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THE EVOLUTION OF BLENDED LEARNING IN MALAYSIA: DRIVING QUALITY EDUCATION (SDG 4)

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Abstract

Blended learning has emerged as a central strategy for advancing inclusive and equitable quality education in line with Sustainable Development Goal 4 (SDG 4): Quality Education. In Malaysia, its development reflects long-term educational reform, rapid digitalisation, and post-pandemic transformation in higher education. This paper aims to synthesise how blended learning has evolved in Malaysia from its early distance education roots to contemporary AI-supported practices, and to examine its alignment with national policies and global education agendas. Adopting a narrative literature review, the study identifies key phases of development, dominant pedagogical trends, and structural enablers shaping blended learning implementation. The findings indicate a progressive shift from access-driven distance education toward pedagogically integrated, flexible, and technology-enhanced learning ecosystems, with growing emphasis on student engagement, lifelong learning competencies, and system resilience. However, persistent limitations remain, particularly inequities in digital access, uneven instructor readiness, and institutional capacity gaps. The study offers theoretical implications by contextualising blended learning evolution through a longitudinal and policy-aligned lens, methodological value by demonstrating the utility of narrative synthesis for educational transformation research, and practical implications for policymakers, institutions, and educators seeking sustainable and inclusive implementation. The originality of this paper lies in its integrated national-level perspective that connects historical development, policy direction, and future trajectories of blended learning in Malaysia within the SDG 4 framework.

Keywords: *Blended Learning; Evolution; Future Directions; Higher Education Institutions; Malaysia; SDG 4.*

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INTRODUCTION

Sustainable Development Goal 4 emphasizes the importance of inclusive and equitable quality education as well as the promotion of lifelong learning opportunities for all. It calls for the reduction of disparities in both access and learning outcomes, a priority highlighted in global discussions on educational development (Mohamoud et al., 2020). Within this broader context, blended learning has emerged as a strategic instructional approach that integrates online digital technologies and face to face teaching to improve flexibility, expand access, and strengthen the overall quality of instruction. International frameworks introduced by UNESCO, including the Futures of Education Report and the ICT Competency Framework for Teachers, position blended and digital learning as essential mechanisms for safeguarding educational continuity, supporting equity, and enhancing resilience within education systems (Carney, 2022). Global reviews similarly show that blended learning has become a central response to contemporary challenges in higher education, although recurring issues concerning pedagogical design, digital infrastructure, and readiness among instructors and learners remain unresolved (Sareen and Mandal, 2024).

In Malaysia, these global directions align closely with ongoing national transformations in higher education. The Malaysia Education Blueprint 2015-2025 recognizes technology enhanced learning, flexible modes of delivery, and digital competence as core elements needed to enhance graduate preparedness (Malaysia Ministry of Education, 2015). Subsequent initiatives further reinforce the centrality of blended learning within the higher education sector. These include the Blended Learning Policy for Higher Education (BPPEL), the Digital Learning Action Plan for Higher Education Institutions (PTPD IPT 2021-2025), and the Digital Education Policy (DEP) 2023-2030. Collectively, these policies institutionalize blended learning as a mainstream instructional strategy across the national higher education system (Ministry of Higher Education Malaysia, 2015; Ministry of Higher Education Malaysia, 2021; Ministry of Education Malaysia, 2023).

The evolution of blended learning in Malaysia has also been strongly influenced by the rapid digital transformation that intensified during and after the COVID-19 pandemic. The sudden transition to fully online teaching during the Movement Control Order (MCO) revealed significant opportunities for innovative practice, yet it also exposed enduring challenges related to digital infrastructure, pedagogical readiness, and assessment practices (Chung et al., 2020; Mohd Radzi et al., 2024). Although blended learning adoption expanded substantially during this period, existing research remains fragmented. Many studies focus on single institutions, specific technologies, or isolated constructs such as student readiness or instructor perceptions. Few studies adopt a longitudinal lens that connects blended learning implementation to wider policy reforms or to global digital education agendas.

This review directly addresses a notable gap in the literature. Numerous of the existing Malaysian research is limited whereas it focused on only a single institution, a specific tool, or one construct. Few studies connect practice to policy over time. Overall, the aims of this article are (1) To examine how blended learning has evolved within Malaysia's educational system, before, during, and after the COVID-19 pandemic; (2) To analyze how these developments, correspond with global and national education frameworks, including SDG 4 and the Malaysian policy; (3) To identify emerging trends and future directions that may influence national strategies for teaching and learning. By pursuing these aims, the article offers two main contributions. It provides one of the few reviews that explicitly links the development of blended learning in Malaysia with wider global education agendas, including SDG 4 and international discourses on digital transformation. It also generates insights that can inform

national strategies and initiatives for higher education. In this way, the review enhances conceptual understanding of blended learning in the Malaysian context while supporting informed decision making by policymakers, institutional leaders, and educators who are working to strengthen the country's digital education ecosystem.

