
Developing a Campus Blended Learning Framework to Improve Adoption in Higher Educational Institutions in Southwestern Uganda**Developing a Campus Blended Learning Framework to Improve Adoption in Higher Educational Institutions in Southwestern Uganda****Kabarungi Moreen¹, Ntwari Richard², Annabella Habinka Ejiri², Kawuma Simon³**
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Abstract

Despite the potential benefits of blended learning in higher education, adoption rates in Ugandan universities remain critically low at 29.1%, with significant barriers including inadequate infrastructure, limited institutional support, and mental health challenges affecting both educators and students. This study aimed to develop a Campus Blended Learning Framework (CBLF) to improve blended learning adoption in higher educational institutions in southwestern Uganda.

A Design Science Research methodology was employed, incorporating both quantitative and qualitative approaches. Data were collected from three universities: Mbarara University of Science and Technology (MUST), Bishop Stuart University (BSU), and Kabale University (KAB). A total of 1,495 participants (1,051 students and 444 staff members) were surveyed using structured questionnaires based on the Complex Adaptive Blended Learning Framework (CABLF). Ten experts participated in qualitative interviews to evaluate the framework's usability and acceptability.

The study identified six critical components for effective blended learning adoption: pedagogy, infrastructure, content, assessment, support, and mental health. Mental health emerged as a significant factor influencing all other components. The proposed CBLF integrates these elements while addressing the unique contextual challenges of developing countries.

The Campus Blended Learning Framework provides a comprehensive approach to addressing low adoption rates of blended learning in southwestern Uganda's higher educational institutions. The framework's emphasis on mental health support and contextual adaptation makes it particularly suitable for developing country contexts.

A. Introduction

The integration of Information and Communication Technologies (ICTs) has redefined teaching and learning in higher education, leading to a paradigm shift in pedagogical practice globally. Blended learning, which strategically merges face-to-face (F2F) instruction with technology-mediated delivery, has emerged as a key pedagogical strategy for enhancing accessibility, flexibility, and student outcomes [9], [19], [20]. A strong body of literature highlights its potential to individualize learning and expand educational opportunities beyond the physical classroom. However, much of this evidence comes from developed contexts where infrastructure and institutional capacities are well established. Scholars consistently note that adoption in sub-Saharan Africa remains significantly lower, reflecting persistent challenges that extend beyond pedagogy to systemic resource and policy constraints [7]. This divergence highlights a critical gap between global discourse and local realities, making it necessary to interrogate blended learning within resource-constrained environments.

1. Background and Rationale

Uganda exemplifies this disparity, with adoption rates in higher education lagging behind global averages. [1] reports an adoption rate of only 29.1%, despite large-scale government investments such as the National Data Transmission Backbone Infrastructure, aimed at expanding fiber-optic connectivity. Yet empirical findings reveal that access to infrastructure does not automatically translate into sustained adoption. [6] that although 43% of users initially adopted blended learning systems, a quarter eventually discontinued use, underscoring weak retention. This aligns with broader evidence suggesting that technological provision without adequate institutional and user support often leads to discontinuity. Interestingly, while infrastructural expansion has been prioritized in policy, limited attention has been paid to sustainability and user engagement. This imbalance suggests a policy–practice gap: government strategies emphasize technology deployment, but institutions struggle to translate access into pedagogical transformation.

Barriers to adoption in Uganda are multifaceted, combining technical, institutional, and psychosocial dimensions. [16] point to limited institutional support, inadequate faculty training, and fragile technology ecosystems as primary barriers. However, [5] highlights a less commonly addressed dimension: mental health. Mental health challenges manifesting in absenteeism, reduced concentration, and diminished performance are shown to directly undermine blended learning effectiveness. This contrasts with most existing studies, which predominantly focus on infrastructure and training. Importantly, the self-directed nature of blended learning can exacerbate stress and anxiety, particularly in contexts where digital literacy and psychosocial support systems are weak. The neglect of mental health in blended learning research in Africa reveals a significant conceptual gap: while adoption models frequently emphasize technology and pedagogy, they often ignore the human factors that shape learning outcomes. Addressing this gap is essential for developing holistic frameworks that foster equitable and sustainable adoption.

Global frameworks such as the Complex Adaptive Blended Learning Framework (CABLF) and the Community of Inquiry (CoI) model provide useful conceptual guidance but reflect assumptions grounded in developed contexts [7]. These frameworks emphasize pedagogical design, collaboration, and adaptability but presuppose baseline conditions such as stable internet connectivity, adequate institutional funding, and high digital literacy. Evidence from sub-Saharan Africa suggests that these assumptions do not hold in low-resource contexts, resulting in partial or failed implementations. For instance, while CABLF highlights adaptability, it does not account for resource scarcity or cultural dynamics that may shape adoption in Uganda. The misalignment between global models and local realities underscores a recurring challenge in educational technology research: the uncritical transfer of frameworks across contexts. This highlights a gap not only in practice but also in theory, suggesting that blended learning scholarship requires more context-sensitive approaches.

