BLENDED LEARNING; MODELS FOR TRANSFORMING INSTRUCTIONAL PRACTICE

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ABSTRACT

Blended learning, defined as the deliberate combination of face-to-face and online instructional methods, has emerged as a pivotal strategy for enhancing educational effectiveness in diverse contexts. This paper undertakes a systematic literature review to examine prevailing blended learning models and assess their effectiveness within instructional settings, with a particular focus on the Kenyan education system. Using a structured methodology guided by clearly defined inclusion and exclusion criteria, peer-reviewed studies and credible reports published between 2010 and 2025 were sourced from academic databases including ERIC, Science Direct, JSTOR, Google Scholar and African Journals Online. The review identifies several dominant models such as the flipped classroom, rotation models, and enriched virtual models highlighting their pedagogical underpinnings and operational characteristics. Findings reveal that while blended learning offers significant benefits in terms of personalization, flexibility, and learner engagement, its implementation in Kenya is constrained by infrastructural deficiencies, limited digital literacy, and socio-economic disparities. The paper discusses strategies to mitigate these challenges, including investments in digital infrastructure, targeted professional development for educators, and policy frameworks that support sustainable integration of technology in pedagogy. The study concludes by emphasizing that the strategic adoption of contextually appropriate blended learning models is critical to advancing effective instruction and achieving equitable educational outcomes.

KEYWORDS

Blended Learning, Synchronous Learning, Asynchronous Learning, Hybrid Learning, Blended Learning Models, Instructional Practice

1. INTRODUCTION

In recent years, the landscape of education has undergone a significant transformation, largely driven by advancements in technology and the increasing demand for more flexible, student-centered learning experiences. Among the most impactful innovations are blended learning models, which strategically integrate online digital media with traditional classroom methods. Blended learning allows students to benefit from both the personalization and flexibility of online instruction and the social interaction and mentorship of face-to-face learning. Recognizing the potential of technology to enhance educational access and quality, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has consistently advocated for the integration of digital learning tools to promote inclusive, equitable, and high-quality education for all learners (UNESCO, 2023) and (Alammary, 2022). This study focuses on four prominent blended learning models: The Enriched Virtual Model, Lab Rotation Model, Individual Rotation Model, and Online Driver Model. Each model offers unique structures for combining online and offline learning, and each responds differently to students' needs for flexibility, personalization, and support (Picciano, 2023). While these models have shown promise in various educational contexts, there remains a need for deeper exploration into their comparative effectiveness, the challenges faced in their implementation, and the evolving role of teachers within these hybrid

environments (Graham, et al 2023). By investigating these blended learning models, the study aims to contribute to the global dialogue on best practices in modern education. It seeks to align with UNESCO's vision of leveraging innovative pedagogical strategies to close educational gaps, improve learning outcomes, and prepare students for the demands of a rapidly changing world. Through this research, the study will offer insights and recommendations for policymakers, school leaders, and educators committed to advancing quality education through blended learning approaches.

The main difference between a *physical environment and a virtual environment* lies in the way in which they are experienced. A physical environment refers to a tangible, real-world space that we can see, touch, and interact with physically, such as a classroom, office, or outdoor setting. In contrast, a virtual environment exists in a digital space created through technology, such as virtual reality (VR), augmented reality (AR), or online platforms. In a physical environment, interactions occur in person, allowing for face-to-face communication, hands-on activities, and a sense of presence that is often lacking in virtual environments. Physical environments provide sensory experiences that engage all five senses and promote a sense of connection and shared experience among individuals. On the other hand, virtual environments offer unique opportunities for immersive experiences, simulations, and interactions that may not be possible in a physical setting. Virtual environments can transcend physical limitations, allowing users to explore new worlds, manipulate objects digitally, and collaborate with others remotely in real-time. While physical environments offer a sense of authenticity and immediacy, virtual environments provide flexibility, scalability, and accessibility that can cater to diverse learning styles and preferences (Ferdig, & Pytash, 2024).

As technology continues to evolve and impacts all aspects of our daily lives, learning and education of these new technologies cannot be overlooked. It's important to remember that "evolving" refers to moving ahead to the next level without decimating the old, i.e. taking advantage of both the worlds the positives of old with the advantages of new.

In the case of education, this is known as blended learning. The concept of blended learning has gained great popularity over the last few years, with its advantages being lauded by learning professionals. Blended learning combines the benefits of traditional classroom teaching with emerging technology to make learning more real-time, contextual, and engaging. Let's delve deeper into what blended learning and is, and highlight different models and benefits it offers to the contemporary educational setting.

2. METHODOLOGY

This study adopted a *systematic literature review (SLR)* as the primary research methodology to explore the role of blended learning models in transforming instructional practice. Systematic reviews are characterized by their structured, replicable, and transparent procedures for identifying, evaluating, and synthesizing existing studies, making them especially suited to examining broad educational trends (Gough, Oliver, & Thomas, 2017; Snyder, 2019).

The review was guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework to ensure methodological rigor and transparency (Page et al., 2021). The central research questions focused on: identifying the most commonly implemented blended learning models; examining how these models influence instructional strategies and teacher roles; and exploring the challenges and success factors associated with their implementation. A comprehensive literature search was conducted using five major databases: ERIC, Scopus, Web of Science, JSTOR, and Google Scholar. Search terms included combinations such as "blended learning models," "instructional transformation," "flipped classroom," "station rotation," "flex

model," and "pedagogical change." Boolean operators and filters were applied to refine the search results. The inclusion criteria encompassed peer-reviewed empirical studies published between 2010 and 2025, focusing on primary, secondary, tertiary, or professional education settings, and reporting on the impact of blended learning on instructional practices. Grey literature, such as dissertations and conference papers, was also reviewed when it offered empirical insights. Studies that focused exclusively on either traditional or fully online modalities were excluded. The screening process involved two stages: an initial review of titles and abstracts, followed by full-text analysis of potentially relevant studies. The selection process was documented using a PRISMA flow diagram, in line with established best practices. A total of 20 studies met the inclusion criteria and were included in the final analysis. Data extraction was carried out using a structured coding matrix. Key information collected included authorship, year of publication, educational context, type of blended model used, observed changes in instructional strategies, and reported challenges or successes. The data were then analyzed thematically using a combination of inductive and deductive coding approaches. Emerging themes included redefined teacher roles, shifts toward student-centered pedagogy, increased integration of digital tools, and variations in implementation outcomes based on institutional support and teacher preparedness (e.g., Graham et al., 2019; Smith & Johnson, 2021).

