



MODELLING INSTITUTIONAL CHARACTERISTICS THAT ACCELERATES IMPLEMENTATION OF BLENDED LEARNING IN PUBLIC UNIVERSITIES IN KENYA

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Cite this article:

Ndwiga M. M., Ongeti K., Syomwene A. (2024), Modelling Institutional Characteristics that Influenced Implementation of Blended Learning in Public Universities in Kenya. British Journal of Education, Learning and Development Psychology 7(3), 40-57. DOI: 10.52589/BJELDP-CXGDO8CI

Manuscript History

Received: 16 May 2024

Accepted: 14 Jul 2024

Published: 26 Jul 2024

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ABSTRACT: *Blended Learning is an undisputedly useful and effective pedagogical approach for the 21st-century classroom. However, its adoption in many state universities in Kenya is worryingly low. This study aimed to develop a pedagogical model that would accelerate the adoption of blended learning in public universities in Kenya. Bandura's Social Learning Theory was used to understand students' perception, self-efficacy, and previous experience variables in a blended learning environment. The methodology used was exploratory sequential mixed research design. Third-year bachelor of education students (N=7385) in public universities in Kenya formed the population for the study. The researcher used multiple-stage sampling and the Nassiuma formula was used to select 3rd-year education students (n=218). Data was collected using semi-structured questionnaires. Data was analyzed by Structural Equation Modelling (SEM) to design an appropriate pedagogical model out on institutional characteristics. The study revealed three significant paths: 1) University preparedness and students' perception (regression estimate = .399; $P < .05$); 2) university preparedness and students' self-efficacy (regression estimates = .389; $P < .05$); and 3) blended learning adoption and students' perception (regression estimates = .55; $P < .05$). Students and lecturers responded that "Poor internet connection," and "Lack appropriate infrastructure and equipment," as the main barriers. In conclusion, the implementation of blended learning highly depends on the interaction of students' perceptions and universities' preparedness. The study suggested that universities should focus on promoting an environment that focuses on university preparedness and perception/attitudes. Further studies should be done on appropriate BL models for TVET and secondary schools in Kenya.*

KEYWORDS: Modelling, blended learning, characteristics, implementation, public universities.



INTRODUCTION

Background information

A model is a desired working system under specified conditions. Structural Equation Modelling (SEM) is the testing of a multivariate structure with causal connections between variables that are both latent and observed. In this context, the researcher sought to come up with the best student characteristics variables as contemplated in Bandura's Social Learning theory and their causal connection to the blended learning approach for curriculum delivery under conditions of public universities in Kenya. Structural equation modelling entailed factorial analysis (covariance analysis) and causal relationship analysis using partial least square methods in a structural mode (Hair et al., 2021).

Structural equation modelling is becoming a popular and plausible educational research tool in building pragmatic multidimensional models (Panchenko, 2023). Once data is valid and representative, the researcher was able to do factorial analysis, that is; correlation, variance, covariance, and regression using SEM. According to Panchenko (2023), SEM helped determine effective new methods in teaching and learning. A knowledge synthesis of 132 journal articles found SEM an appropriate methodology for determining effective innovative factors in teaching and teachers' education (Yin & Huang, 2021). SEM was also used to a fit model of Turkish state university students enrolled for online learning in two faculties of education (Yilmaz, 2021). In Vietnam, the SEM model yielded a first-order model of blended learning for Hanoi University of Science and Technology (Long & Hanh, 2020).

Problem statement

Mainstreaming blended learning in low-income universities for effective learning and teaching is still a challenge (Oduor, Ayiro & Boit, 2018). The lack of role models and models in the blended learning approach have been reported as being responsible for the low uptake. University with recorded exemplary implementation of blended learning for benchmarking in sub-Saharan Africa in the technological landscape is yet to be identified (Ayere, 2020). Knowledge was still scanty on the interaction of lecturers-related, students-related, and institutions-related factors towards blended learning adoption (Oduor, Ayiro, & Boit, 2018). Further, evidence emphasized that the lack of a context-based interactive approach toward blended learning was a pedagogical gap (Namyssova et al., 2019). Successful implementation of blended learning in a public university context requires the identification of strong predictors of learners' behaviours and the designing of an ecologic model for faculty to use for delivering courses by both face-to-face and virtual methods (Saleem & Masadeh, 2021). This study, therefore sought to model an appropriate mix of student and institution-related factors that would bring the best out of using both face-to-face and online teaching methods in public universities.

