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Examining Blended Learning Practices in Higher Education Institutions in India: A Systematic Literature Review

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Abstract

Blended learning (BL) has emerged as a key strategy for flexible, technology-enabled higher education in India, though adoption remains uneven. This systematic review synthesizes evidence from 46 peer-reviewed studies published between 2010 and 2025, identified through Scopus and screened using PRISMA 2020 guidelines. Methodologically, BL research progressed from exploratory case studies and mixed methods in the early 2010s to more rigorous experimental, survey-based, and modeling approaches, especially during and after the COVID-19 pandemic. In practice, adoption evolved from Moodle-based pilots and offline frameworks to flipped classrooms, mobile-supported learning, MOOCs, and competency-driven models. The pandemic marked a turning point, accelerating large-scale use of LMS platforms, video conferencing, and mobile applications. Reported outcomes were largely positive, including improved performance, critical thinking, digital literacy, and learner engagement. Faculty also benefited from enriched interaction, though challenges persisted in motivating students for asynchronous tasks and assessing practical skills online. Barriers included weak infrastructure, limited faculty training, institutional inertia, and inequities in student access, particularly in rural contexts. The review concludes that BL has shifted from an experimental supplement to a scalable instructional strategy aligned with NEP 2020. Realizing its potential requires systemic readiness through sustainable infrastructure, faculty empowerment, equitable access, and supportive institutional policies.

Keywords:	Blended Learning, Higher Education Institutions (HEIs), Systematic Literature Review, Digital Pedagogy, National Education Policy 2020

Introduction

Blended learning integrates traditional classroom instruction with digital learning methods to provide a flexible

and personalized learning experience. It supports active participation, learner autonomy and diverse delivery modes. During the COVID-19 pandemic, demonstrated the significance of blended learning in maintaining instruction continuity.

The National Education Policy (NEP) 2020 supports the adoption of blended learning in Educational institutions to promote inclusive and ICT enabled learning.The University Grants Commission (UGC) defines blended learning as the integration of offline and online teaching modes in their concept on "Blended Mode of Teaching and Learning" and also recommended 60:40 Blended Learning ration and also suggested IPSIT Framework to guide in implementation blended learning in educational institutions.

Despite strong policy support, the implementation of blended learning in Indian higher education institutions remains uneven due to inadequate infrastructure, limited faculty training, resistance to change and digital divide. This Systematic Review of Literature (SRL) investigates blended learning practices within Indian higher education, focusing on institutional approaches, student experiences, existing challenges and major recommendations for improvement.

Objectives of the Study

The primary aim of this study is to conduct a systematic review of existing literature on blended learning practices in Higher Education Institutions (HEIs) in India. The specific objectives are as follows:

1. **To examine the research designs and methodological approaches** employed in previous studies on blended learning in Indian HEIs.

2. **To explore how blended learning models have been implemented** across institutions over time, including the tools, strategies, and instructional frameworks adopted.

3. **To analyze the reported outcomes** of blended learning practices, particularly in terms of student engagement, academic performance, and instructional effectiveness.

4. **To identify the challenges and barriers** encountered by institutions and educators during the implementation of blended learning.

5. **To synthesize the key findings and recommendations** from prior research, with a view to informing future practices, policy-making, and instructional design in the context of blended learning in Indian higher education.

Research Methodology

This review systematically analyzed published research to address the above objectives. The process followed the PRISMA 2020 Guidelines, which involve four stages: Identification, Screening, Eligibility, and Inclusion.

Inclusion Criteria

- Studies published between 2010 and 2025.
- Sources limited to the Scopus database.
- Focus on BL in Indian HEIs.
- Only peer-reviewed journal articles and conference papers.
- Studies available in English and open-access or publicly accessible.

Search Strategy:

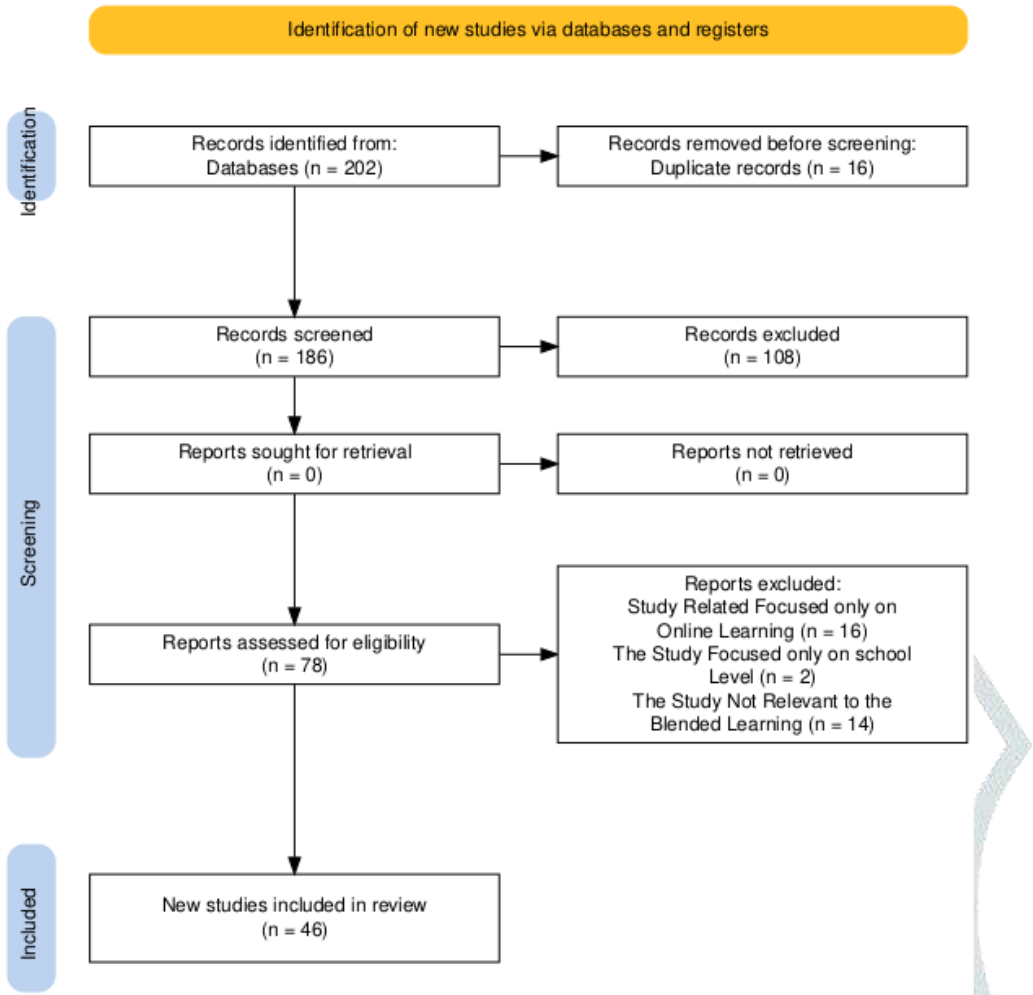
A comprehensive search was carried out using advanced query strings in Scopus and Web of Science:

Advanced Query Search	
SCOPUS	TITLE-ABS-KEY (("blended learning" OR "hybrid learning" OR "flipped classroom" OR "blended teaching" OR "blended pedagogy") AND ("higher education" OR universit* OR college* OR hei* OR institution*) AND (india OR indian)) AND PUBYEAR > 2010 AND (LIMIT-TO (LANGUAGE , "English"))
Web of Science	TS=(("blended learning" OR "hybrid learning" OR "flipped classroom" OR "blended teaching" OR "blended pedagogy") AND ("higher education" OR university* OR college* OR HEI* OR institution*) AND (India OR Indian)) AND PY=(2010-2025) AND LA=(English)

Screening and Selection:

- A total of **202 records** were initially identified.
- After removing 16 duplicates, **186 records** remained.
- Screening titles and abstracts led to the exclusion of **108 articles**, mainly due to irrelevance or access restrictions.
- The full text of **78 articles** was assessed. Of these, 32 were excluded:
  - 16 focused solely on online learning.
  - 2 were limited to school-level education.
  - 14 were unrelated to BL.

The final review included **46 studies**, which were synthesized to provide a comprehensive overview of BL in Indian HEIs.



Research Methodologies and Designs Opted in Blended Learning Studies in Indian HEIs

Over roughly the past decade, research on blended learning (BL) in Indian higher education has become progressively more methodologically sophisticated, which in turn suggests that the field itself is steadily maturing. In the early phase, from about 2012 to 2015, most studies leaned on exploratory designs case studies, small-scale mixed-method projects, and other flexible approaches to make sense of emerging instructional practices. Kamat and Sardessai (2012), for example, investigated Moodle-based agile techniques through a focused case study, while Chhabra and Sharma (2013) used a quasi-experimental design to compare problem-based learning with and without the integration of blogging. In a similar exploratory spirit, Chetlur et al. (2014) has adopted a mixed method framework to capture both usage patterns and participants' interpretations..

In the period between 2016 and 2019, research outputs started to reflect stronger methodological discipline, as evidenced by growing numbers of controlled trials, cross-sectional survey designs, and experiments. Cutrell et al. (2015) conducted a randomized controlled trial (RCT) supplemented by field observations, blending quantitative robustness with contextual insight. Dwivedi et al. (2019) integrated Learning Management System (LMS) analytics with interviews, using the latter to help explain the digital traces left in the LMS. Maheshwari and Seth (2019) employed control groups to examine student engagement and performance, thereby generating more persuasive comparative evidence. Meantime, Joy and Renumol (2018) used an action research strategy, Sanjeev and Natrajan (2019) employed large-scale survey methods to identify broader tendencies, and

Selvakumar and Sivakumar (2019) implemented quasi-experimental pre–post designs to document changes over time.

The COVID-19 period (2020–2022) brought a noticeable pivot in focus, as researchers turned toward understanding the dynamics of rapid digital transition. Within this changing context, survey research, phenomenological inquiries, and intervention-focused designs became especially prominent. Swaminathan et al. (2021) combined surveys with focus group discussions to connect large-scale patterns with more nuanced, discussion-based insights. Intervention-oriented work by Aristotle et al. (2021) and Arathi et al. (2022) drew on statistical procedures like ANOVA and paired t-tests to evaluate the impact of targeted teaching interventions.Meanwhile, Chattaraj and Vijayaraghavan (2021) used Interpretative Phenomenological Analysis (IPA) to examine how participants experienced the shift to digitally mediated learning. In support of these approaches, wide-ranging surveys by Bordoloi et al. (2021) and Gupta et al. (2021) recorded the voices of faculty and students, yielding a wider-angle account of how various groups perceived the shift.