METHODOLOGY

This study adopted a narrative literature review approach to examine the evolution of blended learning in Malaysia and its contribution to achieve SDG 4 in education. A narrative review was considered appropriate given the study's objective to synthesize diverse forms of evidence, including empirical studies, systematic reviews, policy documents, and international reports. A search was conducted across three major databases: Google Scholar, Scopus, and Web of Science. To ensure precision, predefined keywords were combined using Boolean operators:

- "blended learning" AND "Malaysia"
- "higher education" AND "blended learning evolution"
- "blended learning adoption" OR "teaching delivery modes"
- "future directions" AND "digital learning Malaysia"

Inclusion criteria focused on English-language sources published between 2011 and 2025, with particular emphasis on studies situated within the Malaysian higher education context and those explicitly addressing teaching practices, learner readiness, policy frameworks, and emerging technologies such as artificial intelligence. The selected studies were analysed thematically to identify patterns, shifts, and persistent challenges in blended learning implementation, allowing for an integrated interpretation of pedagogical, technological, and policy developments over time. This approach enhances conceptual clarity, contextual depth, and analytical coherence, thereby supporting a comprehensive understanding of how blended learning has evolved in Malaysia and how it aligns with the broader goals of inclusive, equitable, and quality education under SDG 4.

RESULT AND DISCUSSION

Terminology of teaching delivery methods

The literature identifies several teaching delivery modes that differ in the proportion of content delivered online and the extent of technology integration. As shown in Table 1, this review adopts the classification developed by Allen and Seaman (2011) and adapted for the Malaysian context (Noraini et al., 2020). The traditional mode, 0 per cent of content is delivered online, relies entirely on conventional written or oral instruction. The web facilitated mode, where 1 to 29 per cent of content is online, supplements face to face teaching with digital tools such as learning management systems used to distribute materials and support communication. In the blended or hybrid mode, with 30 to 79 per cent of content online, courses intentionally combine online and in person sessions, with selected activities and resources moved to digital platforms to reduce required classroom meetings. The online mode, more than 80 per cent of content is delivered through digital platforms, offers teaching, learning activities, and interaction almost entirely online, with minimal physical meetings. Together, these categories illustrate how the proportion of online delivery serves as an indicator of how technology is embedded in instructional practice.

Table 1: Types of Teaching Delivery Mode

Percentage (%) of Content Delivered Online	Delivery mode	Description
0%	Traditional	The course is implemented by conventional instructional methods, which involve the dissemination of information through written or spoken means.
1% - 29%	Web Facilitated	A course that utilizes online technology to enhance and support traditional face-to-face instruction. Educators utilize various technological tools, such as learning management systems (LMS), to facilitate the dissemination of course materials, including syllabi and assignments.
30% - 79%	Blended/ Hybrid	The course is conducted using a dual mode approach, includes both online and face-to-face delivery methods. A portion of the course material is given through online platforms, resulting in a shift of certain class activities to online formats. This adjustment is made with the intention of minimizing in-person interactions.
>80%	Online	The main mode of instruction for this course is conducted through online platforms, with a limited number of in-person encounters.

Source: (Allen & Seaman, 2011; Noraini et al., 2020)

Within this framework, blended learning also has been defined in various ways by different scholars. The Malaysian Ministry of Education describes it as the combination of face-to-face instruction with technology mediated platforms that provide students with some control over place, time, pace, and learning style (Mustapha et al., 2022). In a similar vein, Raub (2020) characterizes blended learning as an instructional strategy that integrates conventional classroom teaching with online components. Kemaloglu and Bayyurt (2022) further emphasize that blended learning environments typically involve students attending physical classes, engaging in online discussions, accessing digital resources, and completing virtual assignments. Taken together, these definitions position blended learning as an approach that seeks to combine the strengths of in person and digital instruction to create more flexible and effective learning environments. Across those literatures, for analytic consistency blended learning in this review is defined as intentional integration of face to face and online learning where 30 to 79% of activities occur online, with explicit design for flexibility and interaction. This is due to the reason it is widely used in Malaysian policy and aligns with the evidence base reviewed here.

Overview of blended learning environment

The teaching and learning landscape has undergone substantial transformation due to rapid technological advancement, particularly through the widespread availability of digital platforms, mobile devices, and interactive applications (Mohamoud et al., 2020). Within this context, blended learning is increasingly recognized as an effective instructional approach that combines face-to-face interaction with technology-mediated learning to enhance student engagement and educational quality (Anthony et al., 2019; Noraini et al., 2017). Digital technologies in blended environments extend learning beyond the physical classroom by enabling flexible access to content and learning activities regardless of location (Halili et al., 2021).

However, these benefits are accompanied by challenges related to internet connectivity, digital literacy, and learner distraction, which may affect the effectiveness of blended learning implementation if not properly addressed (Chein et al., 2021). These considerations highlight the importance of understanding the structural

components that shape blended learning environments to ensure that technological integration supports, rather than constrains, meaningful learning experiences.

Previous studies identify three core components of blended learning environments: face-to-face instruction, online resources, and collaboration tools (Ashraf, 2021). Face-to-face instruction supports personalized guidance, immediate feedback, and social interaction, contributing to a sense of classroom community (Nordin et al., 2021). Online resources, including recorded lectures, e-books, and multimedia materials, enable self-paced learning and accommodate diverse learning preferences (Chung et al., 2020; Mojtahedi et al., 2020). In addition, collaboration tools such as discussion forums, video conferencing platforms, and social media facilitate interaction, peer learning, and active engagement within blended environments (Chen et al., 2021; Chein et al., 2021). Together, these components create a flexible and integrated learning ecosystem that supports both independent and collaborative learning, provided that they are coherently aligned with instructional objectives.