Main Objective

The purpose of this paper is to come up with a pedagogical model that explains institutional characteristics that influenced the implementation of blended learning in public universities.



Specific objective

1. To determine the relationship between university preparedness and students' perception of blended learning in public universities in Kenya.
2. To determine the relationship between university preparedness and students' self-efficacy towards blended learning in public universities in Kenya.
3. To determine the relationship between students' perception of blended learning and the adoption of blended learning in public universities in Kenya.

Research Hypothesis

H₀₁: There is no significant relationship between university preparedness and students' perception of blended learning in public universities in Kenya.

H₀₂: There is no significant relationship between university preparedness and students' self-efficacy towards blended learning in public universities in Kenya.

H₀₃: There is no significant relationship between students' perception of blended learning and the adoption of blended learning in public universities in Kenya.

Proposed model

According to the conceptualization of the institutional framework, a basic model was created within the framework of Bandura's Social learning theory as shown in Figure 1.

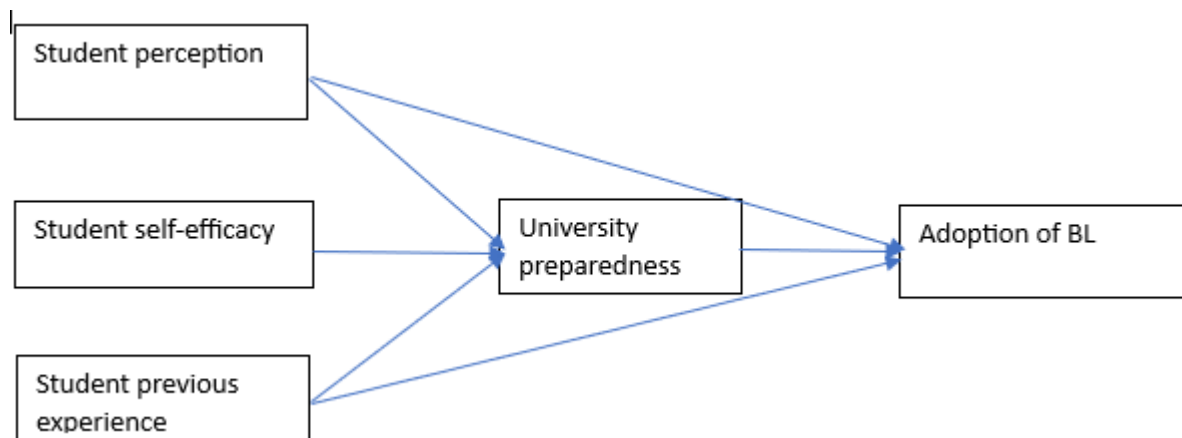


Figure 1: Proposed model for institutional characteristics and adoption of blended learning in public universities

The figure 1 demonstrates that the adoption of blended learning happens in public universities when students have the right perception, self-efficacy and vicarious/previous experience. Besides the three determinants, university preparedness was an important prerequisite to the adoption of Blended learning. The first set of arrows showed that students' perceptions (attitudes) either directly or indirectly through university preparedness determined the adoption of blended learning. second pathway is self-efficacy leading to the adoption of blended learning, either directly or through university preparedness. Self-efficacy was used as students' self-belief to organize and execute blended learning activities to produce desirable learning



outcomes. The third pathway was students' previous experience influencing either directly or indirectly the uptake of blended learning in public universities in Kenya. This proposed model will be tested through structural equation modelling using sampled data collected from BED students in Kenyan public universities.

LITERATURE REVIEW

Empirical Review

Students' Perception and Blended Learning

A critical analysis explored UK university students' perceptions of blended learning. A pragmatic worldview and mixed methods were used to carry out the study. Convenient sampling helped to identify 1917 respondents to the study. Questionnaires and FGDs were used to collect data. The findings revealed that the students were positive about blended learning because they did not see it to be intrinsically detrimental. Again they approved BL because it was flexible and inclusive (Syska & Pritchard, 2023). The European study setting may not apply to Africa, despite insightful findings. Therefore, there is a need for another study focusing on blended learning for curriculum delivery in public universities in Africa.

