

Artificial Intelligence Tools in Blended Learning: A Systematic Study on Evidence, Challenges and New Teaching Approaches

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Abstract: Over ten years, researchers have looked closely at how artificial intelligence fits into mixed classroom setups, though findings still sit scattered among fields, school stages, and tech uses. Pulling together seven real-world investigations, this overview explores AI helpers like talking robots, voice assistants, data trackers, custom study route planners, and big-language engines such as ChatGPT used in elementary, middle, high schools, and colleges. With support from wider reading beyond those reports, the piece weighs how well these tools affect grades, involvement, drive to learn, and teaching strength. Findings show gains tied clearly to better language skills, understanding spoken words, solving problems correctly, plus stronger results across subjects. Despite gains in student involvement - such as a documented 20 percent rise in active participation - not every outcome turns upward. Hidden beneath the surface, persistent hurdles emerge repeatedly during real-world application. Technical glitches disrupt smooth system links. Educators often lack adequate training to use new tools effectively. Some question whether leaning too heavily on machines might dull independent analysis skills. Research itself carries flaws that weaken certainty. Many studies watch learners for only brief intervals. Others rely on trial setups without proper control groups. A shared way to measure results remains missing. To bring clarity forward, a fresh structure appears: the AI-Blended Pedagogical Integration Model (AI-BPIM), offered here as a lens for upcoming inquiry and practical decisions within mixed-mode teaching environments.

Keywords: *Blended Learning, Artificial Intelligence, Chatbots, Learning Analytics, Personalised Learning, Student Engagement, Educational Technology, Hybrid Pedagogy.*

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I. INTRODUCTION

Two decades ago, blended learning began gaining traction - mixing in-person teaching with organized digital tasks. Not long after, schools everywhere started treating it like standard practice, not just a test run. Because software for managing courses improved, educators found smoother ways to blend modes. Devices connected to the internet became common, making access less of a barrier. Interest grew in models that let learners move at their own pace, reshaping how lessons were built. Into this change stepped artificial intelligence, quietly amplifying what teachers could do. Some tools now give feedback automatically, adjusting material based on student responses. Others guide discussions through smart chat interfaces or forecast performance using data patterns.

Where AI meets blended learning, debates grow sharp. Some see promise - machines tailoring lessons precisely, shifting pace and level as students' progress, offering detailed responses without delay (Roll & Wylie, 2016; Luckin et al., 2016). Yet others pause: too much automation might blur real teaching moments. Worries surface about fairness when tech access varies, about cheating slipping easier into view, or how teacher-student bonds could thin under algorithmic weight (Selwyn, 2019; Holmes et al., 2019). This space hums with tension - between efficiency and humanity.

Even though research in this area has expanded, its foundation is still patchy. A good number of articles zero in on limited tech fixes tested briefly; rarely do they explore how well AI tools work when woven into blended teaching setups - environments where learning shifts between face-to-face and online spaces, bringing distinct challenges. What sparked this analysis was a desire to gather existing findings, weigh

them carefully, spot recurring themes and missing pieces, then lay down a mental map for those trying to make sense of it all.

The structure unfolds step by step: first, Section 2 details how the review was conducted. Next comes Section 3, which describes key features of the selected research. Following that, Section 4 explores impacts - both on academic outcomes and learner involvement - linked to artificial intelligence systems. Finally, Section 5 dives into recurring themes around usage trends, teaching influences, and obstacles faced during deployment. What comes next is a proposal - the AI-Blended Pedagogical Integration Model - introduced in Section 6. Following that, Section 7 examines results through the lens of established theories. Future paths emerge indirectly as Section 8 draws interpretations together.

II. METHODOLOGY

This review built its foundation on a methodical gathering of existing research, guided by the PRISMA principles laid out by Moher and colleagues in 2009. Rather than relying on one source, the process pulled data from multiple platforms - Semantic Scholar led the collection with access to more than 126 million scholarly works, while Scopus, ERIC, and Google Scholar filled gaps. Instead of broad terms, the central query focused tightly on three linked ideas: how artificial intelligence tools function within blended learning settings and what results emerge in education. Despite variations in database design, consistency in keyword targeting helped maintain clarity across searches.