The Community of Inquiry (CoI) framework offers a useful theoretical lens for understanding how these components function together in blended learning environments. The framework conceptualizes effective learning through the interaction of teaching presence, social presence, and cognitive presence (Garrison et al., 2000). Teaching presence refers to the design and facilitation of learning activities, social presence emphasizes meaningful interaction and a sense of belonging among learners, and cognitive presence focuses on knowledge construction through reflection and inquiry. Empirical studies across educational contexts demonstrate that blended learning enhances engagement, flexibility, and learning outcomes when these presences are intentionally integrated (Noraini et al., 2020; Abd Gani & Ramalingam, 2024). As illustrated in Figure 1, blended learning has been widely studied across disciplines and settings, reinforcing its adaptability while also highlighting the need for alignment between pedagogy, technology, and institutional support to ensure sustained effectiveness.

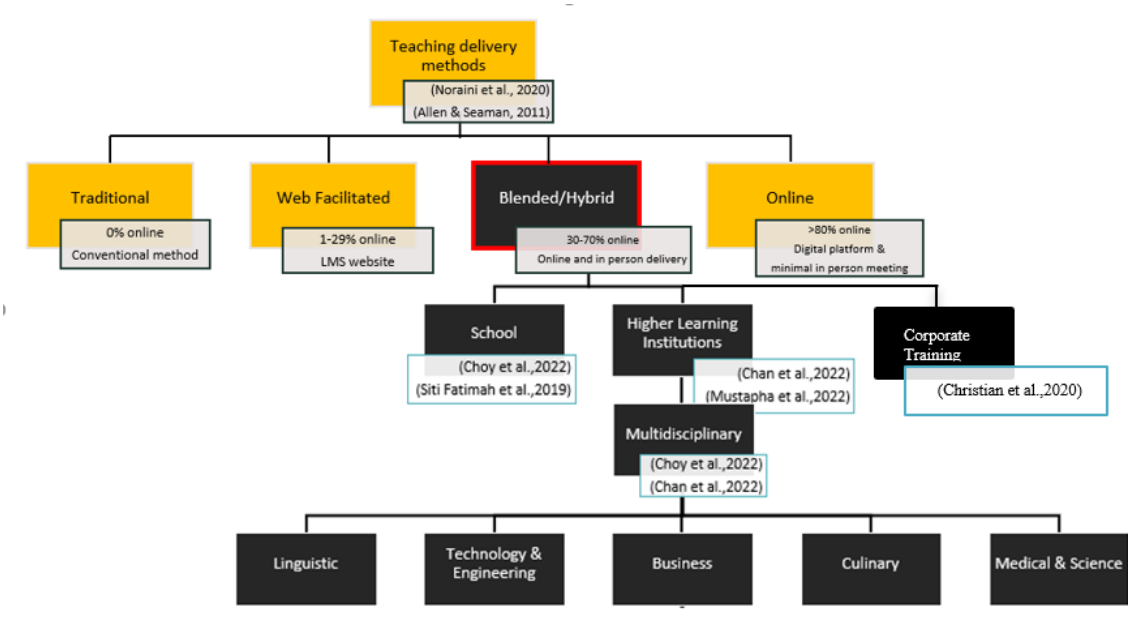

Figure 1: An overview of research priorities in blended learning

Evolution of the implementation of blended learning Malaysia

The development of blended learning in Malaysia is closely related to the expansion of distance education that began in the early 1970s. As illustrated in the timeline in Figure 2, early initiatives sought to widen access to higher education for learners who could not attend classes on campus (Simonova & Faltynkova, 2023; Welsh & Dragusin, 2013). According to the Commonwealth of Learning (2017), the first major distance education initiative was launched by Universiti Sains Malaysia (USM) in 1971, when it offered 11 bachelor degree programs for students unable to participate in conventional campus-based study. This effort formed part of a broader expansion led by private institutions such as Stanford College and Raffles College, which created alternative routes into higher education for students who were excluded from government funded schools. As distance education gained momentum, Institut Teknologi MARA (ITM) introduced diploma programs through distance learning in 1990.

Similar models were later adopted by other public universities, including Universiti Kebangsaan Malaysia (UKM) and Universiti Malaya (UM) in the early 1990s. By 1995, under directives from the Ministry of Higher Education, most public universities were offering some form of distance education, significantly increased enrolment in higher education. The late 1990s saw further expansion with the establishment of private universities such as Multimedia University in 1997 and Universiti Tun Abdul Razak (UNITAR) in 1998, both of which positioned distance learning as a central feature of their provision. There were 11 public universities formed the consortium Multimedia Technology Enhancement Operations Sdn Bhd (METEOR), which was a key milestone in the consolidation of distance education in 1998. METEOR's initiatives led to the establishment of Open University Malaysia (OUM) in 2001, further strengthened the foundation for what later evolved into blended learning. The creation of Asia e University in 2002 and Wawasan Open University (WOU) in 2006 continued this trajectory and demonstrated sustained national commitment to flexible modes of provision (Abd Gani & Ramalingam, 2024; Commonwealth of Learning, 2017). Consequently, these developments created the institutional, technological, and pedagogical foundations that enabled Malaysian higher education to transition from distance education towards more integrated blended learning models.