In response to these gaps, this study proposes the Campus Blended Learning Framework (CBLF), specifically tailored to the realities of southwestern Uganda. The framework is grounded in empirical investigation of three universities namely, Mbarara University of Science and Technology (MUST), Bishop Stuart University (BSU), and Kabale University (KAB), which serve as pioneers in adopting blended learning. Unlike imported models, the CBLF integrates infrastructural, institutional, and psychosocial dimensions, placing equal emphasis on technological provision, faculty capacity-building, and student well-being. By foregrounding mental health and sustainability, the framework addresses dimensions often overlooked in existing models. Furthermore, by incorporating insights from both public and private universities, the study ensures diversity in institutional contexts, increasing the framework's applicability. Ultimately, the CBLF is positioned not merely as a localized intervention but as a scalable, context-sensitive model that can inform higher education practices across other low-resource regions. Its development contributes both theoretically by advancing context-driven models, and practically by offering institutions actionable strategies to overcome adoption barriers.

B. Literature Review

2.1 Blended Learning in Higher Education

Blended learning has increasingly been recognized as a pedagogical model that combines the strengths of traditional face-to-face instruction with the flexibility of online learning. According to [8], an effective model integrates approximately 30% face-to-face interaction with 70% information technology-mediated learning, suggesting that digital platforms should serve as the dominant delivery mode. This structure is argued to create accessible, engaging, and adaptable learning experiences that transcend the limitations of either format in isolation. Historically, the dominance of face-to-face instruction was challenged in the 1990s with the rise of online education, initially framed as a cost-effective solution capable of scaling to unlimited learners [14]. Yet, expectations that online learning would fully replace classroom teaching proved unrealistic, as digital

environments often reproduced passive learning styles rather than fostering interaction. This historical trajectory highlights a critical synthesis: blended learning emerged as a corrective response, balancing digital scalability with pedagogical engagement. It thus occupies a “middle ground,” reflecting both continuity with traditional education and innovation through digital integration.

2.2 Global Adoption of Blended Learning

Globally, blended learning has gained traction as institutions recognize its potential to enhance educational access and quality. In the United States, for example, nearly seven million higher education students (35.6%) were enrolled in distance learning courses by 2018, with around 18% taking at least one fully online course [4]. This reflects a clear shift toward hybrid models where technology supplements traditional instruction. Similarly, Malaysia has emerged as a leader in Asia, with institutions such as UNITAR and Open University of Malaysia establishing mature blended learning systems [11]. In Europe, policy-driven adoption is evident in the Welsh Government’s strategic framework, which emphasizes synchronous and asynchronous models designed to promote collaboration and peer learning [13]. While contexts differ, a common pattern emerges: successful adoption is supported by institutional strategies, government policies, and robust digital ecosystems. However, critical analysis reveals a divergence: while developed nations have institutionalized blended learning, many developing countries remain constrained by weak infrastructure and fragmented support systems, limiting comparable success.

2.3 Blended Learning in the African Context

Across Africa, blended learning adoption has been uneven, with progress hampered by infrastructural deficits, financial constraints, and cultural dynamics. Despite these barriers, studies emphasize its transformative potential to expand access and reduce inequities in higher education. [2] note that integrating ICT tools with traditional teaching offers flexible pathways to learning that can address diverse student needs in resource-constrained contexts. In East Africa, governments and institutions increasingly view blended learning as a strategic response to regional challenges, particularly overcrowded classrooms, inadequate teaching staff, and high student demand. Adoption studies suggest that blended learning can mitigate these pressures by leveraging digital tools for scalability while maintaining elements of personal interaction [2]. However, synthesis across the literature reveals a gap: while most studies highlight potential benefits, there is limited empirical evidence on sustained adoption, user experiences, and long-term outcomes in African universities. This absence of robust evaluation constrains the generalizability of claims about effectiveness across the continent.

2.4 Blended Learning in Uganda

In Uganda, blended learning adoption has been gradual but accelerated significantly during the COVID-19 pandemic, which disrupted traditional teaching and necessitated digital alternatives. [6] identified blended learning as a viable approach for higher education institutions to overcome resource constraints and infrastructure limitations. Beyond universities, its utility has extended into

secondary and primary education, where [12] demonstrated positive impacts on both student performance and teacher effectiveness. These findings suggest that blended learning is not merely a stop-gap measure but a tool for systemic reform across educational levels. In southwestern Uganda, [4] examined teacher professional development, highlighting the value of integrating online resources with face-to-face training to strengthen pedagogical capacity. Yet, critical synthesis indicates that while Uganda has promising initiatives, adoption remains fragmented, lacking a coherent national framework. Moreover, most studies emphasize short-term gains rather than institutional sustainability, leaving unanswered questions about scalability, inclusivity, and long-term impact.