➤ Inclusion and Exclusion Criteria

Screening studies began by checking whether they looked at AI tools used strictly in settings where classroom teaching mixed with digital platforms. Where research reported results on how students performed academically, stayed involved, or showed overall progress, it moved forward. Clear descriptions of both the artificial intelligence system and the structure of the hybrid course shaped eligibility decisions. Designs relying on experiments, near-experiments, or carefully observed comparisons without randomization qualified under methodological rules. Only

those set inside official schools, colleges, universities, or certified training programs made the cut. Evidence drawn from real-world use of AI applications had to appear directly in each report. Merging web-based activities meaningfully with in-person sessions was a requirement, not optional overlap.

Some studies got left out when they focused solely on digital settings - or skipped hybrid setups entirely. Where artificial intelligence came up just in passing, with no real testing involved, those papers didn't make the cut either. Work missing actual measured results - like essays based on ideas alone - was set aside. Full scrutiny required complete articles; short summaries from conferences, lacking detailed review, played no role in the main findings.

➤ Data Extraction and Quality Assessment

From each study, information flowed into categories like research setup, settings where digital and classroom methods mix, details about artificial intelligence systems used, key results tied to learning and involvement, along with traits of those who took part. One step involved a machine system trained to pull out facts in an organized way - though people checked every piece, making sure nothing slipped through or stayed unclear. For judging strength, markers came from tweaks made to a known evaluation framework, focusing on how well ideas connect inside the work, whether measurements hold steady, plus openness in what gets shared.

Among those examined, seven satisfied every requirement needed for inclusion - these now anchor the main body of evidence here. To round out understanding, a few more scholarly works appear alongside them; these help position results within broader ideas while covering areas the central research left unexplored.

III. FEATURES OF STUDIES INCLUDED

Across these seven investigations, settings differ widely - from classrooms to online platforms - alongside varied uses of artificial intelligence tools. What ties them together appears in Table 1: a snapshot capturing key features side by side.

Table 1: Summary of Included Studies

Study	Context	AI Tool	Participants	Primary Outcome	Key Finding
Study 1	Blended learning (higher ed)	AI chatbots	211 students (104 control, 107 AI-enhanced)	Student intention to learn; academic performance	Positive effect on attitudes and perceived usefulness
Study 2	Higher education blended learning	AI performance assessment	Not specified	Continuous learning motivation	AI assessment indirectly boosted motivation via expectation confirmation
Study 3	High school biology education	AI-powered learning analytics	48 Biology teachers	Teacher design of personalised learning sequences	Significant improvement in personalised instruction (p=0.018)

Study	Context	AI Tool	Participants	Primary Outcome	Key Finding
Study 4	Undergraduate business education	AI speakers (Google Home Mini, Amazon Alexa)	47 third-year business majors	English language skills, TOEIC listening scores	Significant gains in listening comprehension
Study 5	Undergraduate aerospace engineering	ChatGPT (LLM)	110 freshmen students	Problem-solving, critical thinking, group skills	90–98% accuracy in mathematical problem-solving; concerns about critical thinking
Study 6	Primary/elementary education	AI-driven personalised learning paths	200 students aged 6–12	Vocabulary learning; reading comprehension	25% vocabulary improvement; 30% reading comprehension increase; 20% engagement boost
Study 7	Middle school education	Various AI tools + PBL approach	33 middle school students	English achievement; affective factors	Significant improvement in speaking and writing; enhanced motivation and confidence

Looking across the studies, a wide mix of AI uses in education comes into view. From young learners aged six up to university graduates, each level saw some form of artificial intelligence at work. Instead of sticking to one type, researchers tested chatbots, voice-activated devices, even systems that analyse classroom data to aid instructors. Such variety shows how freely ideas are being tried out - yet makes drawing clear parallels difficult.