From the lenses of students, Lu (2021) sought to establish students' perceptions of the social, pedagogical, and technical design of blended learning and its impact on critical thinking. Using a mixed method design the study collected data via a Web-Based Learning Environment Instrument from 90 first-year non-English major students at Normal University in China. The findings showed students' positive impressions of the designs and expressed that the BL environment fostered critical thinking (Lu, 2021). According to Lu (2021), students received and perceived technical support to be satisfactory, online material available, and conveniently enjoyed learning 'anywhere' and 'anytime.'

Bhagat (2020) surveyed 7 faculty members and 31 MBA students enrolled in BL courses in 2019 at Uganda Management Institute on the learners' attitude towards blended learning courses. The results showed that students' general experience was positive; the reason being the flexibility to learn anywhere and anytime. In addition, most students found courses delivered via BL to be relevant (71.7%). BL made the students attentive (54.8%), confident (58.06%), and connected with others (87.09%). Generally, the learners were satisfied (Bhagat, 2020). Like the previous studies, the study also suffered from self-grading and inadequate sampling which limits its results to be generalized on the population of lectures and students. To address the deficits a broader probability sampled mixed study needed to be carried out.

Among 19 universities that offered bachelor of nursing in Kenya, experimental research was done in two public and two private universities on how they utilized blended learning on undergraduate nurses for post-intervention outcomes. The respondents were 486 nursing students in their fourth year and enrolled in the NRS 400 course that was concerned with education concepts and instruction styles. The study revealed that most nurse students $n=302(62.1\%)$ were motivated to embrace blended learning. However, 75.1% of them experienced challenges while using the blended learning mode of delivery (Kaniaru, Karani, Mirie, & Nyangina, 2019).



Students' Self-Efficacy and Blended Learning

Self-efficacy is a key construct in Bandura's social cognitive theory. Self-efficacy is a self-belief to organize and execute the 'courses of action needed to produce given accomplishments and having exclusive power to predict one's behavior' (Bandura, 1977, P3). The belief is made up of four constructs: enactive mastery experience (performance accomplishments, vicarious experience, verbal persuasions, and physiological and affective state (Bandura, 1977).

A review of antecedent literature on self-efficacy has different findings. For example, Katsarou (2021) sought to establish the influence of self-efficacy and computer anxiety on Greek L2 students' self-perceived satisfaction and digital competence in higher education through a cross-sectional study. The survey involved 331 undergraduates from the faculty of agricultural and forestry sciences at Democritus University of Thrace. The findings revealed that self-efficacy positively influenced IT attitude and usage (Katsarou, 2021). This study has good insights into Bandura's social cognitive theory and self-efficacy among public university undergraduates. However, the study assumes that attitude and use of IT are equivalent to attitude and use of blended learning.

A correlational study was done in Turkey. The aim was to assess the influence of reflective thinking, problem-solving, metacognitive awareness, and community of inquiry on learners' academic self-efficacy in blended learning. The study involved 217 undergraduates in the faculty of education enrolled in Turkish language and math for primary schools and were doing introductory computer courses. The sampling was purposive. According to the study findings, a community of inquiry, metacognitive awareness, problem-solving skills, and reflective thinking strongly and positively correlated with self-efficacy among undergrads (Gizem, Yilmaz, Ustun, & Yimaz, 2023). In this study, self-efficacy is a dependent variable instead of an independent variable. Secondly, it used purposive sampling subjecting it to serious bias. Thirdly it used correlational design which only establishes relationships and not cause effect. These weaknesses point to the need for another study that is robust and makes self-efficacy the subject and independent variable.

A similar study using pretest and posttest design was done in Boston, USA. The study aimed to examine changes in self-efficacy for service learners involved in various community services. The researchers interviewed 228 students from one state university and 4 community colleges across 19 courses. The study revealed that the motivating potential of courses moderated self-efficacy (Cronstaves, Metchik, Lynch, Bedezos, & Richards, 2023). The study focuses on the role of motivation potential of courses on self-efficacy and service learning. Again, the study was self-reporting research in the northeastern United States whose results are susceptible to self-bias and may not credibly apply in Africa.

Phan (2023) did a comparative study on self-efficacy among Taiwan and Vietnam engineering students. The study used mixed methods and an 11-point Likert scale questionnaire to collect information from 222 engineering students. T-test and regression analysis was used and demonstrated that the number of prior MOOCs, English proficiency levels, self-regulation, and age predicted self-efficacy (Phan, 2023). Like precedent studies, self-efficacy is a dependent variable. Therefore, it does not tell how it influences the use of blended learning among public universities.



