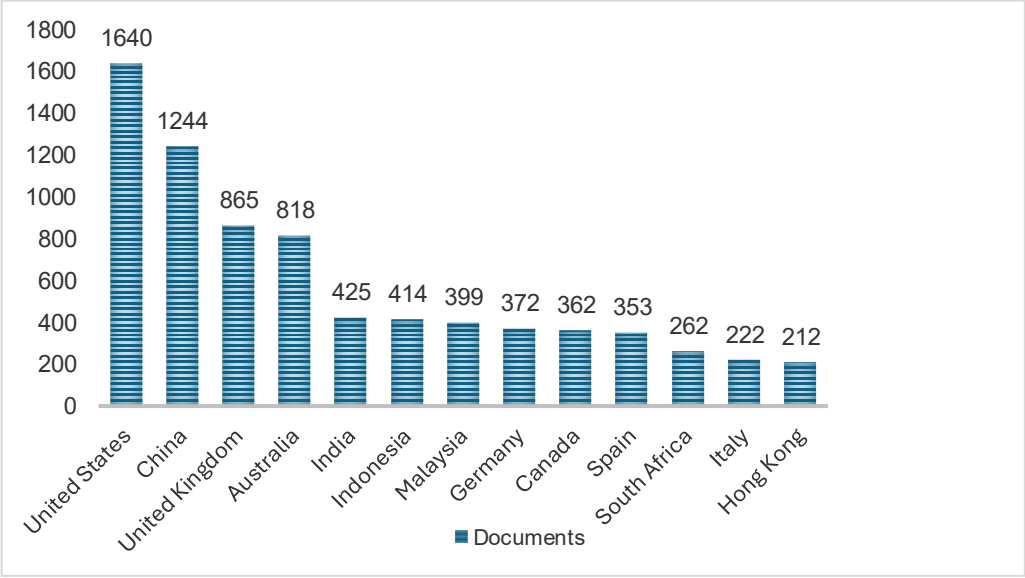

Figure 2. Number of scientific publications on blended learning in leading countries of the world (based on Scopus database)

Recently, as can be seen from the materials of the Scopus database, the issue of blended learning has decreased its popularity. In general, the dynamics of publications by sources demonstrate a steady increase in interest in the issues of blended learning in 2015–2022, the peak of which falls on the period of the COVID-19 pandemic, after which a gradual decrease in the number of articles is observed (see Figure 3).

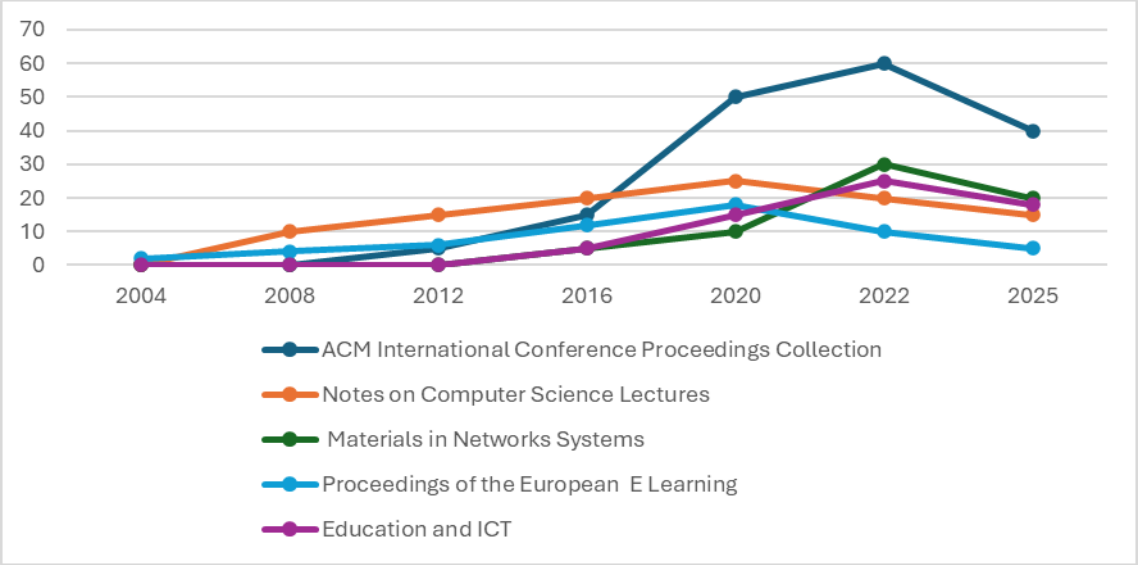

Figure 3. Dynamics of scientific publications by sources

Figure 3 shows the growth in the number of publications in leading sources and the concentration of research in interdisciplinary conference series. This indicated the broad integration of blended learning in the field of educational technology. This quantitative picture formed an important basis for further bibliometric analysis (VOSviewer), which allowed to identify key scientific clusters and the evolution of the definition of blended learning in higher education.