Most implementations differed widely in size. While three trials included between 100 and 499 people, another three worked with under 100 subjects; one failed to disclose numbers entirely. Because many efforts remain small - a pattern often seen across educational technology research (Hattie, 2008) - results may not apply widely, highlighting room for broader studies spanning multiple locations.

IV. HOW AI TOOLS CHANGE WHAT STUDENTS LEARN

➤ Learning Performance Outcomes

Looking at all seven studies together, using AI tools seemed to help students do better in school - though how much it helped, and what exactly improved, differed quite a bit. One group of gains showed up in speaking and writing abilities. Another set linked to thinking through problems and analysing ideas more effectively. A third pattern tied back to how teachers shaped lessons when supported by AI. Each cluster revealed a different way progress unfolded.

- *Language and Communication Skills*

Among the analysed works, three cantered on language-based results, highlighting how notable AI-supported methods are in mixed-language teaching settings. Following exposure to voice assistants like Google Home Mini and Amazon Alexa, participants in Study 4 - undergraduate

learners of Japanese business communication - showed clear improvement in TOEIC listening test performance. Such outcomes resonate with earlier observations about technology-driven practice for speech and auditory skills (Godwin-Jones, 2019). Perhaps it is the informal, interactive nature of these devices that fosters relaxed repetition, something beneficial when mastering a new tongue.

Despite limited comparison groups, one analysis stood out for detailed results - learners aged six to twelve using tailored AI instruction gained 25 percent more words and scored 30 percent higher in understanding texts than earlier attempts suggested. Though promising, brief exposure times and uneven pairing across conditions suggest caution when drawing conclusions. In another case, Chinese pupils at intermediate levels showed stronger expression in speech and writing after blending artificial intelligence resources with problem-centered teaching methods; emotional responses also shifted noticeably, revealing deeper engagement, heightened drive, and growing belief in their own abilities.

- *Problem Solving and Stem Skills*

Surprisingly, Study 5 expanded the scope of analysis by exploring how ChatGPT assists undergraduates in solving math problems within engineering courses. Although focused narrowly, its results showed strong outcomes: solution accuracy reached 90% to 95% for theoretical cases, while interpretation-based tasks saw correctness climb to 96%–98%. Because of these figures, researchers viewed the model as a useful addition in teaching college-level math. Such an outcome lines up with Borge and colleagues’ 2023 observations, where similar systems produced dependable, sequential answers for calculus and linear algebra assignments.

Yet worry emerges in Study 5 - one needing clear attention when weighing AI's role in STEM teaching: access to powerful tools might weaken student motivation to wrestle with ideas, a process vital for real grasp of concepts. That mirrors older arguments around reliance on calculators in math classes (Ellington, 2003), now revived by unease over passive absorption through AI aids (Bender et al., 2021). Balancing quick results against deeper skill growth remains a core difficulty for those bringing AI into mixed-mode science instruction.

- *Teacher-Mediated Learning Quality*

One overlooked aspect emerged clearly in Study 3 - how artificial intelligence shapes teaching methods indirectly, by reshaping how instructors plan lessons. Rather than targeting learners alone, this work focused on high school biology educators using a custom-built AI system developed alongside researchers; results showed marked gains in designing customised lesson flows ($p = 0.018$). Such findings shift attention toward strengthening educator expertise - an area too often side lined in tech debates - and align with earlier views framing AI as a thinking ally for teachers, not a substitute (Luckin, 2017). With access to real-time learning patterns, those who teach gain sharper awareness of pupil requirements, enabling adjustments grounded in evidence instead of assumption. Personalisation becomes more achievable when guidance stems from observed progress, not general trends.

- *Student Engagement and Motivation Results*

Looking past test scores, some of the analysed papers looked at how artificial intelligence affects learners' involvement, drive, and overall experience. Interest grows here because being engaged often shapes school success more directly than many assume - particularly when education mixes digital platforms with face-to-face sessions, demanding independence absent in standard classrooms (Fredrick et al., 2004; Halverson & Graham, 2019).