Previous Experience of Students and Blended Learning

In Social Learning Theory (SLT), previous experience is the vicarious experience; the influence of students towards hating and liking blended learning depended on other previously completed tasks. Past experiences included their successful encounters with digital devices to interconnect with comrades and lecturers on a social platform. The previous experiences and performances with technical device tools not only give the students requisite skills for blended learning but also cause social persuasion or power of others (peers and mentors) on students' ultimate behaviour (Koutroubas & Galanakis, 2022).

How did learners' previous experience with BL influence their use of blended learning? This question was answered by an exploratory case study in Australia. The study involved 20 students enrolled in the Bachelor of Law program's introductory unit. The case study used focused group discussions and questionnaires and found that most of the students were direct high school leavers who had not had prior BL encounters. However, their previous experience did not influence their use of BL. Instead, students were quick to learn BL's benefits and used BL tools such as videos and quizzes to catch up (Pechenkina, Scardamaglia & Gregory, 2018). This study was done in an Australian setting which was different from Africa. Secondly, a sample of 20 students is too small to infer for all public university students in Kenya.

Shedrout (2021) also used an exploratory case study, to examine experiences of elementary teacher candidates on technology tools. Twenty-seven teacher candidates enrolled in a teacher education program at the Catholic Liberal Arts College in the Midwest participated in the study. Previous experience of the teacher candidates influenced their use of blended learning. The previous experience made them familiar with digital tools and usage (Shedrout, 2021). The case study was largely qualitative, excluding the strengths of quantitative methods. It also used a very small sample (n=27) during COVID-19. The results may not be valid in normal post-COVID-19 times and a large population of public universities in Kenya.

In Jordan, a descriptive survey study was done to investigate the online component challenges. The study had 263 participants who were students enrolled in sports science BL classes at the University of Jordan. Information was gathered with the help of questionnaires and analyzed with the aid of SPSS and AMOS software. Students who had no previous experience in BL encountered significant challenges in the use of BL for learning in sport science studies at the University of Jordan (Bayyat, Muaili & Aldabbas, 2021); meaning that previous experience significantly and positively influenced students' use of blended learning in Jordan. The limitation of this study is that it is exclusively qualitative and applicable to Jordan settings. There is a need for a mixed-method study that applies to the implementation of a blended learning approach in public universities in Kenya.

Among students of Sultan Qaboos University - Oman, a study was done to discover variables that affected the adoption of BL in higher education institutions. The research was animated by the Theory of Planned Behaviour (TPB). Data was collected on demographics, attitudes, subjective norms, beliefs, perceived behavioural control, behavioural intention, self-efficacy, and actual usage from 362 social science students. The data was analyzed by Pearson correlation and multiple regression. The analysis revealed that previous experience positively influenced social science students at Sultan Qaboos University to use blended learning (Hamad, Shehata, & Hosni, 2024). The exclusive quantitative approach and Oman contextualization make the results of the study not applicable to Kenyan public universities with utmost validity.



While investigating the reasons for liking or disliking a learning environment in a local university, Chaw and Tang (2023) found out that previous experience and particularly prior use of web applications influenced students' digital readiness. The study used an exploratory sequential mixed methods research design where data was collected from 117 diploma, bachelor's, and master's students using focus group discussions and online questionnaires (Chaw & Tang, 2023). Likes and previous experiences of students in Singapore may not apply in Kenya due to geographical and developmental pedestal differences. The study also assumes that previous experience in web applications is the same as previous experience in blended learning. Therefore, there is a need for another mixed-method study focussing on blended learning in public universities in Kenya.

University Preparedness and Blended Learning

University preparedness meant institutional readiness which entailed vision, policies, structures, infrastructure, partnerships, and technical support systems that favour or frustrate the acceptance and implementation of blended learning at public universities. Perris and Mohee (2021) guide that quality in higher education embracing blended learning can only be assured when BL is anchored on university vision; policies and structures; infrastructures, partnership; research and innovation; program relevance and curriculum; learning support; and professional development (Mohee & Perris, 2021).