2.5 Factors Influencing Blended Learning Adoption

Several factors influence the successful adoption of blended learning in higher educational institutions:

2.5.1 Technology Infrastructure

Technology infrastructure constitutes the backbone of successful blended learning adoption, as it provides the necessary platforms, connectivity, and tools for delivery. Core elements include reliable internet access, robust learning management systems (LMSs), and appropriate hardware and software resources [15]. In contexts where infrastructure is adequately developed, blended learning thrives by supporting seamless interaction and access to diverse digital resources. However, in many developing regions, inconsistent internet connectivity and limited availability of digital devices remain pervasive obstacles, constraining equitable access. Comparative studies show that while infrastructure is frequently prioritized in policy discussions, actual institutional investments often fall short, leaving significant disparities between urban and rural institutions. Furthermore, existing research tends to emphasize infrastructure provision but pays less attention to its sustainability and integration into pedagogical practices. This reveals a key gap: without aligning infrastructure development with user capacity-building and pedagogical strategies, technology alone cannot guarantee adoption. Thus, infrastructure must be conceptualized as a necessary but insufficient factor in driving blended learning success.

2.5.2 Pedagogical Considerations

Beyond infrastructure, pedagogy determines the quality and effectiveness of blended learning experiences. [10] emphasizes that successful models require learner-centered instructional designs that integrate online and face-to-face activities in alignment with learning objectives. This approach fosters active engagement, collaboration, and critical thinking rather than replicating passive knowledge transfer. Evidence from global studies demonstrates that when pedagogy is adapted to blended environments, student satisfaction and achievement improve. Yet, in many institutions, blended learning is often reduced to a simple digitization of lecture notes or the uploading of content onto learning platforms, resulting in superficial implementation. This tendency suggests a lack of pedagogical innovation and limited training for instructors on designing meaningful digital learning activities. Furthermore, there is little empirical research from African contexts on how pedagogical frameworks are adapted to

local cultural and institutional realities. The literature thus reveals a gap: while pedagogical principles are well articulated globally, their localized operationalization in low-resource contexts remains underexplored, limiting their transformative potential.

2.5.3 Student Factors

Students play a decisive role in shaping blended learning outcomes, as adoption depends heavily on their skills, attitudes, and personal circumstances. Key factors influencing success include ICT literacy, self-regulation, attitudes toward technology, time management, and the presence of family or peer support networks [3]. In contexts where students demonstrate high digital competence and motivation, blended learning fosters autonomy and deeper engagement. However, disparities in ICT access and skill levels often exacerbate inequalities, with digitally disadvantaged students struggling to keep pace. In addition, blended learning demands higher self-discipline and task management skills than traditional classroom settings, which can become overwhelming for some learners. Although several studies acknowledge these issues, most tend to focus narrowly on technological literacy while underexploring the psychosocial and cultural factors such as family obligations or peer influences that shape student participation. This signals a conceptual gap: student-related factors should be examined holistically, integrating both technical competence and broader social-psychological conditions.

2.5.4 Mental Health Impact

Mental health has emerged as a critical but often underexamined determinant of blended learning success. Students facing psychological challenges may encounter difficulties with concentration, stress management, and motivation, all of which hinder their ability to engage effectively in technology-mediated environments [5]. Blended learning often requires heightened self-regulation and autonomy, which can amplify stress for individuals struggling with anxiety or depression. Empirical evidence links poor mental health with lower academic achievement, absenteeism, and higher dropout rates, yet its intersection with blended learning adoption remains insufficiently studied, particularly in African contexts. Current research predominantly highlights infrastructural or pedagogical barriers, marginalizing mental health as a peripheral issue rather than a central determinant. This oversight limits the comprehensiveness of existing adoption frameworks. Critically, without supportive structures such as counseling services or peer support systems, blended learning may inadvertently widen educational inequities. Thus, integrating mental health considerations into adoption models is essential for creating inclusive and sustainable blended learning environments.

2.6 Existing Frameworks and Models

Several theoretical frameworks have been developed to guide blended learning implementation:

2.6.1 Complex Adaptive Blended Learning Framework (CABLF)

The Complex Adaptive Blended Learning Framework (CABLF), introduced by [23] conceptualizes blended learning as a dynamic system centered on the

learner while integrating six interrelated components: learner, teacher, technology, content, learning support, and institution. This model acknowledges that successful blended learning requires constant interaction and adaptation across these domains. Empirical studies applying CABLF demonstrate its value in highlighting interdependencies; for instance, technology adoption cannot be isolated from institutional support or pedagogical design. However, critical analysis reveals that CABLF was primarily developed in technologically advanced contexts, where institutional readiness and infrastructure were largely assumed. In low-resource settings, where these baseline conditions are absent, the framework may lack explanatory power. Furthermore, CABLF tends to emphasize systemic interactions at the expense of individual-level factors such as mental health or socio-cultural influences, which are highly relevant in African contexts. Thus, while CABLF provides a robust macro-level perspective, its application in Uganda requires contextual adaptation to address overlooked human and cultural dimensions.