One study showed student views improved when AI chatbots were added to mixed-format courses. Engagement intentions rose under those conditions, which lines up with earlier ideas about tech uptake in classrooms. A well-known model suggests usefulness and simplicity drive whether tools get adopted. That idea fits what was seen here. The results echo findings from the late 1980s on how people accept new systems in learning spaces.

Surprisingly, Study 2 looked at students in higher education. It showed that artificial intelligence tools used to assess performance didn't directly boost long-term motivation. Instead, their impact came through a sequence of psychological steps. When learners' initial beliefs matched what actually happened, they began seeing the tool as helpful. That sense of usefulness then shaped how satisfied they felt with their learning experience. From there, satisfaction nudged them toward sticking with the course. The pattern fits well with older ideas from Oliver (1980). Later work by Bhattacharjee (2001) adapted those concepts for classrooms. What stands out is that expectations matter - how users think things will go plays a strong role. Even smart technology

gains traction mostly when it lives up to what people thought would happen.

One out of every five young learners showed stronger involvement when navigating customised AI-supported lessons, according to Study 6 - the clearest sign of active participation seen in any analysis here. Though exact tools used to track that change remain unclear, such a shift lines up closely with earlier research on tailored instruction; work by Pane and colleagues in 2015 already linked flexible materials and student choice to deeper attention. In another direction, middle years' pupils responded with more enthusiasm for studying English after exposure to similar methods - evident not just in raised attendance but also bolder contributions during sessions, per Study 7. Confidence around schoolwork grew alongside willingness to engage, hinting at emotional gains beyond raw scores.

It could be that what looks like strong student involvement actually stems from the freshness of a new tech tool - something often seen when digital resources first appear in classrooms (Higgins et al., 2012). Since most research examined covers only brief periods, telling lasting impact apart from early fascination remains challenging. Because of this, tracking outcomes over extended stretches should guide future work.

V. THEMATIC ANALYSIS

- *Patterns in Integrating AI Tools*

Looking at the seven studies, researchers spotted five different ways AI gets used in blended learning setups. Though these patterns sometimes overlap - some research mixed features from multiple types - they still form a helpful framework. Each approach shows where AI fits inside combined teaching designs. Not every study followed just one model; several blended aspects freely. Still, together they clarify common strategies for weaving AI into hybrid education structures.

A different way to bring AI into classrooms shows up when tools just add onto current teaching methods instead of changing them. In one case, business learners worked with smart speakers like Google Home Mini and Amazon Alexa to sharpen their listening skills - these devices slipped quietly into a format already mixing online and face-to-face learning. Rather than shaping how lessons were built, they simply offered extra chances to practice conversations. Because teachers did not need to overhaul lesson plans, resistance stayed low. Still, leaning too heavily on this method might keep deeper changes out of reach.

One step beyond standard methods, personalisation through AI shaped how material unfolded for each student, adjusting speed and responses based on their needs. In study six, young learners followed routes built by artificial intelligence, which guided nearly every exchange with lessons directly. Human contact shifted toward reinforcing ideas and supporting peer connections during class meetings. Though such setups echo hopes tied to responsive technologies, they rely heavily on accurate algorithms backed

by evidence. Without close monitoring from educators, adjustments made by machines risk missing the mark.

One way researchers used artificial intelligence involved grading student work and offering replies based on results. In Study 2, an automated system judged how learners performed. Meanwhile, Study 5 applied ChatGPT to solve math tasks and assign marks. Because responses come quickly, this method helps more than waiting for teacher evaluations - especially when hundreds of students are involved. Getting answers fast makes learning smoother in big classes where delays often happen.

Notably, Study 3 illustrated the fourth model: assistance for educators combined with professional enhancement. Instead of engaging learners directly, the artificial intelligence system focused on strengthening how instructors analyse information and prepare lessons. Rather than shifting control, this approach allows teachers to remain central in teaching decisions. Behind the scenes, algorithms manage repetitive tasks like detecting each student's learning gaps. Sustainability seems more likely here, since authority stays with the educator while machines take over background work.