3. LITERATURE REVIEW

3.1. Blended Learning and Hybrid Learning

Blended learning is an educational approach that combines *traditional classroom learning* with *online learning*. It is a flexible and adaptable approach that considers different learning styles and preferences. It allows for a mix of face-to-face interaction with teachers and peers, as well as self-paced online study (Ndwiga, et al 2024). This approach can be very effective in catering to different learning styles and preferences, as well as providing flexibility and accessibility for students. It often includes a variety of multimedia resources, interactive activities, and opportunities for collaboration. In blended learning, the goal is to create a single, unified learning experience that mixes classroom time with online activities. For example, imagine a biology class where students attend lectures in person twice a week. After each lecture, they log into an online platform at home to complete simulations of cell division or participate in online discussions about genetics. The face-to-face lessons and the online work are interconnected, designed to support each other. In blended learning, students are usually required to attend their in-person classes regularly the online work *enhances* but does not replace classroom time as presented in Figure 1.
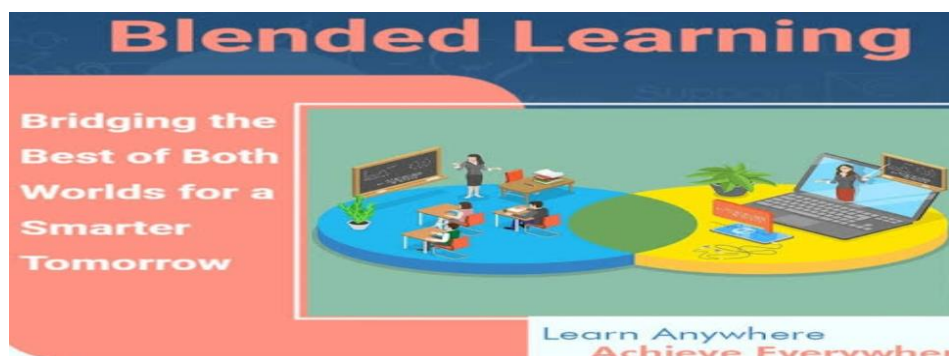

Figure 1: Blended learning

Essentially, blended learning can enhance the learning experience and help students achieve their educational goals in a more personalized and engaging way. As observed earlier, in a blended learning setup, students do not only rely on in-person lessons; they also engage in learning experiences outside the classroom through digital platforms. The purpose is to create a richer, more flexible educational experience that makes use of the strengths of *both physical* and *virtual learning environments*. Apart from the *face to face* physical environment, the virtual learning environment can happen in two main ways: *synchronous and asynchronous* as summarized below (Hodges, & Barbour, 2022).

Face-to-face learning refers to the traditional model where students and teachers meet physically in a classroom setting. The teacher or instructor offer guidance to the learners observing the schedules according to the fixed time on the timetable. In blended learning, face-to-face sessions are a crucial part   they often focus on activities that benefit most from direct interaction, like *group discussions, lab experiments, practical demonstrations, or live feedback from the teacher*. For example, in a blended senior school chemistry class, students might attend a laboratory session in person to perform experiments that cannot be simulated online.

Synchronous learning means that students and teachers interact in real-time, even though they might not be in the same physical location. This could happen through *video conferencing tools like Zoom, google meet or Microsoft Teams among others*. For instance, after a face-to-face lecture on world history, the teacher might schedule a live online discussion where students debate historical interpretations. Even though students are logging in from different places, the interaction happens at the *same scheduled time,* just like a physical class. This type of learning provides immediate feedback, promotes active participation, and fosters a sense of community among students. One of the key benefits of synchronous learning is the opportunity for real-time interaction and collaboration. Students can ask questions, engage in discussions, and receive immediate feedback from instructors, which can enhance their understanding of the material and promote deeper learning. Synchronous learning also helps create a sense of accountability and motivation, as students are expected to participate actively during scheduled sessions. However, synchronous learning may present challenges related to scheduling conflicts, time zone differences, and technical issues that can hinder participation. To address these challenges, instructors can provide alternative ways for students to access course materials, such as recorded lectures, discussion boards, or online resources, to accommodate different learning needs and preferences.