2.6.2 Community of Inquiry (CoI) Framework

The Community of Inquiry (CoI) framework, developed by [18], conceptualizes blended learning through the interplay of three presences: cognitive, teaching, and social. At its core, CoI posits that meaningful educational experiences emerge from the convergence of critical thinking, instructional guidance, and interpersonal interaction. The framework has been widely adopted in global higher education contexts, with evidence showing its effectiveness in fostering deep learning and collaborative engagement. However, critiques note that CoI presupposes a baseline of technological fluency and stable internet connectivity to sustain community interaction, assumptions not always applicable in developing countries. Moreover, while CoI effectively captures relational and pedagogical dynamics, it pays limited attention to institutional, infrastructural, and psychological barriers that shape blended learning adoption. In African contexts, where structural constraints and mental health challenges significantly affect participation, CoI may inadequately capture the full spectrum of adoption factors. Thus, while valuable for its pedagogical lens, CoI requires supplementation with models that foreground contextual and systemic challenges.

2.6.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT), developed by [24], offers a predictive model of technology adoption based on four constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. UTAUT2 later extended the model to include hedonic motivation, price value, and habit [25]. Empirical research demonstrates its robustness in explaining individual technology adoption behaviors across diverse domains. Its predictive strength makes it particularly useful for analyzing initial adoption decisions. However, critiques argue that UTAUT tends to oversimplify adoption by focusing primarily on user perceptions while underemphasizing broader institutional and cultural dynamics. In blended learning contexts, this is especially limiting because adoption depends not only on individual acceptance but also on systemic support, pedagogical alignment, and psychosocial well-being.

Furthermore, UTAUT pays minimal attention to retention and sustainability of use critical challenges observed in Uganda where discontinuation rates remain high. Consequently, while UTAUT is useful for micro-level analysis, it requires integration with broader frameworks to capture the complexity of blended learning adoption in low-resource environments.

2.7 Research Gaps

Despite the existence of various frameworks, several gaps remain:

1. Most existing frameworks were developed for and tested in developed country contexts, potentially limiting their applicability in developing countries like Uganda.
2. Limited consideration of mental health factors in existing frameworks, despite evidence of their significant impact on learning outcomes.
3. Insufficient attention to contextual factors specific to African educational environments.
4. Lack of comprehensive frameworks that integrate all stakeholders (students, instructors, administrators) effectively.

C. Methodology

1. Research Design

This study employed a Design Science Research (DSR) methodology, a solution-oriented approach that emphasizes the creation of novel artifacts to address practical problems in complex environments. Guided by the five-phase model proposed by [21], the research progressed through stages of problem awareness, solution suggestion, artifact development, artifact evaluation, and conclusion. DSR was particularly suitable for this study because the challenge of blended learning adoption in Ugandan higher education requires not only theoretical insights but also the design of actionable solutions tailored to institutional contexts. Furthermore, a pragmatic research philosophy underpinned the study, privileging practical outcomes and enabling the integration of both quantitative and qualitative methods. Pragmatism was considered the most appropriate stance because it accommodates methodological flexibility while ensuring that findings are both theoretically defensible and practically applicable in guiding educational reforms.

2 Study Setting

The research was conducted in three universities located in southwestern Uganda, namely Mbarara University of Science and Technology (MUST), Bishop Stuart University (BSU), and Kabale University (KAB). These institutions were purposively selected because of their pioneering efforts in adopting blended learning and their comparable academic profiles. All three universities are accredited by the National Council for Higher Education and offer similar undergraduate programs, particularly within the fields of science, education, and social sciences. Their selection ensured that the study context was both representative of higher education in Uganda and sufficiently diverse to capture institutional variations in the implementation of blended learning. By focusing on these institutions, the study was able to assess adoption processes in settings that

are not only resource-constrained but also strategically positioned to drive regional innovations in teaching and learning.

3. Study Population and Sampling

The study population comprised students, lecturers, and administrators from the three selected universities. Together, these groups represented both the primary users and the institutional decision-makers influencing blended learning adoption. In total, the population included 12,393 students and 726 staff members across the institutions. To ensure that the findings were statistically reliable and generalizable, sample sizes were calculated using the Krejcie and Morgan (1970) formula. The computation produced sample targets of 1,051 students and 444 staff members, distributed proportionally across the three universities to reflect institutional sizes (MUST: 521 respondents, BSU: 486 respondents, KAB: 488 respondents). This sampling strategy captured a broad cross-section of perspectives, ensuring that both learner and staff experiences were adequately represented. The inclusion of administrators was critical, as their strategic and managerial roles shape the institutional frameworks within which blended learning systems operate.

4. Inclusion and Exclusion Criteria

Clear inclusion and exclusion criteria guided participant recruitment. Eligible participants were those aged 18 years and above who consented to participate, and who had direct experience with both online and face-to-face learning components. Specifically, the study focused on undergraduate students, lecturers responsible for teaching undergraduate courses, and administrators directly involved in blended learning planning or management. These criteria ensured that participants could provide relevant insights into blended learning adoption and its associated challenges. Exclusion criteria applied to individuals under 18 years of age, those unwilling to provide consent, and those lacking experience with blended learning modalities. Universities outside the defined study scope were not considered. Such careful delimitation of participants enhanced the internal validity of the findings by ensuring alignment between the research objectives and the lived experiences of the study respondents.