Since 2023, the field has shown a growing inclination toward advanced theory-led research designs. Virani et al. (2023) used Structural Equation Modeling (SEM) to study MOOC adoption, capturing the interrelations among latent constructs instead of examining each factor separately. Kalra et al. (2025) helped refine the measurement toolkit by validating the Blended Learning Effectiveness and Challenges Scale (BLECS.. Similarly, Widyandana et al. (2024) used retrospective cohort analysis to assess learning outcomes, adding a more longitudinal and comparative dimension to the evidence base. At the same time, conceptual and policy reviews by Chaturvedi et al. (2021) and Saha et al. (2021) have deepened theoretical engagement by applying frameworks such as the Community of Inquiry (CoI), thus situating Indian BL research within wider international debates.

Overall, the trajectory of this literature shows a movement away from early exploratory work toward more demanding experimental, mixed-method, and theoretically modeled investigations. The pattern that emerges is of an academic field growing more mature and flexible, repeatedly reworking its methods to respond to evolving digital realities in teaching and learning.

Adoption of in Blended Learning Models in Studies in Indian HEIs

BL adoption in Indian higher education appears to have evolved in a series of distinct phases, each phase moulded by what technologies were accessible and by the specific demands of the context.. During the initial phase from 2012 to 2015, research efforts largely clustered around trials of Moodle-driven and offline frameworks, which were purpose-built for resource-constrained, low-connectivity settings. Chhabra and Sharma (2013) integrated blogging into Problem-Based Learning to sustain reflection outside class, and Chetlur et al. (2014) rolled out EduPaL to accommodate learners with limited internet bandwidth. Within health sciences, educators experimented with role-play and video-based strategies (Munir & Kumar, 2014), whereas disciplines such as theatre and biotechnology trialled performance-oriented and virtual laboratory models (Cloete et al., 2015; Radhamani et al., 2015), signalling an early experimentation with modality-rich designs.

Between 2016 and 2019, Learning Management Systems (LMSs) and synchronous communication tools moved closer to the centre of BL practice. Diwakar et al. (2016) expanded the reach of virtual labs to rural students, and Mahapatra et al. (2016) sought to bridge digital divides by coupling LMS environments with WhatsApp-based support. Flipped classroom models gained particular traction in engineering and management, using pre-class videos and in-class active discussions to bolster student engagement (Peethambaran et al., 2018; Maheshwari & Seth, 2019). Alongside flipped classrooms, there was a rise in alternative formats, including Station Rotation approaches (Selvakumar & Sivakumar, 2019) and blended communication skills modules (Joseph & Sherine, 2019), pointing toward a broader design repertoire.

The COVID-19 period (2020–2022) saw an explosive growth of Blended Learning, with universities relying on combinations of LMS, Zoom, mobile technologies and open educational resources to sustain teaching (Bordoloi et al., 2021; Gupta et al., 2021). In health professions education, competency-oriented and flipped designs gained prominence in medicine and nursing (Aristotle et al., 2021; Swaminathan et al., 2021), while scripted learning sequences emerged as a way to scaffold online engagement (Chattaraj & Vijayaraghavan, 2021). This phase was was accompanied by policy reflections (Saha et al., 2021) that began to reframe BL from being an emergency improvisation to being a planned, sector-wide strategy.

In the post-pandemic years (2022–2025), emerging research indicates continued diversification alongside a growing sense of methodological and design maturity. Studies focusing on backward design in Moodle (Indira, 2022), gamified blended courses (Desai et al., 2022), and national MOOC initiatives like SWAYAM and NPTEL (Virani et al., 2023) collectively stress personalization for learners, large-scale reach, and adaptable delivery. More advanced models—including Active Blended Learning (Kumar et al., 2024) and the validation of the Blended Learning Effectiveness and Challenges Scale (BLECS) (Kalra et al., 2025)—reflect a growing concern with institutional integration, quality assurance, and systematic evaluation of BL experiences.

Taken together, these developments suggest that BL in Indian higher education institutions has moved from small-scale pilots and isolated experiments toward more advanced, policy-aligned, and institutionally embedded frameworks.

Reported Outcomes in Adoption Blended Learning in Indian HEIs

Evidence on BL outcomes in Indian higher education suggests a gradual transition from limited, modular experiments to fully fledged, policy-aligned teaching frameworks. During 2012–2015, outcome evidence was primarily tied to engineering courses using Moodle, where chunked online content was paired with hands-on laboratory classes. Chhabra and Sharma (2013) reported documented enhanced collaboration strengthened when PBL was combined with blogging, and Chetlur et al. (2014) further showed that flipped formats remained viable in bandwidth-poor contexts through offline content delivery. Munir and Kumar (2014) showed that role-play and video-based approaches in health sciences boosted clinical readiness, and parallel research in theatre and biotechnology reported richer experiential gains via performance-led tasks and virtual laboratory designs (Cloete et al., 2015; Radhamani et al., 2015).