Across the European Higher Education Area (EHEA), institutions heavily invested in equipment, infrastructure, and professional development. However, the approach suffered from strained funding, inability to design a concerted institutional approach, and inadequate staff (Gaebel, Zhang, Stoeber, & Morrisroe, 2021). The level of blended learning in Europe is at an advanced level; to the extent of developing a customized model. A 3-round Delphi study carried out between December 2018 and July 2019 on 28 European experts revealed that Europe had developed a European Maturity Model (EMM). EMM defined how blended education was designed and implemented in institutions of higher learning. The model systematically mapped blended learning activities, conditions, strategies, and policies. Maturity was the degree of formality and optimization of evidence-based decision-making design, recording, and CQI. The model helped to guide instructors to align course objectives, learning activities, and assessments with target student groups. The model had 21 subdivisions that were grouped under course, program, and institutional levels (Dijkstra & Goeman, 2020). Lecturers were actors at the course level. Coordinators, deans, and departmental heads were actors at the program level.

In a cross-institutional study among engineering students at Purdue, Trine, and McGill universities preparedness dimensions were observed as critical success factors in BL implementation in higher education institutions. Blended learning was positively approved as a "freeform environment" for teaching and learning. However, university preparedness as extracurricular pressures and responsibilities, time constraints, and technical support affected the application of blended learning. The investigator also discovered a lack of structures to realign online and face-to-face teaching affecting acceptance of blended learning. The study adopted Actor-Network Theory (ANT) which took students as active actors and implementors of blended learning. A semi-structured interview was done with 271 engineering students from the universities and a step-by-step thematic analysis of collected data (Evenhouse, Lee, Berger, Rhoads, & DeBoer, 2023). The sample was good enough. The fact that the study used a self-



reporting method, weakened the study with subjectivity and bias. Secondly, thematic analysis weakened the study with limitations of new insights at saturation.

To find key conceptual and theoretical features that facilitated success in implementing blended learning in higher education, a desk review approach was used to systematically analyze 11 studies using Google Scholar and Scopus as search strategies. University policy was identified as a core feature affecting blended learning. Other policy-related features identified by the studies were vision, goal, infrastructure, faculty, strategy, professional development, and support systems (Bekele, Karkouti, & Amponsah, 2022). Even though the findings are evidence-based, they are neither public university-specific nor Sub-Saharan Africa-specific.

In Pakistan, an exploratory qualitative study, involving 30 faculty members and 60 undergraduates enrolled in social sciences, arts, and humanities, was done. The research aimed to identify the practices and issues affecting blended learning in Islamia University of Bahawalpur. Lack of policy guidelines was a key finding (Hussain, Shahzad, & Ali, 2019). In addition, the research found that the university did not support the adoption of online and blended learning, and lacked sophisticated technology, time management, authentic learning resources, and information. Weaknesses found in this study are methodic; which is skewed towards the qualitative strand alone. Secondly, the study setup is in Pakistan which is different from Africa.

Infrastructure was identified as barrier number one in an exploratory qualitative study investigating the inhibitors of faculty blended learning in Ghana. The study purposively sampled 22 teaching staff from four faculties of a university in Ghana. Data collected was subjected to coding, comparative, and thematic analysis. Other barriers identified were institutional issues, faculty concerns, and technical support (Anturi-Boampong, 2021). The findings of the research showed a picture of challenges an African university in matters of implementing blended learning. However, the methodology is only qualitative with a very small sample that was purposively sampled. These make the findings weak and biased, hence the need for a study grounded on mixed methods and a bigger sample.

Across Africa, the adoption of BL was still at an embryonic stage. Kizito (2016) found that institutional factors such as organizational culture, paucity of trained and motivated staff, limited technological support, and absence of records of success to build on hampered the application of BL for teaching and learning by universities in Africa. A summative evaluation of blended learning in universities in East Africa revealed that blended learning was highly relevant. Most universities (80%) used blended learning. However, the students and lecturers experienced inadequacy in ICT infrastructure, a lack of supportive policies, overloaded teaching staff, unmotivated staff, and inconsistency in the application of blended learning for teaching and learning (Young et al., 2021).

At Kenyatta University, there were inconsistent efforts to build supervisors' capacity and the university lacked resources to effectively implement blended learning which affected the completion rate (Miheso-O'Connor, Bwire & Mwangisi, 2020). Specifically, training, planning, and legislation were found to be critical in the effective application of a blended learning model and in creating a favorable educational environment (Masadeh, 2021).