5. Data Collection

A mixed-methods approach was adopted to generate both quantitative breadth and qualitative depth. Quantitative data were collected using a semi-structured questionnaire developed around the Complex Adaptive Blended Learning Framework (CABLF) but expanded to incorporate mental health-related factors, reflecting the unique contextual considerations of the Ugandan higher education environment. The questionnaire was divided into three sections: demographic characteristics, requirements for blended learning framework design, and items assessing mental health-related influences on learning and adoption. Both closed and open-ended questions were included, with the latter enabling participants to provide nuanced responses beyond fixed categories. Data collection was voluntary and anonymous, minimizing potential response bias and ensuring participant comfort.

Complementing the surveys, qualitative data were gathered through in-depth interviews with purposively selected experts drawn from the three institutions. A total of ten participants (MUST: four, BSU: three, KAB: three) were interviewed. These experts were selected because of their direct involvement in blended learning planning, implementation, or evaluation, and their professional expertise in either instructional design, ICT integration, or educational management. Interview sessions lasted between 45 and 60 minutes and were conducted in environments that allowed for privacy and focus. Guided by an interview protocol, the discussions probed perceptions of framework usability, system quality, and information quality. With participant consent, all sessions were audio recorded and later transcribed verbatim to ensure accuracy in capturing perspectives.

6. Data Analysis

Data analysis followed a two-pronged strategy aligned with the mixed-methods design. Quantitative data were initially entered into Epi-Info 7 for validation before being exported to SPSS for detailed analysis. At the univariate level, descriptive statistics such as frequencies, percentages, and distributions were used to summarize participant characteristics and responses. At the bivariate level, cross-tabulations and chi-square tests were conducted to explore potential associations between variables such as institutional support, mental health status, and adoption levels of blended learning. These analyses enabled the identification of statistically significant patterns that informed the framework design.

For qualitative data, content analysis was employed to extract meaningful patterns and themes from interview transcripts. Thematic coding was applied systematically, with data reduction ensuring that the analysis remained focused on the research objectives. Emerging themes included the alignment of blended learning with institutional goals, challenges related to technology infrastructure, and the impact of student mental health on adoption sustainability. Triangulation with quantitative findings strengthened the validity of results, allowing for richer interpretation and the integration of multiple data sources. This approach not only highlighted measurable adoption rates but also explained the underlying human and organizational dynamics influencing those rates.

7. Data Quality Control

Robust measures were put in place to assure the quality of the data. Internal validity was reinforced through pre-testing of the questionnaire among a population with similar characteristics to the study participants, enabling refinement of items for clarity and relevance. External validity was enhanced by correlating the study findings with existing empirical evidence from both regional and international research on blended learning. Reliability was strengthened through pilot testing of the questionnaire, triangulation of methods, and expert review of all instruments prior to field deployment. These measures collectively enhanced the trustworthiness of the study outcomes, ensuring that findings could be considered both credible and transferable to similar contexts.

8. Ethical Considerations

The study adhered strictly to ethical principles governing research involving human participants. Ethical clearance was obtained from the National Council of Science and Technology (NCST) as well as from the Research Ethics Committee (REC) at Mbarara University of Science and Technology. Before data collection, participants were fully informed about the study objectives, procedures, and potential benefits. Informed consent was obtained in writing, with assurances provided that participation was voluntary and that individuals could withdraw at any point without consequence. To safeguard confidentiality, responses were anonymized, and all data were securely stored in password-protected systems. These measures ensured that participant rights and dignity were upheld throughout the research process, aligning with both national and international standards for ethical research practice.

By combining a Design Science Research methodology with a pragmatic philosophical orientation, this study ensured both methodological rigor and contextual relevance. The purposive selection of universities in southwestern Uganda provided an appropriate setting where blended learning challenges could be observed in real-world conditions, while the inclusion of diverse stakeholders students, lecturers, and administrators enabled the capture of multiple perspectives influencing adoption. The integration of quantitative surveys with qualitative interviews created a robust mixed-methods design, where statistical patterns were triangulated with experiential insights to generate deeper understanding. Measures to assure validity, reliability, and ethical compliance further enhanced the credibility and transferability of findings. Collectively, these methodological choices positioned the study to not only design a novel context-sensitive framework for blended learning adoption but also to contribute meaningfully to global scholarship on educational innovation in resource-constrained environments.

D. Results and Discussion

1. Demographics

The study involved 1,495 participants across three purposively selected universities in southwestern Uganda. Institutional representation was well distributed, with slightly higher participation from Mbarara University of Science and Technology (MUST, 35.2%), followed by Kabale University (KAB, 32.7%) and Bishop Stuart University (BSU, 32.1%). Gender distribution was relatively balanced (52.3% male, 47.7% female), and the majority of participants (67.8%) were aged 18–25, reflecting typical undergraduate demographics. This balanced representation was critical in capturing diverse perspectives across learners, instructors, and administrators, all of whom play interdependent roles in blended learning adoption. By engaging stakeholders across gender, age, and institutional contexts, the study ensured that the resulting framework would be broadly applicable and sensitive to the realities of higher education in the region.