Building on this established distance education infrastructure, blended learning became increasingly visible in Malaysian higher education institutions from the early 2000s to 2019 (Valverde-Berrocoso & Burgos-Videla, 2020). Research during this period focused primarily on the readiness of instructors and students, examining attitudes, motivations, and perceptions towards blended instructional approaches. Concurrently, rapid technological advancements expanded the range of available digital tools and learning platforms, including both proprietary and open-access systems with varying pedagogical affordances (Soon Tan et al., 2022). These developments signaled a gradual shift in teaching and learning practices; however, adoption remained uneven across institutions. While some instructors and students actively embraced blended learning and experimented with innovative pedagogical strategies, others continued to favor traditional face-to-face instruction. This divergence resulted in varying levels of acceptance and implementation of blended learning within Malaysian higher education institutions (Adams et al., 2021; Raub, 2020; Zaidan et al., 2021).

Despite continuing technological progress, a substantial proportion of academics remained cautious or resistant towards blended and online approaches (Noh et al., 2019). This resistance became particularly visible at the end of 2019, when the COVID-19 pandemic forced an abrupt shift in educational practices in Malaysia and worldwide. The Movement Control Order (MCO) led to the temporary closure of all educational institutions, requiring students and instructors to move suddenly to fully online environments (Chung et al., 2020). The transition presented serious difficulties, especially for those unfamiliar with digital platforms or lacking adequate

infrastructure (Net et al., 2022; Razali, 2022). Nevertheless, the pandemic created conditions in adaptation to online and blended formats was unavoidable, and it accelerated digital transformation across the sector.

As Malaysia transitioned into the endemic phase, higher education institutions gradually resumed face-to-face teaching, although not to pre-pandemic levels. Many institutions chose to retain blended learning models that combine in-person sessions with online components, drawing on pedagogical and technological experience gained during MCO period. The advantages of blended learning became more evident, when it reduced travel costs, flexible access to lectures and learning materials, and greater autonomy for students to engage with coursework without rigid scheduling constraints (Simonova & Faltynkova, 2023). However, the effectiveness of blended learning differs across disciplines because practice based and laboratory intensive fields face greater difficulty in balancing online and hands on requirements. Despite these disciplinary differences, blended learning is gaining wider acceptance among educators and students, indicating ongoing transformation in Malaysian higher education. (Abd Gani & Ramalingam, 2024; Mohd Radzi et al., 2024).

The transformation accelerated when artificial intelligence (AI) introduced new possibilities for enhancing blended learning environments. Recent studies indicate increasing exploration of AI-supported tools to personalize instruction, provide adaptive feedback, and improve the efficiency of learning processes (Neo, 2022). The integration of AI is expected to further strengthen blended learning by supporting instructors and learners in managing complex tasks and large volumes of digital content. As illustrated in Figure 2, the progression of blended learning adoption in Malaysia, together with recent technological innovations, has stimulated sustained research interest in its impact on academic outcomes and student development. The shift to online and blended formats during the pandemic created a unique context for examining their impact on students' aspirations in practical disciplines. As blended learning becomes more established in higher education, ongoing empirical research is needed to assess its long-term effects on student achievement, skill development, and learner identity. Further investigation is also required to understand its capacity to support competencies that match the expectations of twenty first century learners and labour markets.

Key trends in the development of blended learning in Malaysia

The historical trajectory of blended learning in Malaysia reveals several cross-cutting themes that explain how distance provision in the 1970s gradually evolved into a post pandemic digital ecosystem. Rather than treating the timeline as a set of isolated events, these themes highlight the structural and pedagogical shifts that shaped blended learning across decades. Table 2 summarizes the major themes and trends that have shaped the development of blended learning in Malaysia.

Theme 1: Shifts in access, flexibility, and learning opportunities

Across all phases depicted in Figure 2, the most enduring driver of blended learning development in Malaysia has been the pursuit of wider access to higher education particularly for learners who were historically excluded from conventional campus-based study due to geographic, economic, or work-related constraints (Malaysia Ministry of Education, 2015; Ministry of Higher Education Malaysia, 2015). During the early development phase from the 1970s to the 1990s, initiatives such as the introduction of distance learning programs at Universiti Sains Malaysia marked important progress in Malaysian education (Universiti Sains Malaysia, 1971; Commonwealth of Learning, 2002). These initiatives were primarily designed to extend educational opportunities to working adults and to learners in rural or underserved areas who were unable to participate in conventional campus-based study (Commonwealth of Learning, 2002; OECD, 2020).

This access-oriented agenda continued through the expansion and growth phase in the late 1990s and 2000s, marked by the establishment of institutions such as Open University Malaysia, Universiti Tun Abdul Razak, and Wawasan Open University. These developments institutionalized flexible learning pathways and normalized non-traditional modes of participation in higher education. As blended learning gained greater visibility between the 2000s and 2019, the emphasis shifted from access alone to flexibility in learning design and delivery. Universities increasingly combined face-to-face instruction with online components to allow students greater control over time, pace, and place of learning. This shift reflects international research identifying flexibility as both a central benefit of blended learning and a persistent implementation challenge, particularly in balancing learner autonomy with structured support (Boelens et al., 2021; Park et al., 2024).

The COVID-19 period further accelerated this trajectory by making flexible access a necessity rather than a choice, where institutions transitioned rapidly to fully online and subsequently hybrid models. While, in the post-pandemic phase, flexibility has become embedded as a defining feature of Malaysia's blended learning ecosystem. Blended approaches now support expanded learning opportunities through recorded lectures, asynchronous activities, and hybrid attendance options, while still accommodating the reintroduction of in-person elements essential for practical and collaborative learning. Taken together, these developments demonstrate that Malaysia's blended learning environment did not emerge abruptly but evolved incrementally from long-standing efforts to widen participation, diversify access routes, and enhance flexibility. This sustained focus on access and learning opportunity has created a strong foundation for blended models, yet it continues to raise important questions about equity, quality, and consistency across disciplines and institutions.