One way this appeared was through combining artificial intelligence with active learning methods focused on student-driven exploration. In one case, researchers used several AI systems alongside problem-solving tasks designed by learners themselves. This mix seemed to boost how effectively technology supported education. When digital tools were linked to teaching styles encouraging independence and teamwork, outcomes improved. Real-life challenges became part of the process, making learning more grounded. The approach worked best where students took charge, questioned together, and applied knowledge beyond theory.

➤ *Pedagogical Enhancement Factors*

Looking at the research, a few ways emerge showing how artificial intelligence supports teaching within mixed learning setups - not just by handing out online materials. Some tools shape feedback timing, while others adjust task difficulty based on learner responses. A number of systems track student progress quietly in the background, offering hints before confusion grows. Instead of replacing instructors, many platforms assist them by highlighting areas where learners struggle. These functions often work behind the scenes, making lessons more responsive without drawing attention to themselves.

One reason stands out more than others: personalisation across big groups. Different research points to AI's role in shaping distinct paths for learners, even when numbers grow high - something tough for teachers to manage without heavy support. According to Baker and Inventado (2014), watching each person's progress closely, then shifting teaching methods to match, shows just how strong AI can be inside classrooms.

Feedback that works right away stood out as a clear improvement across cases. During Study 5, learners in engineering got quick responses from ChatGPT when solving math problems - this helped them fix mistakes fast while refining their understanding step by step. Research has long shown how crucial prompt input can be during education (Hattie & Timperley, 2007). When technology delivers such guidance consistently - and handles many users - it moves ahead of older methods relying solely on delayed grading routines.

Though often overlooked, multiple senses played a key role in the language research. In one case, artificial voices engaged hearing - something written formats tend to miss. Practice that included reading along with writing, listening, plus talking showed broader skill growth compared to methods using just one form. These combined activities, seen across several technology-supported efforts, built stronger understanding than isolated tasks. Each study leaned into different ways minds learn, moving beyond pages alone.

When data shapes how lessons are built - like in Study 3 - it brings subtle yet meaningful shifts to teaching methods. Teachers gain access to detailed insights on how students perform, thanks to AI-generated reports. These patterns help replace guesswork with observations rooted in actual outcomes. Such changes echo larger trends seen across schools adopting learning analytics as part of daily work. Foundations for this approach appear in earlier research by Siemens and Baker from 2012.

➤ *Implementation Challenges and Barriers*

Even though results were mostly favourable in the analysed research, similar obstacles kept appearing during real-world use. Far from being minor issues, these barriers shape how well AI systems perform once removed from tightly managed trials. Their influence often decides if benefits last beyond experimental settings.

Problems connecting technology show up repeatedly in the literature. Getting artificial intelligence software to work inside current teaching platforms, school networks, or course designs often runs into complications - breakdowns in compatibility may weaken how students interact with materials or reduce trust in what the system offers. Work by experts highlights a pattern: stronger results happen when creators of digital education tools team up early on with those who shape classroom methods, instead of bringing them together later (Beetham & Sharpe, 2013).

One major obstacle stood out: preparing educators through adequate training. Success in Study 3 came not just from the tool itself, but because teachers helped shape it during its creation - this hands-on role made a difference. Such involvement runs counter to how tech usually reaches classrooms: built by experts, then handed to schools without much teacher say. When it comes to using artificial intelligence in teaching, figuring out proper support for staff has become a pressing topic across studies and government discussions alike (Ertmer & Ottenbreit-Leftwich, 2010; Voogt et al., 2013).

Study 5 brought up the conflict between using AI help and building personal skills more sharply than others, though it matters beyond just one project. When artificial intelligence handles mental tasks learners should tackle alone, growth may stall because struggle often leads to stronger understanding. Such worries aren't new under this technology label - they echo past discussions around leaning on aids too much when learning to read, relying on calculators in math class, or depending on auto-correct while writing (Vygotsky, 1978; Means et al., 2013). Still, today's smart tools are easier to reach and do more, making the issue feel sharper now.