2. Blended Learning Adoption

Analysis of the current state of blended learning adoption revealed that while all three universities had implemented blended learning components,

adoption rates varied substantially. MUST reported the highest adoption at 67%, followed by KAB at 58% and BSU at 51%. Despite these initial adoption rates, sustained usage remained a significant challenge, with 34% of early adopters discontinuing use within the first academic year. This discontinuation was attributed to limited institutional support, infrastructure constraints, and stress or fatigue associated with navigating online and face-to-face learning concurrently. These findings underscore that adoption is not solely a matter of implementing technology but requires a holistic approach encompassing pedagogy, infrastructure, support, and the psychosocial well-being of stakeholders. The results align with previous studies highlighting the vulnerability of blended learning initiatives in low-resource contexts without comprehensive support systems.

3. Critical Framework Components

Through quantitative and qualitative analyses, six interdependent components were identified as critical for effective blended learning adoption. Pedagogy emerged as a leading determinant ($\beta = 0.312$, $p < 0.01$), emphasizing learner-centered strategies, active engagement, personalized pathways, and alignment with clear objectives. Infrastructure ($\beta = 0.287$, $p < 0.01$) was equally vital, highlighting the need for reliable internet connectivity, adequate hardware, robust learning management systems, and technical support. Content quality and relevance ($\beta = 0.276$, $p < 0.01$) also influenced adoption, with stakeholders calling for engaging multimedia materials, culturally relevant resources, frequent updates, and multi-format accessibility. Assessment strategies ($\beta = 0.263$, $p < 0.01$) were necessary to integrate continuous, authentic, and timely feedback mechanisms, while institutional and student support systems ($\beta = 0.251$, $p < 0.01$) ensured professional development, administrative backing, and technical assistance. Notably, mental health ($\beta = 0.298$, $p < 0.01$) emerged as a cross-cutting factor, significantly influencing all other components. This finding underscores the unique contribution of the study, demonstrating that psychological well-being is foundational to sustainable blended learning adoption, a factor largely absent in prior models such as CABLF and CoI.

4. Campus Blended Learning Framework (CBLF)

Informed by these findings, the Campus Blended Learning Framework (CBLF) was developed as a comprehensive, context-sensitive model. The framework comprises six interconnected modules designed to address both systemic and human factors.

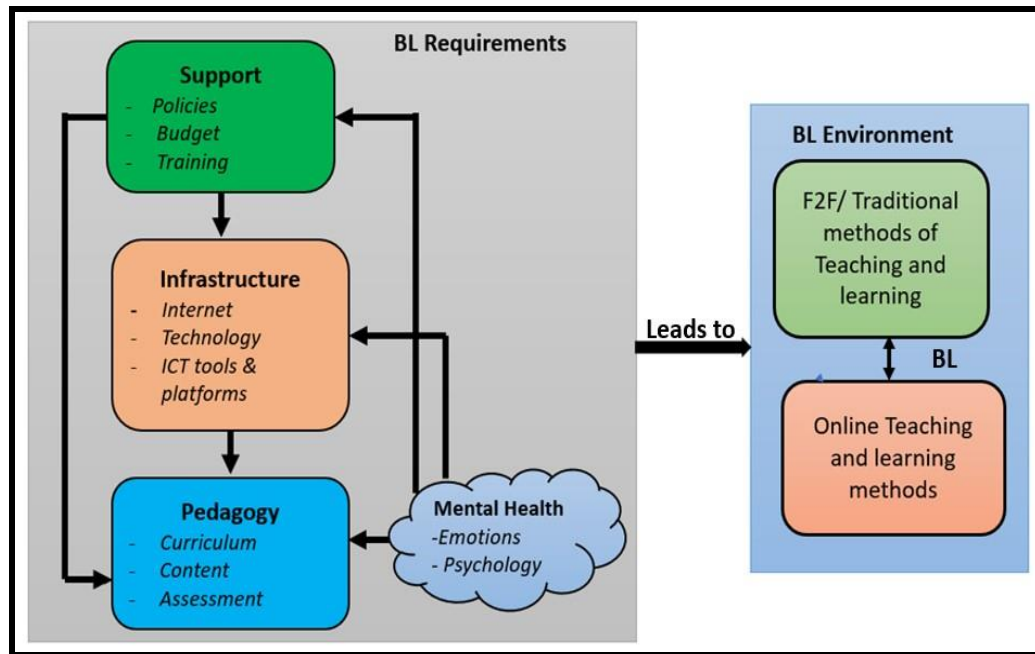


Figure 1. Campus blended learning framework (CBLF)

The pedagogy module promotes learner-centered teaching and enhanced instructor capabilities, while the infrastructure module ensures technological readiness and resource adequacy. The content module emphasizes engaging, culturally relevant, and accessible learning materials, and the assessment module integrates online and offline methods with continuous and authentic evaluation. The support module delivers technical, academic, and administrative assistance, and the mental health module explicitly addresses stress management, counseling, and awareness programs. By embedding mental health as a central concern, the CBLF advances beyond existing frameworks, aligning with empirical evidence showing that psychosocial factors significantly impact both adoption and sustained engagement.