Among public universities in Kenya, a mixed method study of one hundred and forty-eight faculty members in 3 Kenyan public universities using blended learning revealed that the GoK had an elaborate institutional and policy framework to increase broadband internet and interconnectivity through Kenya Education Network Trust (KENET) for teaching, learning, and research in universities (Tarus, Gichoya, & Muumbo, 2015). Although the GoK had successfully interconnected the universities, only 11% of the students in public universities in Kenya used the blended learning approach. The barriers to the use of the blended learning approach were inadequate ICT infrastructure, finance, policies technical skills, assurance among faculty members, and enough time to create E-learning content.

Among 114 students at Tom Mboya University College (TMUC), an exploratory study was done on taking advantage of informal education for the expansion of participation in Kenyan university education. The study used survey methods to collect data. The findings showed BL in Kenyan public universities was not at the desired level because of infrastructure. Specifically, there was a lack of computing resources that facilitated BL for teaching and learning (Hawi, Heinrich, & Lai, 2021). Because of the self-reporting method's weaknesses, the findings needed to be confirmed by a mixed-method study.

In a scoping review of challenges that faced e-learning in universities in Kenya, deficiency of Information, Communication, and Technology (ICT) infrastructure was cited as a major barrier. Other challenges were inadequate e-learning policies, fast change in technologies, technical and pedagogical incompetencies among e-tutors and e-learners, and the absence of e-learning theory to support the e-learning exercise (Kibuku, Ochieng & Wausi, 2020). In addition, Kibuku, Ochieng and Wausi (2020) discovered that universities faced budgetary and sustainability challenges. The investigators also observed undesirable attitudes about e-learning, quality challenges, the dominance of technology and market forces in e-learning, and inadequate partnership among the e-learning participants. In as much as the study gives insightful knowledge on the barriers to the application of blended learning on campuses in Kenya, it is purely based on literature. No current feelings and views of actual participants are captured to validate the findings. The study also assumes that e-learning is equivalent to blended learning. Therefore, there is a need for a mixed-method study with a focus on how infrastructure hinders the use of blended learning in Kenyan public universities.

Infrastructure and unreliable technology were also found as a barrier to the sustainable upscaling of ABRACADABRA; an online platform for teaching and learning English and French in Kenya. These findings were a product of an exploratory qualitative study that involved 40 respondents whose findings were descriptively analyzed. Other hindrances to the widespread use of ABRACADABRA were a lack of technical support at school, inadequate policies, negative student attitudes, and lack of professional development (Lysenko, Abrami, & Wade, 2022). The weaknesses of this study rest in the small sample and exclusive use of qualitative methods. Another research that includes quantitative and robust inferential analysis of data is needed.

Theoretical Underpinnings

Social Learning Theory (SLT) gave the theoretical framework that underpinned this research. The framework was constructed from SLT as a tested and validated theory to guide the researcher in thinking and planning as well as giving the foundation on which all knowledge was constructed (Grant & Osanloo, 2014). The Social Learning Theory (SLT) was propounded



by Albert Bandura in 1971. Albert Bandura was a Canadian psychologist (Bandura, 1971). According to Bandura, observation or perception, self-efficacy, vicarious experiences or past experiences, motivation or modeling, reinforcement, and reward predicted learning (Koutroubas & Galanakis, 2022). In addition, the environment plays a critical role in learning, too (Nabavi, 2014). The theory emphasizes the role of personal factors such as beliefs, attitudes, and knowledge acquired out of previous experiences that influenced one's expectations and goals (Koutroubas & Galanakis, 2022).

Of interest to this study are perception, self-efficacy, and vicarious/previous experience as predictors of blended learning in a public university environment. The researcher tested these theoretical concepts to establish their applicability and relevance in designing a working model for students to embrace blended learning sustainably. University preparedness is an addition to the theoretical underpinnings because of the high dependency of BL on ICT infrastructure, policy, and competencies.

MATERIALS AND METHODS

The study adopted the pragmatism philosophy because it was after practical solutions that would make blended learning work for public universities in Kenya. The design was exploratory and the data collection and analysis methods were both qualitative and quantitative. The study was done in Kenya.