Bibliometric indicators processed in the program VoSViewer indicated the main terms that reflect the leading directions of research on the phenomenon of blended learning (BL) in higher education. The structure of these clusters revealed the heterogeneity of the research field and indicates the gradual complication and expansion of the conceptual boundaries of BL. The first 4 clusters are important. 1 cluster (74 terms) is methodological and evaluative. This cluster includes concepts related to educational measurement and psychometric methods: achievement test, regression analysis, self-efficacy, and technology acceptance. It reflects the growing interest of researchers in the validity and reliability of assessment tools in BL, as well as in the application of statistical methods (SEM, AOC, reliability analysis) to prove the effectiveness of BL formats. The presence of such terms as usability or standardized test indicated the integration of BL into the space of educational assessments.

Cluster 2 is pedagogical-didactic (63 terms), since it combined terms describing active and constructivist approaches: active learning, collaborative learning, community of inquiry, personalization, digital learning, experiential learning, and peer learning. This indicated that the modern definition of BL is not limited to a combination of online and offline forms but is increasingly interpreted as a student-centered didactic strategy. At the same time, cluster 3 is organizational-managerial (58 terms). Its presence indicated that BL is considered a pedagogical approach and institutional innovation, requiring management decisions, accreditation standards, and teacher training programs. Cluster 4 (analytical-technological) includes 48 terms learning analytics, instructional design, human-computer interaction, database, data science, and cognitive psychology. This cluster indicates the powerful development of the direction of digital analytics in BL, where the key task is to use data on student interaction with education platforms to monitor progress, personalize, and optimize the learning process. The last clusters are situational.

Cluster 10 (Pandemic-crisis:15 terms) It includes terms that are directly related to the COVID-19 pandemic: coronavirus, online learning, online teaching, face-to-face, workload, pandemic. This reflects the sharp growth of BL research in 2020–2022, when blended and distance learning became the basic mechanism for ensuring the continuity of higher education. The cluster can be considered as episodic, but decisive for the evolution of the BL discourse. Cluster 11 (Conceptual model: 10 terms) A separate cluster is focused on key BL models: blended learning, hybrid learning, flipped classroom, ADDIE model, and instructional design. This indicates that BL remains a central object for the development of didactic and methodological models: from classical (flipped classroom) to universal instructional models (ADDIE) (See Figure 4).

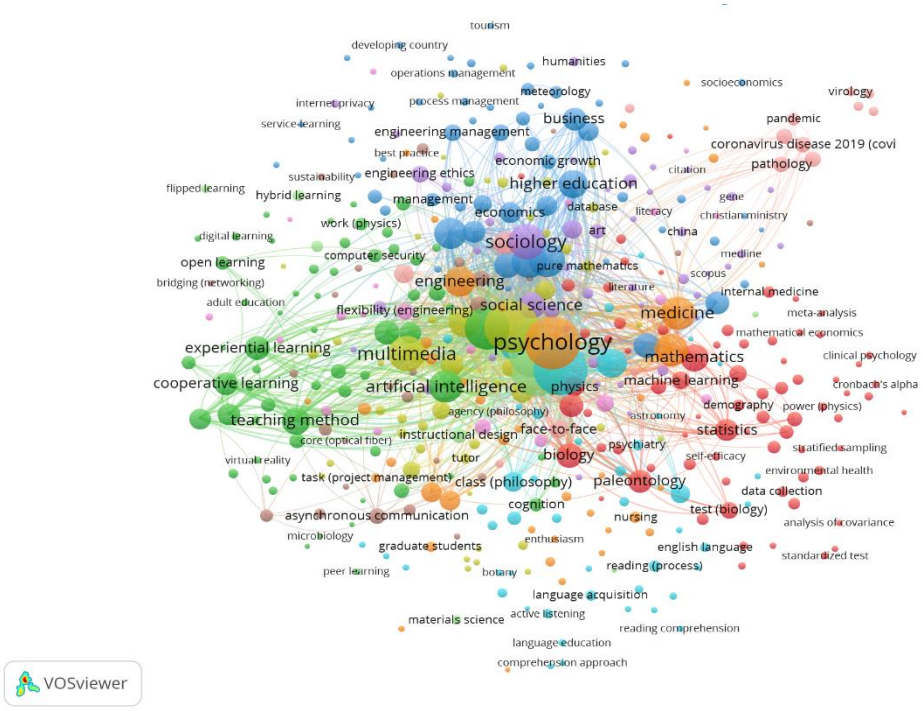

Figure 4. Cluster visualization of scientific discourse on BL in higher education