Between 2016 and 2019, BL outcomes reflected a maturing ecosystem built around Learning Management Systems (LMSs) and synchronous tools. Diwakar et al. (2016) demonstrated how virtual labs could be scaled across rural villages, thereby widening access, while Mahapatra et al. (2016) identified LMS–WhatsApp integration as a practical way to reduce digital inequality.. At the same time, Gulzar and Leema (2016) observed that fully blended frameworks were present in only a small subset of institutions, indicating that adoption was still uneven. flipped formats were associated with significant gains in student engagement and achievement (Peethambaran et al., 2018; Maheshwari & Seth, 2019), while models like Station Rotation and planned BL structures (Selvakumar & Sivakumar, 2019; Joseph & Sherine, 2019) highlighted that careful pedagogy mattered as much as, if not more than, the technology.

During the pandemic, findings pointed simultaneously to the extensive reach of BL implementation and to the pressures created by shifting so quickly to blended and online modes. Evidence from broad survey studies (Bordoloi et al., 2021; Gupta et al., 2021) showed heavy dependence on LMSs, Zoom, and open educational resources, suggesting that BL functioned as a default infrastructure in numerous institutions.

Health science studies reported that competency-based flipped configurations enhanced training effectiveness (Aristotle et al., 2021), whereas mobile, asynchronous learning pathways helped nursing students continue learning despite difficult conditions (Swaminathan et al., 2021). searchers additionally noted changes in learners' routines and study scripts (Chattaraj & Vijayaraghavan, 2021), and consistently argued that long-term success depended on contextually attuned pedagogy and better faculty readiness (Saha et al., 2021).

Post-pandemic studies (2022–2025) indicate outcomes linked to mainstreaming and personalization, rather than simply keeping learning going in crisis mode. Backward design implemented in Moodle was linked to more targeted feedback and clearer learning pathways (Indira, 2022), gamified BL models improved mathematics learning outcomes (Desai et al., 2022), and flipped Problem-Based Learning further deepened conceptual understanding in medical education (Arathi et al., 2022). National MOOC platforms such as SWAYAM and NPTEL became more firmly institutionalized (Virani et al., 2023), moving from optional add-ons to integrated components of programme delivery. Advanced outcomes reported in this phase include strengthened teamwork and assessment cycles within Active Blended Learning models (Kumar et al., 2024), greater contextual adaptability through multi-model experiments (Ahmed et al., 2024), and closer alignment with national policy directions (Qamar et al., 2024). Kalra et al. (2025) further consolidated this trajectory by validating BL outcomes through the BLECS instrument, signalling a phase of evaluative and conceptual maturity.

Overall, the pattern of outcomes suggests that BL has moved beyond early access-driven pilots toward advanced, scalable, and learner-centred designs, cementing its role as a recognised and increasingly mainstream strategy within Indian HEIs.

Challenges addressed by HEI's while adoption Blended Learning

The adoption of blended learning (BL) in Indian HEIs has been constrained by persistent technological, pedagogical, institutional, learner-centric, and equity-related challenges.

Technological barriers remain among the most significant. Studies reported unstable internet connectivity, inadequate infrastructure, device unavailability, and LMS integration issues, particularly in rural and under-resourced contexts (Kamat & Sardessai, 2012; Chetlur et al., 2014; Diwakar et al., 2016). Despite wider adoption, more recent studies highlight continuing inefficiencies and poor device access (Kalra et al., 2025).

Pedagogical readiness has also limited effective adoption. Faculty often lacked training in digital pedagogy, faced resistance to new formats, and struggled with the additional workload of creating context-specific digital content (Maheshwari & Seth, 2019; Arathi et al., 2022). Limited interactivity in video lectures, difficulties motivating pre-class preparation, and poor alignment with curricula compounded these issues (Nancy et al., 2022; Qamar et al., 2024).

Higher education institutions faced diverse constraints, from policy gaps to uncoordinated strategies and a broader hesitation within leadership to channel resources toward technology. As a consequence, blended learning was introduced in many institutions without systematic planning or close alignment of teaching and assessment structures (Munir & Prem, 2014; Virani et al., 2023).

From students' perspective, declining motivation, variable digital competencies, and prolonged screen exposure frequently hindered engagement. Students who were first-generation or who relied on regional languages seemed to struggle even more, particularly in collaborative or experimentally oriented learning environments (Swaminathan et al., 2021; Chattaraj & Vijayaraghavan, 2021). These difficulties were compounded by health-related concerns—stress, eye strain, and frequent distractions—that further diminished engagement.

Equity gaps emerged as a particularly pressing issue. Limited access to affordable devices, recurring regional internet shutdowns, and persistent socio-cultural constraints—especially gender-based restrictions—narrowed opportunities for participation (Sareen & Mandal, 2024; Bordoloi et al., 2021). Smaller institutions lacking LMS platforms or MOOC integration were disproportionately affected by these inequities.