Identification of the study unit and respondents was done using multistage and proportionate sampling methods. The research selected the 8 universities using purposive sampling based on the criteria of availability of education programs, willingness to participate in the study, and regional balance. Based on the criteria, the eight (8) universities were: Pwani University, University of Embu, University of Nairobi, Kibabii University, Kirinyaga University, Maseno University, Laikipia University, and Garissa University. After getting 8 universities, the researcher used to go for the 3rd-year students enrolled in B. ED programs. The third-year students enrolled in B. ED were selected because of their long experience and knowledge of educational concepts. According to Table 1, there were 7385 third-year B. ED students in the eight selected universities. To get the representative populations of participants from the universities per each stratum, the researcher used the Nassiuma formula on the students' population.

$$n = \frac{N \cdot C^2}{C^2 + (N-1) \cdot e^2}$$

Where;

n = the desired sample size;

N = the proportion of the target population

C = Covariance = 0.3; and e = standard error \pm 0.02.

e = the margin of error



After the establishment of the sample size of the eight universities as $n=218$, the researcher determined the sample size for each university. Each university's sample size was determined as a fraction of the 218 proportionate to its 3rd-year B. ED enrolment population. For example, Maseno University and the University of Nairobi had the highest sample sizes as compared to Garissa University and Kirinyaga University.

Data was collected using Open (qualitative) and closed-ended (quantitative) questionnaires. On a seven-point Likert Scale, students and lecturers were asked for information to address research questions. The response range was from 1 -Strongly disagree; 2 – disagree; 3 – Slightly disagree; 4 - Neither agree nor disagree; 5 - Slightly agree; 6 – Agree; 7 – Strongly agree. Reliability coefficient alpha was applied to determine if Likert-scaled instruments were reliable (Huang, 2016). In a similar study to assess student satisfaction with BL, the reliability coefficient of Cronbach's alpha was found to fit in determining the internal consistency of research instruments (Naaj, Nachouki, & Ankit, 2012). According to the test, an instrument is reliable when the alpha is close to 1; meaning that the items in the instrument had high internally consistent and covariance (Hajjar, 2018). After testing all scale items, the tool passed the test. On average the reliability was 0.8; above the Cronbach alpha threshold of 0.7 and closer to 1; meaning that reliability was good (Oluwatayo, 2012 & Balan, 2013).

Further, the validity of the research instruments was enhanced by the lecturers' opinions. Content validity was observed by the researcher identifying and outlining the domain of interest in the adoption of blended learning in institutions of higher learning. The construct validity of research instruments was checked by the use of correlation analysis. Nevertheless, the researcher borrowed and modified the instrument developed by the University of Trinidad & Tobago in a mixed method research; Student Blended Learning Experience Questionnaire (SBLEQ) for students. The instruments were effectively used to gather evidence on students' experiences of switching to blended learning from the traditional learning method (Jackman, 2018).

Ethical Issues Considered

'Do no harm,' seeking informed consent, anonymity and confidentiality, plagiarism check, data integrity, and approvals were the principles that the researcher observed during the study. For example, the researcher embraced the 'do no harm principle.' Risks entailed possible harm that may arise from the research. Such harm would be loss of resources such as time, reputation, physical and emotional (Fleming & Zegwaard, 2018). Second, the respondents were made to fill and sign the informed consent form before engaging as proof that they were sufficiently informed, gave voluntarily the information without compulsion, and were free to withdraw at any point of the research process (Abed, 2015). Third, the researcher upheld the anonymity and confidentiality of the respondents by not sharing with other participants private information and concealing the source of information (Bos, 2020). Moi University librarian checked and issued with non-academic plagiarism certificate to prove the authenticity of the study. The investigator ensured data integrity by not manipulating respondents' answers (Bassey, 2019). Approval from relevant institutions was another ethical issue that was considered important, especially when human participants were involved (Fleming & Zegwaard, 2018). Keeping in line with GoK laws, the researcher obtained letters of introduction from Moi University and approval from NACOSTI before going to the field to collect data.

Ethical considerations were upheld by the researcher because they promoted collective work standards such as fairness, mutual respect, compliance with the legal framework, social responsibility, and human rights (Natade, Murunga & Kabesa, 2023).

DATA ANALYSIS

After data collection, data analysis was done by descriptive and inferential statistics. Descriptive statistics involved percentages, mean and standard deviation, and reliability using SPSS. Inferential statistics used Structural Equation Modelling (SEM) that entailed factor loadings analysis, and confirmatory fit indices to determine a good fit model for adopting blended learning in public universities in Kenya. The development of a pedagogical model explaining institutional influence on the use of blended learning was done using structural equation modeling with the aid of AMOS version 21 software. Results of items relating to learners'/students' perception, self-efficacy and previous experience were grouped and transformed into indices under each variable as exogenous variables. The Same was done to the outcome variable; that is institutional factors and effective teaching and learning.