The identified bibliometric clusters not only outline the multidimensionality of the BL discourse, but also form the conceptual basis for developing a generalized model. In particular, the methodological-evaluative cluster defines the role of assessment and acceptance systems (PU/PEOU, BI), the pedagogical-didactic cluster defines the need for active methods and SRL, the analytical-technological cluster defines the development of digital infrastructure and learning analytics, and the organizational-management cluster defines the importance of institutional policy, support, and professional development. The crisis cluster defines a promising direction for the system's resilience and readiness for unforeseen conditions. It is these five content blocks that became the basis for building the POCM-BL model.

Hence, blended learning in higher education is distinguished as a pedagogical approach that involves the integration of face-to-face learning with online and digital environments and that combines synchronous and asynchronous interactions, personalization, and analytics of educational data to improve the quality and student-centeredness of the educational process (See Table 1).

Table 1. Interpretation of BL in modern higher education research

Authors	Source	How blended learning is understood	Key emphasis
Sahni **(2019)**	*J E Learn High Educ*	Combination of online and traditional formats as a mechanism for increasing student engagement	BL as a means of activating students
Prifti **(2020)**	*Open Learning*	BL as an environment in which self-efficacy and student satisfaction determine effectiveness	BL as a factor of self-efficacy and satisfaction
Serrano et al. **(2019)**	*Eur J Educ*	Technology-enhanced learning aimed at increasing student engagement	BL as part of digital pedagogy
Islam et al. **(2021)**	*E Learn Digit Media*	Model of student-centered BL in higher education	BL as a student-centered approach
Ibrahim & Nat **(2019)**	*Int J Educ Technol High Educ*	Model of teacher motivation to use BL	BL as a factor of professional motivation of the teacher
Alamri **et al. (2020)**	*TechTrends*	Models of technologies that support BL personalization	BL as an environment of personalized learning
Evans et al. **(2019)**	*High Educ Res Dev*	BL as an element of teacher professional development	BL as pedagogical practice in higher education
Anthony et al. **(2019)**	*Educ and Inform Tech*	BL as a means of increasing teaching and learning effectiveness	BL as a tool for increasing efficiency
Keržič et al. **(2019)**	*PLOS ONE*	BL is assessed through perceived usefulness and benefits for students	BL as a technology that increases performance
Anthonysamy et al. **(2020)**	*Educ Inf Technol*	BL as an environment for developing SRL strategies and non-academic outcomes	BL as a space for forming self-regulation
Müller & Mildenberger **(2021)**	*Educational Research Review*	BL as a mechanism for flexible learning that replaces classroom time with an online environment	BL as a strategy of flexibility
Eggers et al. **(2021)**	*Australas J Educ Technol*	BL as an environment for forming self-regulation in students	BL as a condition for SRL
Bruggeman et al. **(2021)**	*The Internet and Higher Education*	BL as a process whose success depends on the qualities of the teacher	BL as a competency requirement for the teacher
Suartama et al. **(2019)**	*Int J Emerg Technol Learn*	Instructional design model for mobile BL	BL as an innovative design of mobile learning
Heilporn et al. **(2021)**	*Int J Educ Technol High Educ*	BL as an environment where teacher strategies affect student engagement	BL as a pedagogical strategy of the teacher
Rianto **(2020)**	*IJELTAL*	BL as an important form for English language teaching	BL as practical experience in language education
Widjaja & Aslan **(2022)**	*Nazhruna*	BL in geography programs: combining digital and traditional methods	BL as a subject-specific strategy
Al-Mekhlafi **et al. (2025)**	*Cogent Education*	BL as an effective form of learning from the students' perspective	BL as a tool of perceived effectiveness
Lazar et al. **(2020)**	*PLOS ONE*	BL as a context for developing a digital acceptance scale	BL as a testing space for digital adoption
Armellini et al. **(2021)**	*TechTrends*	Active blended learning as a student experience that combines activity and reflection	BL as active and experiential learning
Adams et al. **(2020)**	*Interactive Technology*	BL as an environment where students' readiness for digital formats is important	BL as readiness and preparedness
Martín-García et al. **(2019)**	*Br J Educ Technol*	BL explained through TAM models and stages of acceptance	BL as technological adoption