Further obstacles emerged in the areas of instructional design and assessment. Static instructional materials, the absence of gamified or interactive elements, and restricted opportunities for feedback tended to weaken learner engagement (Cloete et al., 2015; Desai et al., 2022). Online assessments introduced their own complications, including concerns about academic integrity, potential bias in peer-evaluation processes, and the difficulty of accurately assessing higher-order cognitive skills (Sharma & Alvi, 2021; Widyandana et al., 2024).

Taken together, these challenges suggest that technological readiness, while necessary, is not on its own enough. Long-term adoption depends on coordinated efforts to strengthen infrastructure, support faculty development, expand equitable access, and design pedagogy that fits local needs.

Key Findings and Recommendations:

Blended learning (BL) in Indian HEIs has steadily driven pedagogical innovation, strengthened faculty development, and supported broader institutional change, even as it has continued to expose significant gaps in infrastructure and equity.

Pedagogical Innovation and Student-Centered Learning: Across disciplines, flipped classrooms proved particularly effective—especially in engineering and medical education—because they enhanced critical thinking, supported learner autonomy, and improved outcomes for underachieving students (Peethambaran et al., 2018; Arathi et al., 2022). Activity-based and project-oriented approaches also helped narrow the divide between academic learning and industry expectations while encouraging meaningful collaboration (Joy & Renumol, 2018).

Faculty Development and Instructional Support: Faculty readiness consistently emerged as a decisive element of successful implementation. Studies recommended ongoing professional development, centralized training structures, and the systematic use of instructional design principles to help instructors redesign curricula and integrate multimedia more effectively (Munir & Prem, 2014; Bordoloi et al., 2021).

Digital Infrastructure and Technological Integration: Persistent disparities in connectivity and access to devices continued to limit adoption, particularly in rural areas. Even so, scalable low-tech solutions such as EduPaL (Chetlur et al., 2014) and mobile applications (Shanmugapriya et al., 2023) demonstrated considerable promise. Widely adopted platforms—including Google Classroom, LMS environments, and various integrated tools—supported content delivery, collaborative work, and iterative feedback (Vijaya Lakshmi & Sri Lakshmi, 2020; Desai et al., 2022).

Across studies, BL was associated with steady improvements in motivation, skill development, and academic performance. Blogging, for instance, strengthened both reflective capacities and technical skills (Chhabra & Sharma, 2013), while virtual laboratories provided credible substitutes for hands-on practice (Radhamani et al., 2015; Diwakar et al., 2016). Repeatedly, engagement emerged as a key factor mediating these outcomes (Sanjeev & Natrajan, 2019).

Equity and Accessibility: The pandemic made long-standing digital divides more visible, especially in rural and conflict-affected regions. Still, mobile-first approaches, multilingual resources, and LMS–WhatsApp integration offered promising avenues for expanding access and participation (Mahapatra et al., 2016; Swaminathan et al., 2021; Sareen & Mandal, 2024).

Curriculum Integration and Institutionalization: BL adoption tended to be most successful when formalized through institutional policy and aligned with national accreditation systems and NEP 2020 guidelines. Competency-based models in the health sciences and nursing fields illustrate the effectiveness of this alignment (Aristotle et al., 2021; Manjur Ahmed et al., 2024).

Assessment and Governance: Blended assessment practices improved efficiency but continued to face challenges in measuring higher-order cognitive skills. As a result, studies recommended hybrid assessment models, structured peer-evaluation processes, and the use of authentic tasks (Nancy et al., 2022; Tomar et al., 2024). The BLECS scale (Kalra et al., 2025) now offers a validated framework for evaluating BL effectiveness.

Taken together, these findings indicate that BL has evolved from an emergency response into a scalable and adaptable instructional model. To fully realize its potential, HEIs will need to pursue integrated strategies that align pedagogy, technological infrastructure, faculty development, equity, and governance.

Discussion

The development of blended learning (BL) research in India shows a clear, gradual shift in methodological sophistication. In the early 2010s, most studies adopted exploratory and qualitative designs; however, by the end of the decade, the focus had shifted toward experimental and quasi-experimental approaches.In the COVID-19 period, the range of methods expanded again, incorporating large-scale surveys, interpretive analyses, and research that relied more heavily on advanced statistical procedures.Taken together, this evolution suggests not only growing methodological maturity in the field but also a capacity to adapt quickly to fast-moving digital transformations.

On the implementation side, BL models in practice have expanded well beyond initial Moodle-based delivery to encompass flipped classrooms, mobile applications, MOOCs, and competency-oriented frameworks. The crisis period of the pandemic became a key moment of change, simultaneously accelerating BL adoption and obliging institutions to deploy it at scale.The findings across these studies were predominantly favorable, indicating gains in academic achievement, levels of engagement, critical thinking abilities, and digital skill development. Faculty members also described more meaningful interactions with students, even as they continued to face difficulties in sustaining motivation in asynchronous settings and in assessing practice-oriented competencies in online formats.

Even so, several enduring constraints continued to shape BL implementation. Chronic infrastructure gaps, inadequate faculty development, reluctance to change at the institutional level, and disparities in digital access all surfaced as key barriers. The problems were most acute in rural and under-resourced settings, which underscores the importance of system-level readiness for the durable success of BL. For the future, the agenda centers on resilient infrastructure investment, wide-ranging faculty support, the systematic use of inclusive design, and policies that secure BL’s place in mainstream curricular arrangements.