A fresh concern emerges around how we verify learning fairly. When artificial intelligence tackles university-level math tasks nearly flawlessly, doubt creeps into traditional grading methods. Evidence from Study 5 shows performance between 90 and 98 percent correct, stirring unease over current evaluation models. As tools like ChatGPT spread, educators face pressure to rethink what counts as authentic work. Some schools turn to detection tech; others reshape assignments - yet these moves lack unified reasoning. Guidance remains scattered, according to Perkins and colleagues in 2023, echoed by Tlili's team the same year.

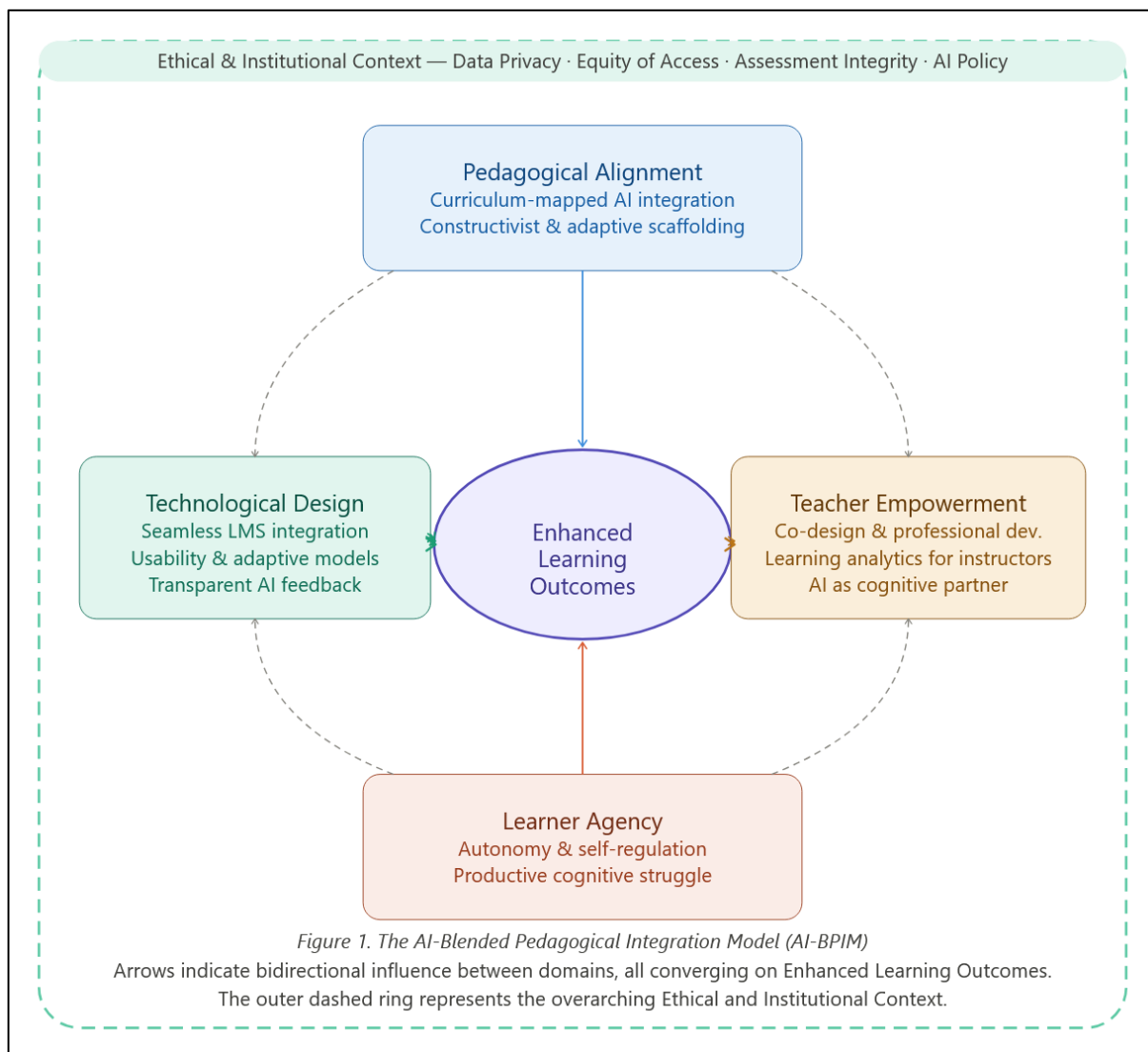
Though rarely discussed in the papers examined, issues like fairness in access, protection of personal information, and skewed algorithms matter greatly moving forward. When artificial intelligence learns from one-sided data, it risks delivering weaker outcomes for students from marginalized communities - evidence shows this clearly (Obermeyer et al., 2019; UNESCO, 2021). Without deliberate attention to inclusion, technology-enhanced classrooms might widen gaps instead. Unequal availability of stable connections or digital tools can deepen divides unless design choices actively counter them.