Asynchronous learning is a method of learning where students are not required to be present at the same time or in the same location. It allows for flexibility in terms of when and where students can access educational materials, participate in discussions, and complete assignments on their own schedule, without real-time interaction. Students are engaged in watching a pre-recorded video lecture on their own time, participating in a discussion forum throughout the week, or submitting assignments via an online learning management system like Moodle or Google Classroom. Asynchronous learning supports flexibility, allowing students to work at their own pace while still following a structured timeline. One of the main benefits of asynchronous learning is that it accommodates different learning styles and schedules, allowing students to learn at their own pace. It also provides an opportunity for students to engage with course materials in a more thoughtful and reflective manner, as they have the time to digest information and formulate their thoughts before responding. However, asynchronous learning poses some challenges, such as the potential for decreased interaction and engagement among students and instructors. To address this, incorporating interactive elements like *discussion forums, group projects, and video conferences* can help enhance the learning experience and foster a sense of community in an online environment. General, asynchronous learning offers a flexible and convenient way for students to pursue their education, while also requiring self-discipline and

effective time management skills to stay on track with their studies. Teachers and academic staff in educational institutions should be trained in blended learning pedagogies to effectively utilize transformative instructional practice, to balance between *face-to-face and online learning* modes of delivery *(synchronous and asynchronous)* as demonstrated in *Figure 2.*
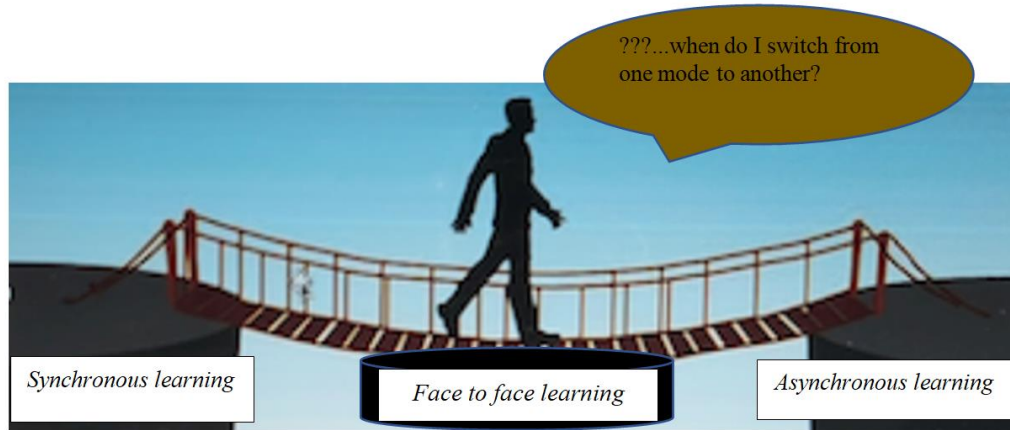

Figure 2: Blended Learning Modes

In an effective blended learning model, *face-to-face* sessions are strategically used for building relationships, tackling complex problems, or clarifying difficult concepts, while *synchronous online sessions* provide live interaction when physical attendance isn't possible, and *asynchronous* online activities allow for reflection, deeper research, and independent practice.

Incorporating a mix of synchronous and asynchronous learning activities can help create a balanced and engaging learning experience that caters to different learning styles and preferences. By leveraging the benefits of both synchronous and asynchronous learning, educators can create dynamic and interactive learning environments that support student success. Ultimately, blended learning aims to take the best of both worlds   the immediacy and relational depth of face-to-face education, combined with the flexibility and expanded access to resources provided by online learning, whether in real-time or self-paced formats.

3.2. Hybrid Learning

However, gives students more flexibility as it allows them to choose whether they participate in-person or online - combines *two types* of *learning environments*. An instructor delivers materials to learners, some attend class in person, others join the same class virtually from home. Meaning, the educator teaches remote and physically present students at the same time using tools like video conferencing hardware and software. Picture a university course where students can either come to campus for a lecture or join the same lecture remotely via Zoom. Some students might choose to attend *physically* every week, others might decide to attend *remotely* based on their schedules, or switch between modes. In hybrid learning, the teacher plans lessons with both the in-person and the online learners equally in mind. *The fundamental point is that students have the option*   the system is designed to work well whether they are physically present or attend remotely. Notably, in blended learning, all students usually experience both online and face-to-face elements together in a structured way, while in hybrid learning, students are given the *choice* to attend physically or virtually, and the learning experience is adapted to support both types of participation.

3.3. Modes of Online Learning

Some scholars classify **modes of online learning differently** to facilitate remote education and to cater for different *learning styles and preferences*. Common modes of online learning include: *Synchronous Learning:* Involves real-time interaction between students and instructors through live online classes, video conferences, or webinars. This mode allows for immediate feedback and active participation.

Asynchronous Learning: Involves self-paced learning where students access pre-recorded lectures, readings, and assignments at their convenience. This mode offers flexibility for students to study at their own pace.

Hybrid Learning: combines two types of learning environments. An instructor delivers materials to learners, some attend class in person, others join the same class remotely or virtually from home.

Online Discussion Forums: Provide a platform for students to engage in discussions, share ideas, ask questions, and collaborate with peers and instructors. This mode promotes communication and community building in online learning environments.

Multimedia and Interactive Content: Utilizes various digital resources such as *videos, simulations, interactive modules, and virtual labs* to enhance engagement and facilitate active learning. By incorporating these modes of online learning, educators can create a dynamic and inclusive virtual learning environment that supports student learning and engagement in a remote setting.

4. BLENDED LEARNING MODELS

Blended learning models are *educational approaches* that combine traditional face-to-face classroom methods with online and digital learning activities (Tucker, 2022). Instead of relying solely on in-person instruction or only on virtual platforms, blended learning aims to create a more flexible, personalized, and engaging learning experience by integrating both environments thoughtfully (Trust, & Whalen, 2023). The balance between online and face-to-face learning can vary depending on the model. Some blended learning models give students a lot of control over the time, place, pace, or path of their learning, while others are more structured with specific schedules and sequences. There are seven types of blended learning models as summarized.
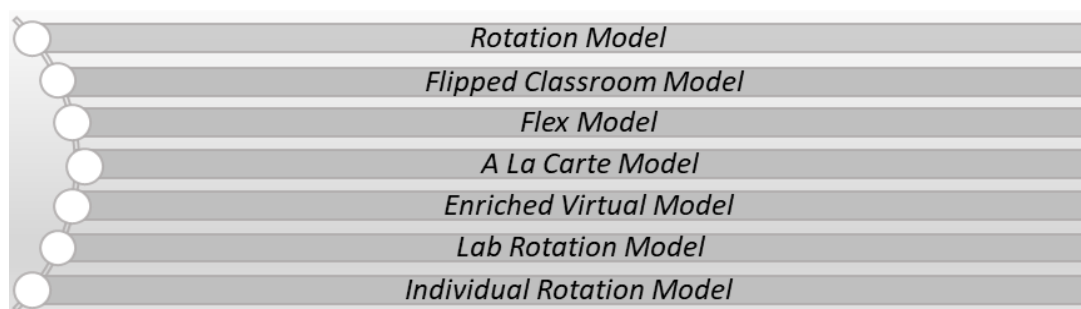
In the *Rotation Model*, students move between different learning stations or activities, which include a mix of online and face-to-face experiences. Each student follows a set schedule or path. Example: In a primary school, students might spend 30 minutes doing math exercises online, then rotate to a small group discussion with a teacher, and finally rotate again to complete hands-on