5. Framework Evaluation

Evaluation of the framework demonstrated strong usability and high acceptability among stakeholders. Expert assessment using the System Usability Scale (SUS) yielded a mean score of 78.2 (SD = 8.4), indicating good usability, with reviewers highlighting the framework's comprehensiveness and contextual appropriateness for resource-constrained settings. Stakeholder acceptability was similarly high: 82% of students considered the framework relevant and practical, 79% of lecturers believed it would enhance teaching effectiveness, and 85% of administrators deemed it feasible for implementation within existing resources. These findings suggest that the CBLF not only reflects theoretical best practices but also resonates with the operational realities and perceptions of end-users, thereby increasing the likelihood of adoption and sustainability. Statistical analysis further highlighted the centrality of mental health in shaping blended learning outcomes. Significant positive correlations were observed between mental health and all framework components, including pedagogy ($r =$

0.412, $p < 0.01$), infrastructure ($r = 0.287$, $p < 0.01$), content ($r = 0.356$, $p < 0.01$), assessment ($r = 0.298$, $p < 0.01$), and support systems ($r = 0.445$, $p < 0.01$). These results confirm that psychological well-being directly influences learners' engagement, instructors' effectiveness, and the sustainability of technology-mediated interventions. By explicitly integrating mental health into the CBLF, the study addresses a critical gap in existing literature, which largely focuses on technological and pedagogical dimensions while overlooking psychosocial determinants.

Collectively, these findings demonstrate that the CBLF offers a holistic and actionable solution for enhancing blended learning adoption in southwestern Uganda. By combining six interrelated modules and foregrounding mental health, the framework addresses structural, instructional, and human factors that influence both uptake and sustained use. The study thereby contributes to theory by extending existing blended learning models to low-resource contexts, and to practice by providing a validated, contextually grounded tool for higher education institutions. Importantly, the integration of mental health considerations represents a novel contribution, highlighting the need for comprehensive strategies that simultaneously address pedagogical, technological, and psychosocial dimensions. Consequently, the CBLF holds promise not only for improving adoption rates from the current 29.1% but also for fostering more resilient, engaging, and supportive blended learning environments.

6. Discussion

This study successfully developed the Campus Blended Learning Framework (CBLF), a contextually grounded model designed to address the unique challenges faced by higher educational institutions in southwestern Uganda. The framework's six-component structure namely pedagogy, infrastructure, content, assessment, support, and mental health provides a comprehensive approach to enhancing blended learning adoption, which currently stands at a low 29.1% within the region. By integrating structural, instructional, and psychosocial dimensions, the CBLF not only improves adoption prospects but also ensures sustainability by addressing the root causes of discontinuation observed in early adopters. A particularly novel contribution of this study is the explicit integration of mental health considerations into the framework, filling a critical gap in blended learning research. Whereas existing models such as the Complex Adaptive Blended Learning Framework (CABLIF) and the Community of Inquiry (CoI) primarily focus on technological and pedagogical aspects, the CBLF acknowledges the pervasive influence of mental health on academic engagement, learning outcomes, and technology adoption [10].

The pedagogy component of the CBLF was strongly associated with blended learning adoption ($\beta = 0.312$, $p < 0.01$), confirming the centrality of learner-centered approaches. This aligns with prior research emphasizing that effective blended learning requires careful integration of face-to-face interaction and technology-mediated instruction to promote active, student-centered learning [16]. The framework's emphasis on active learning strategies, personalized learning paths, and alignment with clear learning objectives directly addresses the needs of Ugandan students, who exhibit diverse levels of digital literacy and prior

exposure to technology-enhanced education. By operationalizing pedagogical requirements in ways that accommodate these variations, the CBLF strengthens both engagement and learning outcomes.

Infrastructure also emerged as a significant determinant of adoption ($\beta = 0.287$, $p < 0.01$), corroborating prior findings highlighting the critical role of technology resources in developing country contexts [15]. Despite national-level investments such as Uganda's National Data Transmission Backbone Infrastructure, institutional-level infrastructure remains inadequate, creating persistent barriers to effective blended learning. The CBLF addresses these challenges by offering specific guidelines for infrastructure development within resource-constrained settings, including recommendations for reliable internet connectivity, adequate hardware provision, and access to technical support. By contextualizing infrastructure planning to the realities of developing country universities, the framework enhances feasibility and ensures that technological limitations do not impede pedagogical effectiveness.

A defining innovation of the CBLF is the integration of mental health support, which was strongly correlated with all other framework components (ranging from $r = 0.287$ to $r = 0.445$). This finding extends prior research indicating that positive mental health enhances motivation, engagement, and persistence in blended learning environments [22]. By explicitly including mental health resources such as stress management programs, counseling services, and awareness initiatives the framework addresses a critical but often overlooked determinant of adoption. This integration not only supports learners but also instructors and administrators, promoting an inclusive and psychologically safe environment that facilitates sustained engagement with blended learning systems. In terms of contextual appropriateness, the CBLF demonstrates clear advantages over existing international frameworks when applied to developing country settings. While CABLF and CoI were originally designed for well-resourced environments, the CBLF accounts for challenges that are particularly pronounced in Uganda, including limited financial resources, inadequate technology infrastructure, cultural and linguistic diversity, varying levels of digital literacy, and stigma surrounding mental health. By addressing these contextual factors, the framework ensures that strategies for blended learning adoption are realistic, culturally sensitive, and operationally feasible.