Blended learning is comprised of several key stages: distance education, in-person practical sessions, and final assessment. Contemporary educational institutions employ diverse strategies for elective learning, encompassing both synchronous and asynchronous online formats. As a result, a range of blended learning combinations are available:

The first combination: Mixing face-to-face and distance learning. This is the most common form, which involves placing educational materials in an LMS, a social network. This model also creates the basic conditions for conducting blended learning and using the "flipped" model in the classroom.

The second combination: mixing structured and unstructured learning. Structured learning is most often implemented in a university and corporate educational environment, where a student receives a pre-prepared set of educational materials and moves along a specific educational trajectory.

In contrast, unstructured learning takes place in a more free-form during conversations, meetings or even e-mail correspondence in the format.

The third combination: mixing user content and external tools. In addition to traditional classes, it involves the use of ready-made courses.

The fourth combination: mixing independent and collaborative learning. Using automated learning technologies and simultaneously forming a common learning space.

Besides, the effective implementation of BL in higher education relies not on one, but on a set of interrelated aspects. Of particular importance is pedagogical and didactic design, which involves the construction of mixed learning routes, a balance of face-to-face and online activities, and the use of active methods (PBL, cases, projects) (Evans et al., 2019).

This is also confirmed in studies by reviews of the effects of replacing classroom time with online activities and the analysis of the main models of BL design. Personalization and self-regulated learning are also important components of the blended form, as they influence the implementation of individual trajectories, support SRL strategies (goal-setting, planning, monitoring and reflection). The evidence base is provided by studies that have evaluated BL personalization models (Adams et al., 2020). Besides, a well-established technological ecosystem and tools play a vital role in shaping modern BL. LMS/LXP (Moodle, Blackboard, Classroom), video environments, virtual laboratories, mobile platforms, and tool integration play an important role in this form. The evidence base is provided by the analysis of BL models through EdTech (Suartama et al., 2019). Organizational readiness and staff development influence the formation of a quality blended learning environment. For this, targeted innovation policies and change management, which include support and mentoring of teachers, institutional resources, and effective PD programs, become important. Student engagement, interaction, and experience are important components of a modern blended learning system. These elements include well-designed activities that enhance engagement, social presence, feedback, and an effective UX of learning. Assessment of outcomes in blended learning is predominantly done in face-to-face environments, and the use of learning analytics for decision-making. However, the readiness of the educational institution to implement BL models is particularly important. This requires high-quality technical access, digital literacy of participants in the learning process, their psychological readiness, and addressing various contextual barriers (see Table 2).

Table 2. Matrix for classifying main aspects of BL in higher education.

Aspect	Key constructs	Typical implementation indicators	Representative sources. Evidence base
Instructional Design	Active/project-based learning; F2F/online balance; Teacher role	Agreed-upon blending Scenarios Task quality Clear rubrics Online content	Evans et al. (2019) Müller & Mildenberger (2021) Suartama et al. (2019) Bruggeman et al. (2021) Armellini et al. (2021) Han & Ellis (2019) Mielikäinen (2021) Dwivedi (2019)
Personalization and SRL	Individual trajectories. Self-regulation	Adaptive pathways SRL artifacts Reflective journals	Alamri & Watson (2020) Anthonyet al. (2020) Eggers et al. (2021) Armellini et al. (2021) Yang et al. (2022)
Technology Ecosystem	LMS/LXP; Mobile/Virtual environments	Stability Integrations 24/7 availability	Widjaja & Aslan (2022) Finlay et al. (2022) Dambic et al. (2021) Martín-García et al. (2019)
Organizational Readiness	PD, Policies, Support	Training programs IT Support Regulations Teaching Programming Courses	Lim et al. (2019) Fresen (2018) Fisher et al. (2018) McKenzie et al. (2020)
Adoption and Motivation	TAM/UTAUT; Motivational drivers	PU/PEOU, BI Actual use Continuance intention Self-efficacy Institutional support as a moderator	Ibrahim & Nat (2019) Keržič et al. (2019) Lazar et al. (2022) Martín-García et al. (2019) Yang et al. (2022)
Student Engagement	Engagement strategies; Social presence	Participation Interaction Timely feedback	Heilporn et al. (2021) Armellini et al. (2021) Bouilheres et al. (2020) Dwivedi et al. (2019)
Assessment and Analytics	Formative/ summative; Learning analytics	Log data Dashboards Improving results	Bouilheres et al. (2020) Awajan et al. (2024) Bervell & Arkorful (2020) Bokolo (2021).
Readiness/Inclusion	Technical access; Digital literacy	Readiness Questionnaires Self-efficacy Barriers/Needs	Adams et al. (2020) Rianto (2020) Widjaja & Aslan (2022) Finlay et al. (2022) Awajan et al. (2024) Warren et al. (2020)