activities with their classmates. The Rotation Model is one of the most widely used blended learning models, especially in primary and secondary education. (Drysdale, & Graham, 2023). In this model, students move through a fixed schedule of different learning activities   some led by a teacher and others completed independently online. These rotations are either teacher-directed or self-paced, depending on the design of the program.

A typical setup in the Rotation Model might include students spending a portion of their time in direct instruction with a teacher, another portion working independently on online modules, and another part engaged in group projects or peer discussions. The key feature is that each student rotates through these different modes of learning within a structured schedule. There are several common variations within the Rotation Model itself:

- *Station Rotation:* Students rotate between different physical stations within the classroom. For example, a fourth-grade math class could have three stations: one for online math practice, one for small-group instruction with the teacher, and one for hands-on math games or collaborative problem-solving.
- *Lab Rotation:* Students rotate out of their main classroom into a separate computer lab to complete the online portion of their work. This is often used in schools with limited technology in the classroom but with access to centralized computer labs.
- *Flipped Rotation:* A variation where students rotate between learning new material online at home and applying it in class through projects and discussions.
- *Individual Rotation:* Students have personalized rotation paths based on their learning needs. Some students might spend longer on online activities, while others might require more face-to-face tutoring (Hodges, & Barbour, 2022).

The Rotation Model in Practice - a middle school English class using a Station Rotation approach. The students spend 20 minutes at Station 1 reading an article online and answering comprehension questions, 20 minutes at Station 2 discussing the article's theme with the teacher and a small group, and 20 minutes at Station 3 writing a personal reflection in their journals.

Every group gets to experience all three stations within the class period.
The Rotation Model allows for differentiated instruction because students can receive more *personalized support* during small-group sessions. It also fosters *greater student engagement*, as students are constantly moving and changing activities. Plus, it *maximizes use of technology* without needing a 1:1 student-device ratio all the time, making it cost-effective.

In the *Flipped Classroom* Model, students first encounter new material outside of class, usually through video lectures or readings. Class time is then used for active learning like discussions, projects, or problem-solving (Tucker, 2022). Example, a high school physics teacher assigns students to watch a video about Newton's Laws at home. In class the next day, instead of lecturing, the teacher guides students through experiments that apply the laws. The Flipped Classroom Model reverses the traditional approach to teaching. Instead of introducing new content during class and assigning practice activities (like homework) afterward, students first *learn* the material outside of class   usually through videos, readings, or other online resources and then *apply* what they've learned during face-to-face class sessions. In this model, direct instruction happens online, and active learning happens in the classroom. Class time is no longer used mainly for lectures but instead for collaborative activities like discussions, problem-solving exercises, group projects, debates, experiments, and case studies. The teacher shifts from being the primary source of information to acting more as a guide or coach who supports and challenges students as they work. In Practice - in a high school biology class, students are assigned to watch a 15-minute video explaining photosynthesis at home. The video might include embedded questions to check for understanding. When the students come to school the next day,

they don't listen to another lecture on photosynthesis. Instead, they conduct a hands-on experiment measuring how light intensity affects the rate of photosynthesis in aquatic plants, working together in small groups with the teacher moving around to offer support and deeper questioning.

Why is it called "flipped"?
Because it *flips the traditional order as summarized in the table*

Type of Model	Order of Practice
Traditional Model	Class = Lecture ➔ Home = Practice
Flipped Model	Home = Learn new content ➔ Class = Apply, practice, and discuss

One major benefit is *greater student engagement*. Since class time is focused on application, students are more actively involved rather than passively listening (Changpueng, & Pattanapichet, 2024). Another advantage is *self-paced learning* students can pause, rewind, and re-watch online content as needed, which is not possible during a live lecture. The model also allows for *deeper, more personalized instruction* during class, as teachers can work directly with students who are struggling while allowing more advanced learners to move ahead. A strategic *challenge* is ensuring that all students actually complete the preparatory online work. If students arrive unprepared, it can disrupt the classroom activities. Access to technology outside of school can also be a barrier for some students, requiring schools to plan carefully to ensure equity. Teachers use *video platforms like YouTube, Edpuzzle* (for interactive videos), or even create their own videos using *screen recording software*. *Learning management systems* (LMS) like Google Classroom or Canvas help organize and track student work. The Flipped Classroom Model is particularly effective in promoting *critical thinking*, *problem-solving*, and *collaboration*, making it a popular choice in both senior school and university settings.