Theme 2: Increasing integration of digital technologies and infrastructure

The evolution of blended learning in Malaysia demonstrates a gradual and sustained integration of digital technologies and supporting infrastructure into instructional delivery. Early distance education initiatives in the 1970s and 1980s relied primarily on printed materials and limited broadcast technologies, reflecting the technological constraints of that period while laying the institutional foundation for non-traditional learning (Commonwealth of Learning, 2017). From the late 1990s to the 2000s, advances in information and communication technologies enabled universities to move beyond print-based delivery, with the adoption of Learning Management Systems (LMS) and structured digital platforms becoming central to content delivery, communication, and assessment in institutions such as Open University Malaysia and Universiti Tun Abdul Razak (Commonwealth of Learning, 2017).

Between the 2000s and 2019, digital integration became more sophisticated through the use of multimedia resources, online collaboration tools, and asynchronous learning environments, although adoption remained uneven across institutions and disciplines (Valverde Berrocoso & Burgos Videla, 2020). The COVID-19 pandemic acted as a major acceleration point, compelling large-scale implementation of synchronous and asynchronous online teaching, while simultaneously exposing gaps in infrastructure and digital readiness and prompting increased investment in platforms, connectivity, and teaching competencies (Chung et al., 2020). In the post-pandemic phase, focus has shifted from emergency digital adoption to long-term optimization, with growing interest in AI-supported learning environments that enhance personalization, learning analytics, and learner autonomy, reflecting a continuous technological trajectory rather than a sudden transformation (Park et al., 2024).

Table 2: Key Trends and Patterns in the Evolution of Blended Learning in Malaysia

Evolution Stage	Key Developments	Main Drivers	Pedagogical Characteristics	Digital Tools / Platforms	Learner Engagement Patterns	Challenges Highlighted in Literature	Policy / National Agenda Alignment	Implications for Malaysian HEIs
Early Development (1970s -1990s)	Introduction of distance-learning programmes (USM, UiTM, public universities)	Need for widening access; early digitisation efforts; institutional autonomy.	Content delivery mainly text-based; limited interaction	Basic computer-mediated tools; printed modules; correspondence methods.	Low interactivity; independent study; minimal real-time feedback.	Low interaction, restricted access, reliance on print materials	Early alignment with widening access and equity; pre-MEB period.	Set foundation for later digital expansion; early policy awareness emerges
Expansion & Growth (Late 1990s - 2000s)	Establishment of Multimedia University, UNITAR, OUM, Wawasan Open University	ICT boom; private - public competition; push for flexible lifelong learning.	Structured online modules introduced; more formal e-learning	LMS adoption begins; email; early online platforms; multimedia content.	Moderate engagement; growth of self-paced learning; increased autonomy.	Digital divide, staff readiness, infrastructure gaps	Supports national ICT agendas (Malaysia's ICT Master Plan, Vision 2020).	Strengthened national direction toward digital education aligned with Malaysia's ICT agenda
Blended Learning Adoption (2000s-2019)	Gradual integration of blended-learning practices in HEIs; pockets of resistance remain	Drive for digital transformation; improved broadband; global pedagogical trends.	Mix of face-to-face & online; emerging focus on interaction and flexibility	More mature LMS (Moodle, Blackboard); video-based learning; flipped classroom tools.	Increased participation in online components; emerging collaborative engagement.	Varied quality across institutions; inconsistent pedagogical design	Aligns with *Malaysia Education Blueprint (2015–2025)* emphasis on online learning.	Movement toward flexible learning pathways; adoption influenced by institutional policy
COVID-19 & Beyond (2020–Present)	Nationwide digital shift; normalization of blended mode; growing AI integration	Pandemic disruption; need for continuity; EdTech acceleration.	Highly digital, multimodal, student-paced; increased reliance on online assessments	Video conferencing (Zoom, Webex); LMS integration; AI-enabled tools (chatbots, analytics).	Higher engagement in some contexts; fatigue and inconsistency in others; improved digital confidence.	Engagement issues, fatigue, unequal access, inconsistent digital pedagogy	Strong alignment with digitalisation goals in MDEB, DEP and NAIR that supports SDG 4 (equity & digital skills).	Acceleration of hybrid models; need for policy reinforcement, digital equity, and pedagogical redesign

Theme 3: Pedagogical transformation and student engagement

A third recurring theme in the evolution of blended learning in Malaysia is the gradual pedagogical shift from basic digitization of instructional content toward more intentional and engagement-oriented blended learning design. In the early stages, technology was primarily used to supplement traditional teaching through the uploading of lecture materials to learning management systems, with limited emphasis on interaction or active learning, reflecting early global patterns of technology adoption in higher education (Valverde Berrocoso & Burgos Videla, 2020).

Between the 2000s and 2019, higher education institutions increasingly adopted student-centred approaches such as flipped classrooms, online formative assessments, multimedia-enhanced activities, and structured online discussions to promote interaction, collaboration, and reflective learning, although resistance persisted among some educators due to concerns about workload and instructional complexity (Valverde Berrocoso & Burgos Videla, 2020; Noh et al., 2019).