VI. AI BLENDED PEDAGOGICAL INTEGRATION MODEL

Figure 1 shows the structure. From insights into recurring themes, observed effectiveness, along with practical barriers uncovered during analysis comes a new approach: the AI-Blended Pedagogical Integration Model (AI-BPIM). This model serves as a reference point when shaping how artificial intelligence tools are planned, used, then assessed within mixed-mode learning settings.

At its core, the AI-BPIM focuses on improving how much students learn. Four connected areas support this aim - Pedagogical Alignment comes first, shaping teaching methods to match learning goals. Instead of operating separately, these areas influence one another constantly. Next is Technological Design, where tools are built not just for function but for fit within classroom needs. Then there's Teacher Empowerment, giving educators authority and space to adapt practices thoughtfully. Learner Agency follows, emphasizing student choice and active participation in their own growth. Around all four spins a broader layer - the Ethical and Institutional Context. This overarching frame shapes what is allowed, valued, and resourced across schools. It sets boundaries guided by fairness, rules, and available support systems. Without attention here, efforts in the other zones risk imbalance or exclusion.

When designing blended courses, aligning AI features closely with teaching goals tends to work better. Studies show these tools succeed more if included early, not added later by chance. Thoughtful planning matters - each use of AI should tie directly to how students learn. Instead of treating technology as a sidebar, build it into the foundation. Decisions about AI ought to reflect specific reasons tied to instruction. What emerges is a pattern: purposeful integration supports stronger outcomes. Tools gain value when their role fits within broader educational aims.



What makes an AI system work well in education often comes down to how it is built. When tools fit smoothly into current classroom software, they cause fewer disruptions. Clear feedback helps users understand what happens behind the scenes. Systems adjusting thoughtfully to different learners tend to support progress better. Bulky tech demands weigh students and educators down. Simplicity, insight, yet responsiveness - these quietly shape success.

When teachers shape how technology is used, learning gains strength. Instead of swapping roles, AI works best beside educators who adapt it thoughtfully. Growth comes through training that evolves with new tools. Involving instructors in design leads to smarter classroom integration. Insight into teaching patterns helps refine methods over time. Power shifts when data supports decisions made by those in classrooms. Rather than fading into background tasks, educators stay central by using feedback loops well.

Student control stays central when learning involves choice and independence. Because machines assist best by guiding - not replacing - thinking, their role must remain supportive. When software explains its own reasoning, trust grows. Questions matter; so do chances to challenge or reject

automated advice. Power shifts wisely only if users retain final say.

Starting with ethics shapes how each domain operates when bringing AI into education. Where institutions set rules about data and artificial intelligence, fairness begins to take form. Because resources must reach everyone equally, spending on systems matters just as much as policy. When evaluation methods adapt to contexts where machines assist thinking, their relevance holds only if grounded in transparency. Without alignment between values and practice, even well-built tools risk misapplication.