The Flex Model is heavily based on online learning, but teachers provide support in person when needed. Students work through digital content at their own pace, and teachers offer targeted help or workshops based on individual needs. Example: In an adult education center, learners complete most of their coursework independently online. However, when someone struggles with a module, they can attend an optional in-person tutoring session with the instructor. The Flex Model is a form of blended learning where *most instruction is delivered online*, but with *teachers available on-site* to offer support, guidance, and targeted instruction when needed (Tucker, 2022). In this model, students move through the digital content largely at their own pace, accessing lessons, assignments, and resources through an online platform. The classroom space transforms into a flexible learning environment   more like a workshop or a learning lab   where teachers act as mentors, facilitators, or coaches rather than traditional lecturers. What makes the Flex Model unique is that *online learning is the core,* not just a supplement. However, the presence of teachers provides essential real-time help, whether through small group instruction, tutoring, or short seminars based on student needs.

In Practice - in a senior school using the Flex Model for English, students come into a large classroom space where they log into the school's online learning system. Each student follows a personalized path: some might be completing a grammar module, others might be drafting essays with online writing tools, and some might be participating in an online peer review forum. Throughout the session, teachers circulate around the room, pulling students aside who are struggling, answering questions, or offering mini-lessons for those who need extra help with a particular skill.

Key Features of the Flex Model:

Students have control over the pace and order of their learning.
Teachers offer just-in-time interventions rather than leading whole-class sessions.
Classrooms are often set up to allow for independent work, small groups, and one-on-one support (Tucker, 2022).

Technology plays a central role, with content, assessments, and progress tracking all managed online. One major advantage is *personalization* students can move more quickly through material they understand well and spend extra time on topics they find difficult. This can significantly boost both engagement and achievement. The Flex Model also *develops independent learning skills,* preparing students for higher education or professional environments where self-directed learning is essential. Moreover, because teachers can focus their energy on students who need the most help, the support becomes *more targeted and effective.* The Flex Model demands that students be *highly self-motivated* and responsible, which can be difficult for some learners, especially younger ones. Effective implementation also requires strong infrastructure reliable devices, good internet connectivity, and robust digital content. Teachers must adapt to a very different role and sometimes need retraining to shift from being "deliverers of content" to "learning coaches." The model is popular in alternative schools, credit recovery programs, or any setting where students have diverse needs and benefit from individualized pacing. However, many traditional schools are now experimenting with the Flex Model in courses like mathematics, science, and language arts. It gives students *greater control over their learning* while still maintaining strong teacher support, making it a powerful and modern approach to education.

In *A La Carte Model*, students take one or more courses entirely online alongside their regular face-to-face school schedule. It gives students the flexibility to supplement their education with subjects not offered in their school. For example, a student enrolled in a rural high school attends regular classes in math and English on campus but takes an advanced Mandarin Chinese course online through a virtual school. The *A La Carte Model* sometimes called the *Self-Blend Model* is a form of blended learning where students take *one or more courses entirely online* in addition to their traditional in-person classes. Unlike models where online learning and face-to-face learning are tightly integrated within the same course, in A La Carte, students separately choose online courses that supplement or expand their academic program (Powell, et. al. 2022). In this setup, students usually attend a traditional school for most of their classes but register for online courses to meet specific needs: to access subjects not offered at their school, to resolve schedule conflicts, to recover credits, or to accelerate their learning. *Example of the A La Carte Model in Practice:* A senior school student at a small rural school wants to study Advanced Placement (AP) Computer Science, but the school doesn't offer it due to lack of specialized teachers. The student enrolls in the course online through an accredited virtual academy. During the day, they attend physical classes like English, History, and Biology at their regular school, but at a scheduled time (perhaps in a computer lab or study hall), they complete their AP Computer Science coursework online, supported by a remote instructor.

Main Features of the A La Carte Model are:

- Students choose individual online courses alongside traditional, in-person learning.
- Online courses are usually offered by external institutions or online programs.
- The learning in online and face-to-face classes is *separate,* not blended within a single course.
- Students often have the flexibility to decide when and where they complete their online coursework.

One of the biggest strengths of the A La Carte Model is *expanded access.* It allows students to study niche subjects, advanced courses, electives, or special programs that would otherwise be unavailable. It also offers *flexibility* in scheduling, helping students balance academics with work, sports, or family responsibilities. In addition, it supports *individualized learning paths,* catering to both high-achievers who want more challenges and struggling students who need credit recovery options. One main challenge is that students must be *self-disciplined* and good at managing their time. Without daily face-to-face contact, students in online courses risk falling behind if they don't stay motivated. Schools also need to ensure that the online providers they partner with maintain *high-quality standards* and offer meaningful support to students. The model is highly effective in senior schools, particularly in settings where course offerings are limited by staff, budget, or location. It's also popular in home-school environments and with students who have special scheduling needs, such as elite athletes or young artists with demanding training schedules. The *A La Carte Model* empowers students by offering them *more choices and flexibility* without losing the structure and community of their traditional schooling (Moore, et al, 2022).

In the *Enriched Virtual Model*, students have *a blend of online learning and occasional face-to-face* meetings. However, unlike the Flipped Classroom, *face-to-face sessions are less frequent and online learning forms the bulk of the course*. For example, a university offers a business course where students complete most modules online, but meet with the professor twice during the semester for intensive workshops and project presentations. The *Enriched Virtual Model* is a blended learning approach where students complete most of their coursework online but also attend some face-to-face sessions with their teacher. Unlike full-time virtual learning, the Enriched Virtual Model still values occasional physical interaction to deepen understanding, strengthen relationships, and provide targeted support (Tucker, 2022).