A comparative analysis with existing frameworks underscores the contributions of the CBLF. Compared to CABLF [23], the CBLF incorporates an explicit mental health module, provides more detailed assessment strategies, and directly addresses resource constraints specific to developing countries. In relation to the CoI framework [17], the CBLF expands the focus to include institutional and infrastructure considerations, involves all stakeholder groups students, instructors, and administrators and provides practical implementation guidance rather than solely conceptual constructs. When contrasted with UTAUT2 [25], the CBLF integrates pedagogical and content considerations, addresses broader contextual factors beyond individual technology adoption, and ensures comprehensive support mechanisms. Collectively, these comparisons highlight the CBLF's novelty, practical utility, and adaptability to resource-constrained environments.

The study's findings have multiple practical implications. For higher education institutions, the modular design of the CBLF provides actionable guidance for systematically assessing institutional readiness and identifying priority areas for improvement. Universities can leverage the framework to align pedagogical strategies, technology investments, and support services with specific institutional resources and student needs, thereby enhancing adoption rates and learning outcomes. For policymakers, the study emphasizes the necessity of including mental health support within national strategies for blended learning and educational technology integration. Policies targeting faculty and student well-being, in conjunction with infrastructure and training initiatives, will create enabling environments for sustained adoption and performance. For educators, the framework offers clear pedagogical guidance for transitioning to blended learning environments, including strategies for engaging students, personalizing learning experiences, and accommodating mental health needs.

Overall, the CBLF represents a significant advance in the design of blended learning frameworks for developing country contexts. By combining six interrelated modules and foregrounding mental health, the framework addresses structural, instructional, and psychosocial factors that influence adoption and sustainability. It offers both theoretical contributions by extending prior models to resource-constrained settings and practical benefits, providing universities and policymakers with a validated, contextually grounded tool for improving blended learning outcomes. The study demonstrates that holistic approaches, which integrate technological, pedagogical, and psychological considerations, are essential for enhancing adoption rates and ensuring that blended learning initiatives achieve their intended educational impact in environments characterized by limited resources and diverse learner needs.

E. Conclusion and Implications

This study successfully developed the Campus Blended Learning Framework (CBLF), a contextually grounded model designed to address the persistent challenge of low blended learning adoption in higher educational institutions in southwestern Uganda. The framework's six-component structure comprising pedagogy, infrastructure, content, assessment, support, and mental health offers a comprehensive and contextually relevant approach that integrates technological, instructional, and psychosocial dimensions. The explicit inclusion of mental health as a cross-cutting factor represents a novel contribution to blended learning research, addressing a gap in existing frameworks that traditionally focus on pedagogical and technological elements. Strong correlations between mental health and all other components underscore its pervasive influence on successful adoption and sustainability of blended learning initiatives.

The CBLF demonstrated high usability and acceptability among stakeholders, including students, lecturers, and administrators, indicating strong potential for practical implementation. By providing actionable guidance for institutional assessment, resource allocation, and pedagogical design, the framework equips educational institutions with a systematic approach to improving blended learning adoption. Furthermore, the framework offers policymakers a foundation for integrating mental health support and digital infrastructure strategies into

national educational technology policies, thereby promoting more sustainable and equitable learning environments. For educators, the framework provides targeted strategies for designing engaging, student-centered learning experiences that accommodate varying levels of digital literacy and prioritize psychological well-being.

Despite these contributions, several limitations must be acknowledged. First, the geographic focus on southwestern Uganda may limit the generalizability of findings to other regions with different cultural, infrastructural, and socio-economic contexts. Second, while the sample size was calculated using robust statistical methods, self-selection bias may have influenced participation, particularly among individuals less comfortable with technology. Third, the study's one-year temporal scope may not fully capture long-term adoption patterns or sustainability factors. Finally, while the framework was rigorously evaluated for design quality, usability, and acceptability, long-term implementation effectiveness was not assessed.

Future research should address these limitations by conducting longitudinal studies that track sustained framework adoption and its impact on educational outcomes. Cross-cultural validation in other developing country contexts would provide insight into the generalizability and adaptability of the CBLF. Economic evaluations comparing the cost-effectiveness of the framework against traditional learning models would inform institutional decision-making. Additionally, targeted research on effective mental health interventions within blended learning environments is warranted to optimize learner and instructor well-being.

In conclusion, the CBLF represents a significant advancement in designing inclusive, effective, and sustainable blended learning environments. By recognizing the complex interplay of technological, pedagogical, and psychological factors, the framework provides both theoretical and practical contributions to the field of educational technology in resource-constrained settings. Its adoption has the potential to improve learning outcomes, enhance faculty effectiveness, and create resilient, supportive learning ecosystems, paving the way for broader integration of technology-enhanced education across developing country contexts.

F. References

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