Therefore, the phenomenon of blended learning has already gone beyond the narrow interpretation as a "combination of online and offline forms". BL is defined as a multi-level educational system in which pedagogical, technological, organizational and socio-psychological factors are closely interconnected. At the same time, the scientific discourse of recent years (especially after COVID-19) puts forward new requirements: ensuring the resilience of educational systems to crises, the integration of innovative technologies (in particular, artificial intelligence and learning analytics), as well as the scaling of blended learning in conditions of inclusivity and equal access. The proposed POCM-BL model is directly based on the structure of clusters identified in the bibliometric analysis. Each cluster reflects a separate dimension of the

model: pedagogical, technological, organizational or socio-psychological. In addition, the mechanisms of acceptance/adoption, readiness and support logically follow from the methodological-evaluative cluster. The inclusion of promising areas in the model — AI, resilience and inclusivity — is due to the presence of crisis and technological clusters, which capture the impact of the pandemic and the development of learning analytics.

The proposed generalized prospects-oriented classification model of BL (POCM-BL) includes three levels:

1. Basic structural dimensions. This involves building educational trajectories that integrate active methods (active learning, problem-based learning, flipped classroom), the development of self-regulation and personalization.

2. Technological ecosystem. It involves the synthesis of LMS, mobile platforms, virtual environments, data analytics tools, creating an accessible infrastructure.

3. Organizational infrastructure. involves the formation of institutional policy, support for IT services, advanced training of teachers, resource provision.

4. Socio-psychological dimension – readiness and motivation of participants, formation of a culture of cooperation, support for inclusiveness.

At the same time, the effectiveness of BL implementation should be determined not only by the presence of structural components, but also by the action of key mechanisms of acceptance and support. These components should include acceptance & adoption: PEOU (Perceived Ease of Use), BI (Behavioural Intention), continuance intention. Readiness: digital literacy, technical availability, psychological readiness of students and teachers and institutional support: the presence of a systemic strategy of the university and investments in resources.

4. Discussion

The key research problem was to carry out a systematic and bibliographic analysis of research on BL, to define the phenomenon of blended learning and its main classification components. Accordingly, the results of the bibliometric analysis study indicated a steady increase in the number of publications on blended learning in higher education. This is consistent with the findings of Müller C. and Mildenberger T., who emphasized the gradual integration of BL as a dominant educational practice (Müller & Mildenberger, 2021; Vasiutiak et al., 2021). At the same time, the data showed a clear peak in 2020–2022, which is associated with the COVID-19 pandemic. Similar conclusions have been expressed in other works (Anthony et al., 2019; Bervell & Arkorful, 2020). Geographic analysis also confirms the global nature of the phenomenon. Countries such as the USA, China, the UK, and Australia are leaders in the study of blended learning. This indicates that scientific innovations in BL are concentrated in countries with a high level of digitalization of education. However, our data also show a gradual increase in the contribution of Asian countries. Overall, this indicated the transnational nature of the discourse and the need to consider local characteristics when developing BL implementation models.

The distribution of terms in clusters confirms the results of previous review studies. For example, the emphasis on reliability, SEM, achievement tests and measurability of effectiveness is consistent with the findings of Fisher et al. (2018) and Ma & Lee (2021) that empirical evidence is a key condition for scaling BL. The pedagogical-didactic cluster, in turn, echoes the works of Sáiz-Manzanares et al. (2020), Li et al. (2020) and Mali & Lim (2021), where BL is viewed as an environment of active, constructivist and personalized learning. The analytical-technological cluster correlates with the mobile/virtual BL models described by Suartama et al. (2019) and Martín-García et al. (2019). At the same time, a separate crisis cluster confirms the findings of Westerlaken et al. (2019) and Jowsey et al. (2020) on the role of pandemics and crises in transforming approaches to BL.