The Lab Rotation Model - students rotate to a computer lab for the online portion of their learning, rather than using personal devices in the classroom. Example: Middle school students attend English class for discussions and grammar lessons, but for the writing practice and vocabulary drills, they move to a designated computer lab where they use specialized writing software. The Lab Rotation Model is a type of blended learning where students rotate between different learning stations, and one of those stations is a dedicated computer lab where they engage in online learning. Unlike some other blended models, the rotation here is fixed or teacher-scheduled not necessarily student-chosen. It's structured but still flexible enough to personalize learning. In a senior School Credit Recovery Program - a senior school can implement a Lab Rotation Model specifically for students who are behind in credits. These students attend a regular schedule of classes but rotate daily into a lab period where they work through online courses designed to help them catch up. Teachers and support staff are present in the lab to assist, but the core instruction during that rotation comes from the online modules. This setup allows students to progress at their own speed without pulling them out of their normal classes entirely. The main goal about the Lab Rotation Model is that online learning doesn't replace face-to-face instruction it complements it through a well-organized system of rotations. It's a powerful model for schools that want to integrate technology without going fully virtual (Ndwiga, & Khaemba, 2024).

Individual Rotation Model is where each student has a customized schedule based on their specific learning needs. They rotate through activities but not necessarily at the same pace or sequence as their classmates. For example, in a personalized learning program, Student A spends more time on online reading modules because they struggle with comprehension, while Student B moves faster and spends additional time doing in-person creative writing workshops. Each of these blended learning models adjusts the balance between online and face-to-face activities depending on the learning goals, student needs, and available resources. The *Individual Rotation*

Model is a blended learning strategy where *each student follows a personalized schedule* of rotating between different learning activities. Unlike Lab or Station Rotation (where all students rotate on the same schedule), in the Individual Rotation Model, students' paths are customized based on their needs, skills, and progress. Some students might rotate between online lessons, small group work, teacher instruction, and independent practice, but *not necessarily in the same sequence or to the same stations (*Zheng, & Kwon, 2023).

*For example, i*n *an elementary school*, students in a second-grade reading class are given an individualized learning plan based on their reading level. A struggling reader might start the day with an online phonics game, then meet one-on-one with the teacher for guided reading, then move to a peer reading station. Meanwhile, a more advanced reader could begin with independent novel reading, proceed to an online comprehension quiz, and later join a creative writing workshop. Each student's rotation looks different, aligned with their strengths and needs. In *a middle school* using the Individual Rotation Model for math, students' schedules are generated weekly. Some students who need extra help spend more time with a live teacher for remediation, while others who have mastered current content spend more time in the computer lab working on advanced topics through adaptive online programs. One student might rotate between teacher-led instruction, a math club project group, and online problem-solving challenges while another student may skip the project group entirely and spend extra time doing foundational skill work online. *In a senior school* career-focused program, students interested in engineering rotate based on their progress through modules. A student needing more support might move from an online physics simulation to a one-on-one tutoring session, then to hands-on robotics lab time. Another student who has already mastered certain skills might go straight from the online module to an independent project designing a prototype. The individual rotation paths are dynamic and updated depending on real-time data gathered from online activities and teacher observations.

Table 1: A Comparative Table; Blended Learning vs Traditional and Online Learning

S/N	Aspect	Traditional Learning	Online Learning	Blended Learning
1	*Learning Environment*	Physical classroom only	Virtual platform only	Combination of physical and virtual environments
2	*Flexibility*	Fixed schedule and location	Highly flexible (anytime, anywhere)	Moderately flexible (self-paced and scheduled sessions)
3	*Student Engagement*	Often passive (lectures, notes)	Can be isolating if not interactive	High (interactive tools, simulations, discussions)
4	*Learning Style Support*	Limited (mostly auditory and visual)	Strong if well-designed	Strong (supports auditory, visual, and kinesthetic)
5	*Student Autonomy*	Low (teacher-led)	High (self-directed)	Medium to high (structured independence)
6	*Access to Resources*	Textbooks, notes	Vast, but may require strong digital skills	Broad access (textbooks + digital content)
7	*Teacher Role*	Content deliverer	Facilitator or guide	Facilitator and integrator of both modes
8	*Technology Requirement*	Minimal	High (reliable internet and devices)	Moderate (internet + periodic access to devices)
9	*Assessment Methods*	Exams, tests, assignments	Quizzes, online tests, forums	Mixed (projects, online & face-to-face assessments)
10	*Cost Implications*	Infrastructure and personnel-heavy	Lower infrastructure but high tech cost	Balance of infrastructure and digital investments
11	*Challenges*	Inflexibility, limited resources	Digital divide, motivation, cheating risks	Access issues, digital literacy, policy gaps

Each model offers a different mix of online and in-person components, and the *choice of a blended learning model depends on various factors,* including:

- The nature of the learning outcomes,
- The target audience,
- Available resources, and
- Logistical considerations

These models can be tailored to meet specific educational goals and student needs, providing a more dynamic and engaging learning environment.

5. INFLUENCE OF BLENDED LEARNING MODELS ON INSTRUCTIONAL STRATEGIES AND TEACHER ROLES

Blended learning models have significantly influenced instructional strategies and redefined teacher roles across educational levels. By integrating traditional face-to-face teaching with online learning components, these models foster dynamic, learner-centered environments that demand innovative pedagogical approaches and evolving professional identities for educators.

5.1. Influence on Instructional Strategies

Blended learning encourages a shift from passive, lecture-based instruction toward more active, student-centered strategies. In the **flipped classroom** model, for example, instructional content is delivered outside of the classroom via videos or digital readings, while in-class time is reserved for collaborative problem-solving, discussion, and formative assessment (Bergmann & Sams, 2012). This inversion of the traditional classroom structure enhances students' opportunities to engage with material at a deeper cognitive level.

Furthermore, blended models support **differentiated instruction** and **personalized learning**, as digital platforms provide real-time analytics on student performance. Teachers can use this data to modify lesson plans, tailor learning activities, and provide targeted interventions (Horn & Staker, 2015). Instruction becomes more responsive to individual learner needs, improving both engagement and outcomes.