The COVID-19 pandemic marked a critical turning point by compelling educators to redesign instruction and assessment for fully online delivery, leading to greater recognition of blended learning as a pedagogical approach rather than merely a technological solution. During the pandemic and endemic phases, blended learning increasingly emphasized student engagement through the integration of teaching presence, social presence, and cognitive presence, as articulated in the Community of Inquiry framework (Garrison et al., 2000; Garrison & Vaughan, 2008). Overall, this progression indicates that pedagogical change in Malaysia's blended learning environment has been incremental, shifting from access and content delivery toward deeper learner engagement and reflective learning.

Theme 4: Policy influence and national digital education agendas

The evolution of blended learning in Malaysia has been strongly influenced by national policies that align higher education reform with broader socio-economic and technological objectives. Early distance education initiatives were driven by government priorities to widen access, increase enrolment capacity, and strengthen human capital development, with technology-enabled learning gradually emerging as a key mechanism for educational transformation (Commonwealth of Learning, 2017). During the COVID-19 pandemic, policy interventions and temporary regulatory flexibility accelerated large-scale digitalisation, enabling institutions to rapidly implement online and blended delivery while highlighting the importance of digital infrastructure and pedagogical adaptability in crisis contexts (Abd Gani & Ramalingam, 2024).

This acceleration aligned with international guidance emphasising digital readiness, system resilience, and equitable access in post-pandemic education reform (UNESCO, 2021). Subsequent national policy frameworks, including the Malaysia Education Blueprint 2015–2025, the Malaysia Digital Economy Blueprint (MDEB), the National Artificial Intelligence Roadmap (NAIR) 2021–2025, and the Digital Education Policy (DEP) 2023–2030, further institutionalized blended learning by prioritizing technology-enabled pedagogy, flexible delivery, lifelong learning, and digital competencies (Ministry of Higher Education Malaysia, 2015; Ministry of Education Malaysia, 2023). Collectively, these developments indicate that blended learning in Malaysia is embedded within a coordinated national reform agenda shaped by sustained policy direction, technological advancement, and long-term educational goals.

Theme 5: Post pandemic reorientation toward blended and AI supported learning

Earlier development of the higher education system progressed incrementally across institutions. The COVID-19 pandemic marked a decisive turning point in Malaysia's higher education landscape, accelerating a rapid transition from incremental digital adoption to fully online teaching and learning in 2020. This shift expanded institutional capacity for online delivery and accelerated the development of instructors' digital competencies, while also reshaping attitudes toward the role of technology in education (Chung et al., 2020). As Malaysia entered the endemic phase, higher education institutions increasingly adopted blended learning as a stable and long-term mode of delivery rather than a temporary crisis response.

These blended configurations retained the flexibility, accessibility, and efficiency of online learning while reintroducing essential face-to-face components needed for practical, laboratory-based, and collaborative learning experiences (Adams et al., 2021). This transition reflects a consolidation of lessons learned during the pandemic and signals a broader acceptance of blended learning as a core instructional approach.

In the post-pandemic era, blended learning in Malaysia has increasingly incorporated AI-supported technologies, reflecting a shift toward more data-driven, responsive, and scalable educational practices. Higher education institutions are adopting AI-enabled tools such as chatbots, academic support systems, and writing assistance platforms, including ChatGPT, Quillbot, and Grammarly, due to their perceived usefulness in enhancing academic performance, personalization, and efficiency (Neo, 2022; Phua et al., 2025; Park et al., 2024).

Empirical studies report growing awareness and positive perceptions of AI among educational stakeholders, alongside early evidence of improved adaptive learning outcomes through frameworks such as EduAdaptNet (Murad et al., 2025; En et al., 2025). However, adoption remains moderate due to limitations in digital skills, infrastructure, and ethical concerns related to data security, privacy, and over-reliance on AI (Leong & Freeman, 2024). Overall, this post-pandemic reorientation indicates a new stage of blended learning maturity in Malaysia, where the strategic integration of AI and blended delivery aligns with national digital transformation agendas and positions blended learning as a cornerstone of a future-ready and inclusive higher education system.

Attaining SD4 through the adoption of blended learning

The adoption of blended learning in Malaysia contributes substantially to the enhancement of educational quality and aligns closely with the objectives of Sustainable Development Goal 4 (SDG 4), particularly its emphasis on inclusive and equitable quality education (UNESCO, 2016). A central strength of blended learning lies in its ability to support personalized learning, allowing instructional content, learning activities, and pacing to be adapted to diverse learner needs. Through online platforms, students gain access to a wide range of multimedia resources, open educational materials, and virtual expert engagements that enrich learning experiences and promote deeper conceptual understanding (Anthony et al., 2022; Mohamoud et al., 2020; OECD, 2020).

At the same time, face-to-face components provide structured opportunities for discussion, collaborative problem-solving, and peer interaction, reinforcing active learning and student engagement (Osman & Hamzah, 2020). This intentional integration of online and in-person learning not only enhances engagement but also supports learner autonomy. Beyond immediate academic outcomes, blended learning fosters essential lifelong learning competencies, including digital literacy, critical thinking, and self-directed learning, which are increasingly recognized as key indicators of quality education under SDG 4 (Abd Gani & Ramalingam, 2024; Wong & Beh, 2024; UNESCO, 2021).