The clustering of key terms confirms the multidimensionality of the research. In particular, the emphasis on achievement tests, reliability, and SEM is consistent with the conclusions of other scholars, who the measurability and perceived benefits of BL determine its success (Fisher et al., 2018; Ma & Lee, 2021). At the same time, pedagogical innovations (active learning, personalization, collaborative learning) are traced in the second cluster, which generally resonate with the other results (Sáiz-Manzanares et al., 2020; Mali & Lim, 2021; Li et al., 2020). It is important that our analysis revealed a separate crisis cluster associated with wars and pandemics, which is only partially traced in the literature (Westerlaken et al., 2019; Jowsey et al., 2020).

The classification proposed in this study covered pedagogical design, SRL, and personalization, technological integration, organizational infrastructure, socio-psychological dimension, as well as mechanisms of acceptance and motivation. It partly echoes the models proposed in other works, in which the main emphasis is placed on student-centeredness and personalization (Chau et al., 2021; Dosbayev et al., 2025). It is also important that modern authors have emphasized the role of the teacher and his motivation to use innovations (Calderón et al., 2020; Geng et al., 2019). This analysis also indicated their significance but showed that they are only one element of a larger system, where institutional policy, university support, and student readiness play a key role.

The generalized model formed in the study (POCM-BL) differs from the previous ones in that it combines several levels: basic dimensions (pedagogical, technological, organizational, socio-psychological), mechanisms of provision (acceptance, readiness, support) and prospective guidelines (AI, resilience, inclusivity). Similar elements are partly traced in other works that used innovation and socio-psychological guidelines, but our model integrates not only adoption, but also the perspectives of scaling and sustainability. In addition, other works have proposed instructive models for mobile BL (Ustun & Tracey, 2019; Buck & Tyrrell, 2022). However, the contribution of this study is to formulate a strategic paradigm in which the BL phenomenon is considered as an important foundation for the transformation of university education. This is also consistent with new trends described in other works. Thus, the results of this study extend to the conclusions of previous authors on the global growth of BL and its student-centricity. Despite the results obtained, this study has its limitations, in particular, the search and selection of literature was carried out based on the most widespread international scientometric databases (Scopus, Web of Science, ERIC, Google Scholar) and a limited number of national repositories. This could have led to the absence of relevant studies published in less-indexed sources or local publications. In addition, the analysis included only publications in English, which could reduce the representativeness of the results, especially for countries in Asia, Latin America, or Africa, where a significant part of the research is published in other languages. The formed generalized model is conceptual and summarizes key trends; however, its application requires further empirical verification in specific educational contexts and disciplines. This opens new areas of research. In the future, the list of processed sources should include materials from scientists from different countries that contain local results. It is also worth conducting an empirical study of the use of the model (POCM-BL) in different educational environments.

5. Conclusions

In the study, because of the calculations, a comprehensive understanding of BL as a multi-level educational system was formed. As a result, pedagogical, technological, organizational, and socio-psychological factors were integrated.

As a result of the analysis of relevant sources from the Scopus scientific-metric database, the global nature of the discourse was noted (among the leaders are such countries as the USA, China, Great Britain, Australia, and India). The study of the dynamics of publications (growth until 2020–2022 and a gradual decline after the pandemic) made it possible to identify the existence of strong research clusters (methodological-evaluative, pedagogical-didactic, organizational, technological, pandemic, and model).

As a result of the analysis, a matrix of seven groups of aspects was proposed - instructional and didactic design, personalization and SRL, technological ecosystem, organizational readiness, motivation and acceptability (TAM/UTAUT), student engagement, assessment and analytics, as well as determination of readiness and inclusion factors.

A generalized perspective-oriented classification model (POCM-BL) was also presented. The proposed model included: basic structural dimensions (active methods, personalization, SRL), technological ecosystem (LMS, mobile and virtual platforms, data analytics), organizational infrastructure (policies, resources, PD), and socio-psychological dimension (factors such as motivation, culture of collaboration, inclusivity).

The article formulates separate recommendations. First, it is about increasing the sustainability of educational systems, integrating AI and learning analytics, scaling BL models while ensuring equal access. At the same time, promising areas for further research include the issue of comparing national and regional models of BL implementation in higher education and further analysis of AI capabilities**.**

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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No additional data are available.

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