The integration of **multimodal instructional resources** including videos, simulations, and interactive assessments also broadens pedagogical strategies. These tools allow educators to accommodate diverse learning styles, foster critical thinking, and reinforce concepts through various channels (Graham et al., 2019). As such, instructional design in blended learning environments becomes more modular, flexible, and outcome-focused.

Moreover, some models, such as **station rotation**, encourage the use of small-group instruction, independent practice, and digital exploration in a single class period. This promotes **active learning** and facilitates classroom differentiation, which is particularly beneficial in mixed-ability groups (Staker & Horn, 2012).

5.2. Influence on Teacher Roles

Blended learning also redefines the role of the teacher from a content expert to a **facilitator, guide, and learning architect**. Instead of delivering knowledge through direct instruction alone, teachers curate content, design interactive digital experiences, and support student autonomy.

This role shift requires teachers to develop competencies in digital literacy, instructional design, and learner support (Voogt et al., 2015).

In addition, teachers are increasingly required to manage both **physical and virtual learning environments**. This involves moderating online forums, providing timely feedback through learning management systems (LMSs), and ensuring that digital resources align with curricular goals (Trust & Whalen, 2020). The ability to orchestrate both synchronous and asynchronous interactions is critical for maximizing the potential of blended learning.

Teachers also take on roles as **coaches and mentors**, offering individualized support and motivation, especially in models like the **flex model**, where students work independently for much of the learning process. This evolution in role requires strong interpersonal skills, the ability to track student progress, and the flexibility to intervene when needed (Halverson et al., 2017).

Moreover, blended learning environments often encourage **collaborative teaching practices**. Teachers work more closely with colleagues, IT personnel, and instructional designers to co-create content and integrate technology effectively. This team-based approach aligns with the rise of **professional learning communities (PLCs)**, where educators engage in continuous improvement and shared responsibility for student success (DuFour & Fullan, 2013).

Blended learning models have transformed both instructional strategies and teacher roles by fostering personalized, active, and technology-enhanced learning environments. These models challenge educators to go beyond traditional teaching methods, embracing roles as facilitators, designers, and mentors in both digital and physical spaces. As blended learning continues to shape 21st-century education, sustained professional development and institutional support will be critical in helping teachers adapt to these new demands.

6. BENEFITS OF BLENDED LEARNING

Blended learning, which integrates face-to-face instruction with online components, provides a transformative approach to education that meets the needs of today's diverse learners and teaching environments.

One of its core strengths is the *flexibility it offers.* Students can access course materials anytime, allowing them to study at their own pace and according to their schedules. This is especially helpful for learners juggling education with work, family responsibilities, or other commitments, as it reduces the rigidity of fixed class times.

In addition to flexibility, *student engagement is greatly enhanced* through the use of interactive tools and multimedia resources. Teachers can enrich traditional instruction with videos, quizzes, virtual labs, discussion forums, and simulations, which make lessons more dynamic and tailored to various learning styles. This multimodal approach ensures that learners remain actively involved rather than passive recipients of information.

Blended learning also fosters *greater learner independence and responsibility*. As students take control of online tasks and manage their own time, they develop essential life skills such as self-discipline, goal setting, and time management. This not only prepares them for academic success but also for the demands of the modern workplace.

Another key benefit is *personalized learning*. Online platforms often adapt to a student's performance, offering tailored content that addresses individual strengths and weaknesses.

Learners can revisit challenging material or advance through topics more quickly, ensuring that no one is held back or left behind. This adaptability promotes inclusivity and equity in education. Moreover, blended learning expands *access to diverse learning resources.* Students are no longer limited to physical textbooks but can tap into a wide array of digital content ranging from scholarly articles and podcasts to interactive simulations available 24/7. This widens their exposure to different perspectives and encourages deeper learning.

The model also encourages *collaborative learning,* even outside the classroom. With tools such as online forums, shared documents, and group messaging platforms, students can work together across time and space. This promotes teamwork, communication, and a sense of community particularly valuable in large or distributed classes.

Lastly, engaging with content through multiple formats (listening, watching, discussing, and applying) leads to *improved retention and application of knowledge.* Students reinforce concepts through various activities, which enhances their ability to recall and use what they've learned in real-world settings (Halverson & Graham, 2022).

7. CHALLENGES OF BLENDED LEARNING IN KENYA

Despite its many advantages, implementing blended learning in Kenya presents significant obstacles, particularly in regions where infrastructure, digital access, and educational readiness are unevenly distributed as summarized in Figure 4.

- limited access to digital technology
- high cost of internet and digital devices
- Inadequate infrastructure
- Digital literacy gaps Resistance
- curriculum designed predominantly for traditional instruction
- Resistance to change
- deepening educational inequality
- Policy and governance gaps
- low self-motivation and poor time management
- assessment and evaluation in digital environments

Figure 4: Challenges of Blended Learning in Kenya

One of the challenges is *limited access to digital technology.* In many rural communities, both students and educators lack reliable electricity, computers, and internet connectivity. This digital gap can be narrowed through public-private initiatives, such as expanding the Digital Literacy Programme (DLP), subsidizing devices, and establishing solar-powered community learning centers equipped with shared digital tools.

Similarly, a *high cost of internet and digital devices is a significant obstacle*, which places a financial strain on many households. Government intervention is essential here through zero-rated educational platforms developed in partnership with internet service providers, tax relief on

educational tech, and the promotion of offline-capable learning apps like Eneza Education and eLimu that function with minimal connectivity.

Another pressing challenge is *inadequate infrastructure.* Many schools, especially in rural areas, lack stable electricity, internet access, and basic ICT facilities. To address this, investments must prioritize foundational infrastructure such as solar energy and satellite internet hubs before rolling out more advanced digital learning strategies.