VII. DISCUSSION

Despite mixed results, signs point to modest gains when AI tools enter blended classrooms. Where conditions align - think structured tasks, clear guidance - the technology links to better outcomes in areas like language skills and math reasoning. Engagement often rises too; students report feeling more involved, even eager. Such shifts matter because holding attention amid digital distractions remains tough work for teachers. Tools easing that burden? They bring

something real to the table. Not magic wands - but helpful allies.

While gaps emerge in the existing data, key weaknesses also come into view. Mostly relying on quasi-experimental setups, brief monitoring windows, and varied assessment tools weakens confidence in cause-effect links. Meaningful comparisons between investigations become hard under these conditions. A stronger approach might involve aligned efforts across several locations, applying uniform methods. Where ethical, random assignment could strengthen design. Tracking results through full school cycles - twelve months or more - would add depth. Such steps would sharpen what we can reasonably conclude.

One way to look at these results is through familiar ideas in ed-tech research. Though originally developed earlier, the Community of Inquiry framework helps explain how AI strengthens certain aspects of blended environments. Where learners think deeply, receive custom guidance, or build knowledge together - AI often supports those spaces well. Instead of just delivering content, some systems adjust support based on real-time performance. Another perspective comes from the SAMR model, which traces tech integration from basic replacement to transformative change. In some cases, artificial intelligence does little more than swap old tools for digital versions. Yet in others, it enables pathways so tailored they could not exist without machine-driven analysis.

One way to look at it: worries over critical thought, reliance on outside tools, and fair evaluation aren't side issues - they're central hurdles in planning. Instead of seeing AI as a quick fix, shaping it into a collaborator that pushes students to reflect may lead to stronger outcomes. In the fifth study, focused on training engineers, ChatGPT solved problems almost flawlessly - this sparked concern about whether tests still measure true understanding, a scenario expected to grow more common. As artificial intelligence evolves, schools emphasizing assignments resistant to automation - such as crafting new ideas, applying knowledge beyond the classroom, defending work aloud, or building together - could maintain credibility in what they teach.

VIII. CONCLUSION

This analysis pulls together results from seven research projects exploring how artificial intelligence functions within mixed classroom settings. Although focused on different technologies - such as automated conversation agents, voice assistants, data-driven feedback systems, adaptive courseware, and advanced text generators - the studies collectively show improved test scores, stronger participation, and increased motivation among learners at various stages and subjects. Even so, despite backing trends in school spending toward tech-integrated teaching methods, patterns in the data carry caveats tied to narrow samples, uneven implementation, and inconsistent measurement approaches.

Looking back at the findings, four main points stand out. Not only do AI systems work better in blended settings when matched to teaching goals, they also fall short if chosen just because they seem advanced. Instead of focusing solely on tech features, giving teachers real influence tends to improve outcomes more - especially when educators help shape the tools and receive ongoing training. Often overlooked, yet vital, is keeping learners in control: supports should guide thought, not replace it, allowing room for effortful thinking where understanding grows. Starting with fairness, institutions must act early on ethics like data safety, fair algorithms, and honest evaluation - not treat them as afterthoughts once systems are already running.

Looking ahead, studies ought to focus on extended timeframes, using either random assignment or closely aligned comparison groups alongside consistent metrics for reliable results across trials. With emphasis shifting toward equity, insights into marginalized learners' journeys matter just as much as tracking how motivation shifts over time when artificial intelligence blends into classroom settings. As these technologies grow stronger and easier to reach, handling honesty in learning will demand fresh solutions. What has been introduced - the AI-Blended framework - serves less as a conclusion and more as a foundation, one built around teaching quality, educator agency, and student needs.

How artificial intelligence fits into blended learning isn't up for debate - only the manner of its inclusion. Though limited in methods, existing research gives practical direction to teachers, scholars, and decision-makers guiding this shift. Moving forward means not eliminating the friction between tech potential and human growth, but shaping it wisely - so systems aid students without replacing essential personal elements in education.

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