Limitations of the Study

This review is constrained by a number of limitations. First, the review is limited to Scopus-indexed publications, which may have resulted in the exclusion of pertinent regional journals and non-indexed research. Second, paywalled studies or those lacking full-text access were excluded, which may have introduced a degree of publication bias. The choice to limit the review to journal articles and conference papers also led to the exclusion of other potentially informative sources, including book chapters, institutional reports, and dissertations. In addition, substantial methodological variation across the included studies limited the extent to which their findings could be directly compared. Finally, the temporal boundary of 2010–2025 means that very recent or emerging developments in BL beyond 2025 are not captured in this review.

Conclusion

This systematic review brings together more than a decade of BL research in Indian HEIs and indicates that carefully designed approaches—such as flipped classrooms, LMS-supported delivery, MOOCs, and mobile-based instruction—tend to improve student performance and engagement. Alongside these positive outcomes, continued gaps in infrastructure, faculty training opportunities, digital access, and assessment approaches make clear that comprehensive, system-wide reform is needed rather than stand-alone efforts. Alongside these positive outcomes, continued gaps in infrastructure, faculty training opportunities, digital access, and assessment approaches make clear that comprehensive, system-wide reform is needed rather than stand-alone efforts. Only through such collaborative engagement can BL progress beyond discrete, short-term innovations and emerge as a mainstream and substantively transformative component of Indian higher education.

References

1. Arathi, M.S., Durga Devi, G., Sharath, K., Johnson, W.M.S., & Bhandari, A. (2022). Effectiveness of Flipped Class Room Approach as a Teaching Methodology in Anatomy for Early Clinical Exposure Modules for First-Year Medical Students – An Interventional Study. *International Journal of Anatomy and Research*, *10*(1), 8255-8261. https://doi.org/ 10.16965/ijar.2021.197
2. Aristotle, S., Subramanian, S., & Jayakumar, S. (2021). Effectiveness of flipped classroom model in teaching histology for first-year MBBS students based on competency-based blended learning: An interventional study. *Journal of Education and Health Promotion*, *10*(1). https://doi.org/ 10.4103/jehp.jehp_467_20
3. Bordoloi, R., Das, P., & Das, K. (2021). Perception towards online/blended learning at the time of Covid-19 pandemic: an academic analytics in the Indian context. *Asian Association of Open Universities Journal*, *16*(1), 41-60. https://doi.org/ 10.1108/AAOUJ-09-2020-0079
4. Chattaraj, D., & Vijayaraghavan, A. P. (2021). Why learning space matters: a script approach to the phenomena of learning in the emergency remote learning scenario. *Journal of Computers in Education*, *8*(3), 343-364. https://doi.org/ 10.1007/s40692-021-00182-z
5. Chaturvedi, S., Purohit, S., & Verma, M. (2021). Effective Teaching Practices for Success During COVID 19 Pandemic: Towards Phygital Learning. *Frontiers in Education*, *6*. https://doi.org/ 10.3389/feduc.2021.646557
6. Chaudhuri, A., Paul, S., Mondal, T., & Goswami, A. (2020). A comparative study of telemedicine-assisted traditional teaching classes and flipped classroom-assisted self-directed learning sessions during COVID-19 pandemic among first MBBS students in Burdwan Medical College: A pilot study. *Medical Journal of Dr. D.Y. Patil Vidyapeeth*, 608-614. https://doi.org/ 10.4103/mjdrdypu.mjdrdypu_397_20
7. Chetlur, M., Tamhane, A., Reddy, V. K., Sengupta, B., Jain, M., Sukjunnimit, P., & Wagh, R. (2014). EduPaL: Enabling blended learning in resource constrained environments. *ACM DEV-5 2014 - Proceedings of the 2014 Annual Symposium on Computing for Development*, 73-82. https://doi.org/10.1145/2674377.2674388

8. Chhabra, R., & Sharma, V. (2013). Applications of blogging in problem based learning. *Education and Information Technologies*, *18*(1), 3-12. 10.1007/s10639-011-9168-6

9. Cloete, N., Dinesh, N., Hazou, R. T., & Matchett, S. (2015). E(Lab)orating performance: transnationalism and blended learning in the theatre classroom. *Research in Drama Education*, *20*(4), 470-482. https://doi.org/ 10.1080/13569783.2015.1065723

10. Cutrell, E., O'Neill, J., Bala, S., Nitish, B., Cross, A., Gupta, N., Kumar, V., & Thies, W. (2015). Blended learning in Indian colleges with massively empowered classroom. *L@S 2015 - 2nd ACM Conference on Learning at Scale*, 47-56. https://doi.org/ 10.1145/2724660.2724666

11. Desai, R., Rai, N., & Karekar, J. (2022). Optimum Use of LMS for Dynamic Mathematics Classrooms in Blended Mode. *Journal of Engineering Education Transformations*, *36*(2), 492-499. https://doi.org/ 10.16920/jeet/2023/v36is2/23075