Digital literacy gaps further hinder the effective use of blended learning. Many teachers and students are unfamiliar with digital tools or online pedagogy. Continuous professional development for teachers, integration of ICT skills in the school curriculum, and mentorship programs pairing digitally proficient teachers with novices are all essential to building capacity.

The *curriculum itself is a limiting factor,* having been designed primarily for traditional instruction. Reviewing it to incorporate digital activities, assessments, and blended modules especially within the Competency-Based Education is vital. Equally important is the development of *localized, culturally relevant online content* in multiple languages to enhance inclusivity.

Resistance to change is another hurdle. Skepticism from educators, students, and parents can slow adoption. Building trust through success stories, training programs, and gradual introduction of blended practices can foster acceptance. Involving parents especially in rural areas through workshops and digital literacy initiatives ensures that learners are supported at home.

Blended learning also risks *deepening educational inequality.* Without intentional planning, students from well-resourced areas may benefit more than those from marginalized communities. A more equitable approach includes deploying a range of delivery modes radio, TV, SMS, and print materials to supplement online resources, ensuring broad accessibility regardless of economic status.

Policy and governance gaps have further hampered progress. Kenya currently lacks a comprehensive national framework for blended learning. Crafting a clear policy complete with implementation strategies, measurable outcomes, and monitoring systems is crucial to guide future investments and maintain accountability.

On the learner side, *low self-motivation and poor time management* present serious challenges. Without structured schedules and face-to-face accountability, some students struggle to stay focused. To mitigate this, blended programs should provide clear routines, regular teacher engagement, and gamified content that sustains interest and motivation.

Finally, *assessment and evaluation in digital environments* remains difficult. Traditional exams are poorly suited to online settings, where cheating and monitoring are concerns. Educators should instead use authentic assessment methods like digital portfolios, group projects, and oral presentations alongside simple, cost-effective proctoring tools. Training teachers in e-assessment design will further support valid, credible evaluation practices (Sele et al., 2023).

8. RECOMMENDATIONS

Based on the findings and conclusions of this systematic literature review, the following recommendations are proposed to enhance the adoption and effectiveness of blended learning models in the Kenyan educational settings:

i. Investment in Digital Infrastructure

The success of blended learning is inherently tied to the availability of reliable technological infrastructure. Therefore, it is recommended that the Kenyan government and private sector invest significantly in both hardware (computers, tablets, and smartphones) and software (learning management systems and content platforms). Moreover, broadband internet access should be prioritized in rural areas to ensure equitable access for all learners. Partnering with telecommunications companies to provide affordable data bundles or even zero-rated educational content could alleviate one of the most significant barriers to blended learning in the country.

ii. Teacher Training and Professional Development

A key challenge identified in the review is insufficient digital literacy among educators. Teachers must be equipped with both the technical skills to use digital tools effectively and the pedagogical skills to blend online and face-to-face instruction seamlessly. Therefore, continuous teacher training programs should be implemented at both pre-service and in-service levels. These programs should emphasize blended teaching strategies, the integration of ICT into lesson planning, and the management of online classrooms. Partnerships with education technology providers and universities could facilitate this professional development.

iii. Curriculum Redesign to Support Blended Learning

The Competency-Based Curriculum (CBC), should be further adapted to accommodate blended learning approaches. This adaptation should focus on ensuring that digital literacy is a core component of the curriculum, preparing learners to use technology effectively both in and outside the classroom. Additionally, curriculum designers should collaborate with content creators to develop locally relevant, culturally appropriate online resources that align with the learning needs and contexts of Kenyan students.

iv. Community Engagement and Awareness Campaigns

For blended learning to be widely accepted, especially in rural and marginalized communities, awareness campaigns are necessary to inform parents, students, and local leaders about the benefits and potential of blended learning. These campaigns should aim to reduce resistance to technological adoption and foster an understanding of how blended learning can enhance educational outcomes. Community-based initiatives could also offer opportunities for parents to receive digital literacy training, enabling them to better support their children's learning at home, which is in line with parental empowerment and engagement as envisaged in the Competency-Based Curriculum (CBC). Parents play a critical role in supporting students, especially in online components of blended learning. Schools should actively engage parents through orientation sessions, communication platforms, and regular updates to foster a strong home-school partnership.

v. Development of Localized Content and Platforms

A major limitation in the successful deployment of blended learning models is the scarcity of local content that resonates with the learners' cultural context. It is recommended that educational authorities, in collaboration with local content creators, develop Kenyan-specific learning materials that are both educationally rigorous and culturally relevant. Additionally, online platforms should be designed with offline capabilities, ensuring that

students in areas with poor internet connectivity can still access educational resources without relying on continuous online access.

vi.   Policy Support and Funding

The Kenyan government should play a central role in facilitating the large-scale adoption of blended learning by providing clear policies that promote its integration into the national education system. This could include subsidizing educational technology, implementing tax breaks for technology providers, and setting up funding mechanisms to support the development of digital learning content. Public-private partnerships should be encouraged to ensure that blended learning is sustainable and scalable in both urban and rural areas.

vii.   Monitoring and Evaluation Systems

To ensure that blended learning models are effectively implemented and achieving the desired outcomes, it is critical to establish monitoring and evaluation (M&E) systems. These systems should track progress, identify challenges, and evaluate the effectiveness of different models of blended learning. Key performance indicators (KPIs) could include student engagement levels, academic performance, teacher satisfaction, and technological adoption rates. Regular feedback from students and educators should inform adjustments to teaching methods and tools.

viii.   Encouraging Partnerships with International Organizations

Kenya should seek to collaborate with international organizations, such as UNESCO, the World Bank, and Ed-tech firms, to benefit from expertise, funding, and innovative technologies. These partnerships can bring in much-needed external knowledge and financial support for large-scale digital education projects.

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