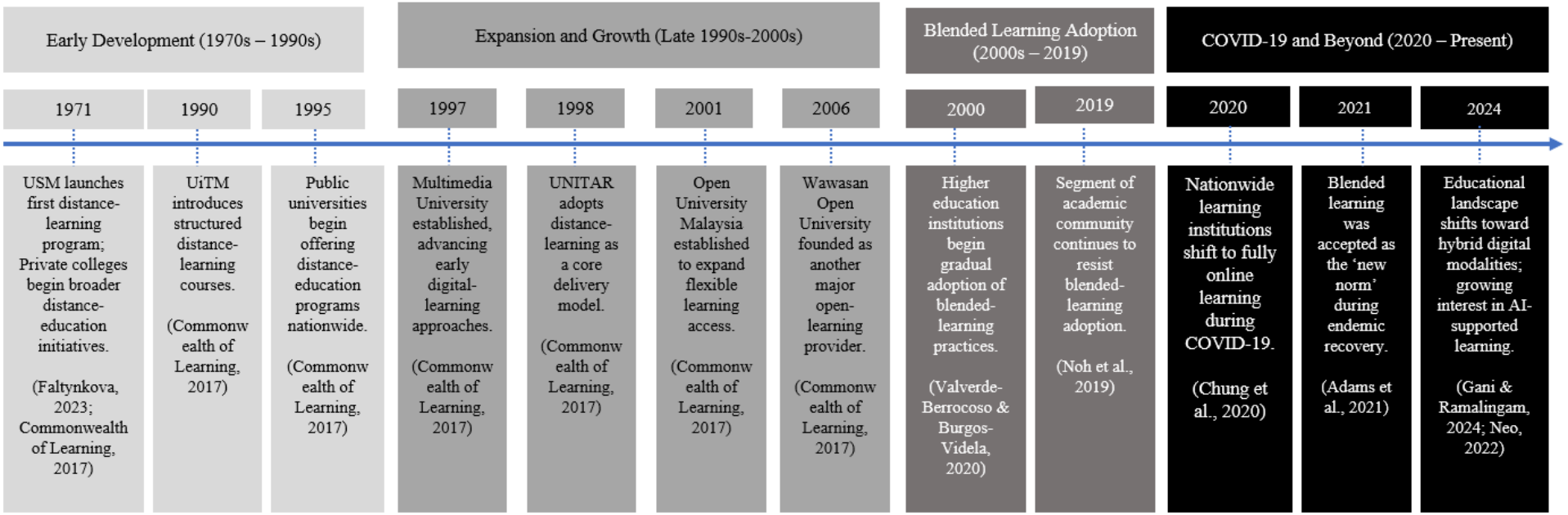

Figure 2: Evolutionary timeline of blended learning adoption in Malaysia (1971–2024).

In addition to improving instructional quality, blended learning advances SDG 4 by expanding access to education and reducing disparities, particularly for learners in remote areas and those with diverse needs (Anthony et al., 2019; Ghanem, 2020). Its flexibility enables learning continuity despite geographical, temporal, or situational constraints, a benefit that became especially evident during disruptions such as the COVID-19 pandemic (Syafidah et al., 2021; UNESCO, 2021). Blended learning also enhances institutional resilience through digital storage of learning materials and assessments, while facilitating international collaboration via virtual guest lectures and joint teaching initiatives that broaden academic exposure (OECD, 2020).

More recently, the integration of artificial intelligence (AI) within blended learning environments has strengthened its contribution to SDG 4 by enabling adaptive learning, intelligent tutoring, and analytics-based feedback that support inclusivity and personalized learning pathways (Zawacki-Richter et al., 2019; Boelens et al., 2017; Park et al., 2024). AI-supported blended learning directly supports SDG 4.1, 4.3, and 4.4 by improving access, quality, and employability-related skills, while assistive technologies enhance inclusion for learners with disabilities or language barriers, contributing to SDG 4.5 (OECD, 2021; World Economic Forum, 2020; UNESCO, 2023).

In Malaysia, national initiatives such as the Digital Education Policy 2023–2030 and the National AI Roadmap 2021-2025 further reinforce this alignment by positioning AI-enabled blended learning as a strategic tool for sustainable and inclusive educational transformation (Ministry of Education Malaysia, 2023; Ministry of Science, Technology and Innovation Malaysia, 2021).

Limitation and policy implications

The review of Malaysia's blended learning landscape reveals a progressive transformation shaped by technological advancement, national reform agendas, and post-pandemic digital acceleration. While it reflects growing institutional readiness and diversification of pedagogical practices, the findings also highlight persistent structural constraints that limit the effectiveness and equity of blended learning implementation. One major limitation in the implementation of blended learning in Malaysia concerns equity across learning environments. Despite expanded access, disparities persist in internet connectivity, device availability, and the availability of conducive learning spaces, particularly between urban and rural regions and among different socio-economic groups. Studies highlight unequal digital literacy, inconsistent technological resources, and limited inclusive teaching strategies (Price, 2025; Hayati, 2021). With such disparities, it reduces student participation and learning quality and potentially reinforces existing inequalities (Rapanta et al., 2020). Along with that, instructor readiness also poses challenges, as educators display uneven digital competence and pedagogical confidence. Although training opportunities exist, they remain less integrated, resulting in technology-driven rather than pedagogically sound blended learning practices (Trust and Whalen, 2020).