12. Diwakar, S., Kumar, D., Radhamani, R., Sasidharakurup, H., Nizar, N., Achuthan, K., Nedungadi, P., Raman, R., & Nair, B. (2016). Complementing education via virtual labs: Implementation and deployment of remote laboratories and usage analysis in south indian villages. *International Journal of Online Engineering*, *12*(3), 8-15. https://doi.org/ 10.3991/ijoe.v12i03.5391

13. Dwivedi, A., Dwivedi, P., Bobek, S., & Sternad Zabukovšek, S. (2019). Factors affecting students' engagement with online content in blended learning. *Kybernetes*, *48*(7), 1500-1515. https://doi.org/ 10.1108/K-10-2018-0559

14. Gulzar, Z., & Anny Leema, A. (2016). Proliferation of E-learning in Indian Universities through the analysis of existing LMS scenario: A novel approach. *Indian Journal of Science and Technology*, *9*(21). https://doi.org/ 10.17485/ijst/2016/v9i21/95290

15. Gupta, S., Dabas, A., Swarnim, S., & Mishra, D. (2021). Medical education during COVID-19 associated lockdown: Faculty and students' perspective. *Medical Journal Armed Forces India*, *77*, 79-84. https://doi.org/ 10.1016/j.mjafi.2020.12.008

16. Indira, K. (2022). Blended Learning Approach to Engineering Education: Students' Perceptions on Learning Experience and Effectiveness. *Journal of Engineering Education Transformations*, *35*(3), 160-170. https://doi.org/ 10.16920/jeet/2022/v35i3/22099

17. Joseph, S., & Sherine, A. (2019). Blended learning: An effective tool to teach presentation skills. *International Journal of Engineering and Advanced Technology*, *9*(1), 962-969. https://doi.org/ 10.35940/ijeat.A9448.109119

18. Joy, J., & Renumol, V.G. (2018). Activity oriented teaching strategy for software engineering course: An experience report. *Journal of Information Technology Education: Innovations in Practice*, *17*, 181-200. https://doi.org/ 10.28945/4116

19. Kalra, S., Srivastava, N., & Gambhir, V. (2025). Development and Validation of the Blended Learning Effectiveness and Challenges Scale (BLECS) in the Indian Educational Context. *International Research Journal of Multidisciplinary Scope*, *6*(1), 775-789. https://doi.org/ 10.47857/irjms.2025.v06i01.02528

20. Kamat, V., & Sardessai, S. (2012). Agile practices in higher education: A case study. *Proceedings - Agile India 2012, AgileIndia 2012*, 48-55. 10.1109/AgileIndia.2012.10

21. Kumar, A., Krishnamurthi, R., Bhatia, S., Kaushik, K., Ahuja, N. J., Nayyar, A., & Masud, M. (2021). Blended Learning Tools and Practices: A Comprehensive Analysis. *IEEE Access*, *9*, 85151-85197. https://doi.org/ 10.1109/ACCESS.2021.3085844

22. Kumar, A., Malhotra, S., Dias, I., & Lee, K. (2024). Active Blended Learning Model for Teaching IoT Application Development Course: A Case Study. *Journal of Engineering Education Transformations*, *37*(2), 425-431. https://doi.org/ 10.16920/jeet/2024/v37is2/24070

23. Lele, G., & Sikdar, M. (2024). Perceptions of Dental Teachers about Blended Learning: A Qualitative Analysis. *International Journal of Clinical Pediatric Dentistry*, *17*(5), 532-538. https://doi.org/ 10.5005/jp-journals-10005-2837

24. Mahapatra, J., Srivastava, S., Yadav, K., Shrivastava, K., & Deshmukh, O. (2016). LMS weds WhatsApp: Bridging digital divide using MIMs. *W4A 2016 - 13th Web for All Conference*. https://doi.org/ 10.1145/2899475.2899485

25. Maheshwari, P., & Seth, N. (2019). Effectiveness of flipped classrooms: A case of management education in central India. *International Journal of Educational Management*, *33*(5), 860-885. https://doi.org/ 10.1108/IJEM-10-2017-0282

26. Manjur Ahmed, A. S. M., Jamshed, M., Sarfaraj, M., & Banu, S. (2024). Exploring Diverse Teaching Models for Enhancing Nursing Students' English Language Proficiency: A Blended Learning Perspective. *World Journal of English Language*, *14*(5), 182-193. https://doi.org/ 10.5430/wjel.v14n5p182

27. Meena, M., & Rumao, P. (2022). Survey Paper on Effect of Different Tools developed for Online Learning Education (Like Blended Teaching Learning Philosophy- TLP) in Engineering Education. *Journal of Engineering Education Transformations*, *35*(3), 78-84. https://doi.org/ 10.16920/jeet/2022/v35is3/22142

28. Munir, A. R., & Prem, K. D. (2014). Implementing blended learning into the academic programs of Rajiv Gandhi University of Health Sciences, Karnataka. *Journal of Complementary and Integrative Medicine*, *11*(2), 147-150. https://doi.org/ 10.1515/jcim-2013-0051

29. Nancy, A., Raj, J. B., Anton, J. D., Aravinthan, S., & Adkoli, B. V. (2022). Online assessment vs Traditional assessment: perception of medical teachers in a tertiary level teaching hospital in South India. *European Journal of Anatomy*, *26*(5), 599-603. https://doi.org/ 10.52083/CPSZ4396

30. Peethambaran, M. K. P., Renumol, V.G., & Murthy, S. (2018). Flipped Classroom Strategy to Help Underachievers in Java Programming. *Proceedings - 2018 6th International Conference on Learning and Teaching in Computing and Engineering, LaTiCE 2018*, (8753391), 44-49. https://doi.org/ 10.1109/LaTICE.2018.000-7

31. Protsiv, M., & Atkins, S. (2016). The experiences of lecturers in African, Asian and European universities in preparing and delivering blended health research methods courses: A qualitative study. *Global Health Action*, *9*(1). https://doi.org/ 10.3402/GHA.V9.28149

32. Qamar, M. T., Malik, A., Yasmeen, J., Sadiqe, M., & Ajmal, M. (2024). Incorporating face-to-face and online learning features to propose blended learning framework for Post-COVID classrooms in

India. *Asian Association of Open Universities Journal*, *19*(1), 70-87. https://doi.org/ 10.1108/AAOUJ-08-2023-0097

33. Radhamani, R., Sasidharakurup, H., Kumar, D., Nizar, N., Achuthan, K., Nair, B., & Diwakar, S. (2015). Role of Biotechnology simulation and remotely triggered virtual labs in complementing university education. *Proceedings of 2015 International Conference on Interactive Mobile Communication Technologies and Learning, IMCL 2015*, (7359548), 28-32. https://doi.org/ 10.1109/IMCTL.2015.7359548

34. Ranjan, P. (2020). Is blended learning better than online learning for b.Ed students? *Journal of Learning for Development*, *7*(3), 349-366. https://doi.org/ 10.56059/jl4d.v7i3.412

35. Saha, T., Das, P. P., & Singh, R. (2021). Challenges in higher education during and after COVID-19 pandemic in India. *Journal of Physics: Conference Series*, *1797*(1). https://doi.org/ 10.1088/1742-6596/1797/1/012065

36. Sanjeev, R., & Natrajan, N. S. (2019). Role of blended learning environment towards student performance in higher education: Mediating effect of student engagement. *International Journal of Learning and Change*, *11*(2), 95-110. https://doi.org/ 10.1504/IJLC.2019.101678

37. Sareen, S., & Mandal, S. (2024). Assessing SDG 4 indicators in online and blended higher education within conflict zones: A case study of northern India's higher education institutions. *Social Sciences and Humanities Open*, *9*. https://doi.org/ 10.1016/j.ssaho.2024.100903

38. Selvakumar, S., & Sivakumar, P. (2019). The impact of blended learning environment on academic achievement of engineering students. *International Journal of Innovative Technology and Exploring Engineering*, *8*(12), 3782-3787. https://doi.org/ 10.35940/ijitee.L3825.1081219

39. Shanmugapriya, K., Seethalakshmi, A., Zayabalaradjane, Z., & Rani, N. R. V. (2023). Mobile technology acceptance among undergraduate nursing students instructed by blended learning at selected educational institutions in South India. *Journal of Education and Health Promotion*, *12*(1). https://doi.org/ 10.4103/jehp.jehp_488_22

40. Sharma, A., & Alvi, I. (2021). Evaluating pre and post COVID 19 learning: An empirical study of learners' perception in higher education. *Education and Information Technologies*, *26*(6), 7015-7032. https://doi.org/ 10.1007/s10639-021-10521-3

41. Siddiquee, T. A. R., Abdullah, F., Sanusi, A. N. Z., & Hasan, M. K. (2023). The Paradigm Shift from Traditional to Blended Learning Methodology in Architecture Education. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, *33*(1), 75-91. https://doi.org/ 10.37934/araset.33.1.7591

42. Swaminathan, N., Ravichandran, L., Ramachandran, S., Milanese, S., Singaravelu, R., & Govindaraj, P. (2021). Entry level nursing graduate students' perception and readiness toward online component of blended learning: A mixed method study. *Journal of Education and Health Promotion*, *10*(1). https://doi.org/ 10.4103/jehp.jehp_771_20

43. Tomar, S., Arundhathi, A., Gupta, S., & Sharma, M. (2024). Digital assessment: impact on student motivation, peer learning, group dynamics. *Journal of Education and Learning*, *18*(1), 9-17. https://doi.org/ 10.11591/edulearn.v18i1.21138

44. Vijaya Lakshmi, D., & Sri Lakshmi, M. (2020). Integrated technological tools for effective blended learning. *2020 IEEE Bombay Section Signature Conference, IBSSC 2020*, (9332223), 163-168. https://doi.org/ 10.1109/IBSSC51096.2020.9332223

45. Virani, S. R., Saini, J. R., & Sharma, S. (2023). Adoption of massive open online courses (MOOCs) for blended learning: the Indian educators' perspective. *Interactive Learning Environments*, *31*(2), 1060. https://doi.org/ 10.1080/10494820.2020.1817760

46. Widyandana, D., Utomo, P. S., Setiawan, I. P., Kurniawati, Y. T., & Dandekar, S. (2024). Comparing paper-based and mobile application for rank-based peer assessment in interprofessional education: before, during, and after the COVID-19 pandemic. *BMC Medical Education*, *24*(1). https://doi.org/ 10.1186/s12909-024-06382-2