Besides that, these challenges are further compounded by gaps in institutional infrastructure. While some institutions have invested in robust LMS, instructional design support, and technology-enabled classrooms, others continue to rely on outdated platforms or lack centralized technical and pedagogical assistance. Such inconsistencies weaken efforts to scale and sustain blended learning and create uneven learning experiences across programs and institutions. Issues of equity, instructor readiness, and institutional infrastructure are closely connected and cannot be addressed effectively through isolated interventions. Instead, they call for coordinated action across multiple levels of the higher education system. These interrelated limitations highlight the need for a coordinated approach that simultaneously addresses equity, educator capacity, and institutional infrastructure to

strengthen the quality and inclusiveness of blended learning implementation. Therefore, it is necessary to consider stakeholder-specific implications and responsibilities that can guide policy formulation, institutional strategy, and pedagogical practice toward more sustainable and equitable blended learning implementation.

Recommendations

In response to these connected challenges, clear implications arise for different stakeholder groups. At the policy level, The Ministry of Higher Education (MOHE) plays a central role in consolidating and formalising national standards aligned with the Malaysia Education Blueprint (2015–2025) and broader digital agendas such as MyDIGITAL. Clear benchmarks related to digital infrastructure, access, instructional quality, platform interoperability, and online assessment integrity can help reduce disparities between institutions with varying levels of readiness and resources. Equity-focused policy interventions, including targeted funding schemes, infrastructure grants for under-resourced and rural institutions, and national initiatives such as shared digital repositories and open educational resources, can further address systemic inequalities. Such measures ensure that all learners, including those from low-income backgrounds, remote areas, or with disabilities, receive adequate technological and learning support, thereby strengthening both educational quality and social justice within the higher education ecosystem.

At the institutional and instructional levels, higher education institutions and educators are key to translating policy direction into effective practice. Institutions should prioritise sustained professional development that builds both technical and pedagogical competencies in blended learning design, online facilitation, assessment, and student engagement. Long-term investment in interoperable digital ecosystems, including robust learning management systems, integrated assessment and analytics tools, and reliable technical support, is essential for consistent and scalable implementation (Razali et al., 2022; Rasheed et al., 2020; OECD, 2020; Brown et al., 2020). At the instructional level, educators should adopt established pedagogical frameworks such as the Community of Inquiry to design blended learning environments that intentionally integrate teaching, social, and cognitive presence. This alignment enables educators to move beyond content digitisation toward engagement-oriented, reflective, and collaborative learning experiences, supporting sustained quality improvement in blended learning practices across courses and disciplines.

Future Directions

Looking beyond current practice and toward future innovation, Emerging technologies, particularly artificial intelligence (AI), present significant opportunities to enhance blended learning when implemented strategically and ethically. AI-enabled tools such as learning analytics, adaptive content delivery, automated feedback, and intelligent tutoring systems can support personalized learning pathways, provide timely insights into student engagement, and reduce instructor workload through automated assessment and feedback (Park et al., 2024). When aligned with pedagogical objectives, these tools enable more responsive and differentiated instruction for diverse student populations. However, effective AI integration requires robust governance frameworks to address data privacy, transparency, accountability, and algorithmic bias. Continuous professional development is also essential to ensure educators and administrators can interpret learning data and use AI tools responsibly. Without careful oversight, AI adoption risks reinforcing existing inequalities related to digital access, disability inclusion, and over-reliance on automated systems.

Future research should move beyond broad claims of AI's transformative potential to examine its pedagogical effectiveness, ethical implications, and equity outcomes within specific educational contexts. Studies

should investigate how AI tools influence student engagement and learning outcomes, as well as the conditions they contribute to meaningful learning. Equally important is research on ethical concerns, including data security, academic integrity, and the impact of AI-driven decisions on trust and professional autonomy. Greater attention must also be given to equity by examining how AI adoption affects learners across different socioeconomic, linguistic, and institutional contexts. Comparative studies across urban and rural settings and across institutions with varying levels of resources are particularly valuable for identifying disparities and informing responsible, inclusive, and evidence-based AI integration in education.

CONCLUSION

In conclusion, the evolution of blended learning in Malaysia reflects a sustained transformation that aligns with global educational goals, particularly the pursuit of SDG 4 on inclusive and equitable quality education. From its roots in distance education during the 1970s to the rapid digital acceleration triggered by the COVID-19 pandemic, Malaysian higher education institutions have progressively integrated digital technologies, flexible pedagogies, and inclusive practices to enhance accessibility and learning quality. These developments show that blended learning has progressed from simple digital use and emergency-based teaching toward a thoughtful and long term educational approach. The combination of policy direction, institutional capacity building, and technological advancement has enabled blended learning to become a key mechanism for promoting lifelong learning, equity, and innovative learning methods in higher education.

Looking ahead, the sustainability of blended learning in Malaysia depends on continuous policy refinement, institutional investment, and ethical technological integration, especially with the growing presence of AI in education. Policymakers must focus on reducing inequities in access and digital readiness, while institutions must commit to professional development and interoperable digital ecosystems that ensure consistent, high-quality delivery. Future research should explore the pedagogical, ethical, and equity dimensions of AI-supported blended learning to ensure that technological progress complements human-centred education. Ultimately, by embedding inclusivity, innovation, and collaboration into blended learning strategies, Malaysia can strengthen its higher education system and advance toward achieving the transformative vision of SDG 4.

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