RESULTS AND DISCUSSIONS

The study developed a pedagogical model that explained institutional characteristics that influenced the usage of blended learning for teaching and learning among B. ED students in public universities in Kenya. The development of a pedagogical model explaining institutional influence on the use of blended learning was done using structural equation modeling with the aid of AMOS version 24 software loaded on SPSS. The results are as per the unstandardized and standardized models below. The unstandardized model gave the covariates of exogenous variables and factorial loading of all the variables in the model depicted in figure 2 below.

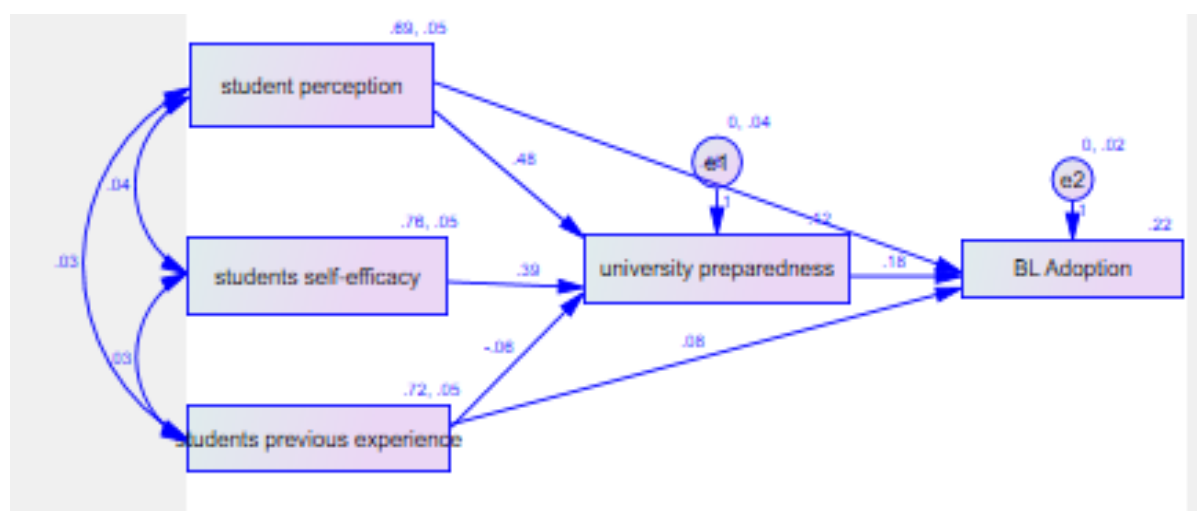


Figure 2: Model 1: Unstandardized

According to Model 1 in figure 2 and table 1, there was a significantly strong correlation between student perception and previous ICT experience, student perception and their self-

efficacy, and previous ICT experience and Self-efficacy. The correlation between students' perception and self-efficacy was the strongest 0.036. The correlation between self-efficacy and previous experience, students' perception, and previous perception were the same 0.034.

Table 1: Covariance of exogenous variables

Covariances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
SELF_EFFICACY_X2 <--> PREVIOUS_EXPERIENCE_X3	.034	.005	7.121	***	
PERCEPTIONS_X1 <--> SELF_EFFICACY_X2	.036	.005	7.341	***	
PERCEPTIONS_X1 <--> PREVIOUS_EXPERIENCE_X3	.034	.005	7.082	***	

According to the findings in Table 1, one unit change in previous experience resulted in 0.034 change in the student's self-efficacy; one unit variance in self-efficacy resulted in 0.036 positive change in student perception; and one unit change in previous ICT experience affected change in 0.34 in students' perception. Implied by the result was that self-efficacy components influenced BED students' positive perception towards BL than previous experience. Therefore public universities needed to invest more in training students on setting up LMS, downloading and organizing learning materials, using LMS for group work, doing and uploading assignments. In addition, the university management needed to train the students on using digital devices to access and use LMS.

A standardized model was used to establish the regression estimates or estimate predictor relations. The model established six (6) predictor pathways. They include self-efficacy predicting university preparedness; students' perception influencing university preparedness; previous ICT experience influencing university preparedness; university preparedness influencing predicting BL adoption; student perception influencing BL adoption and previous ICT experience influencing BL adoption.

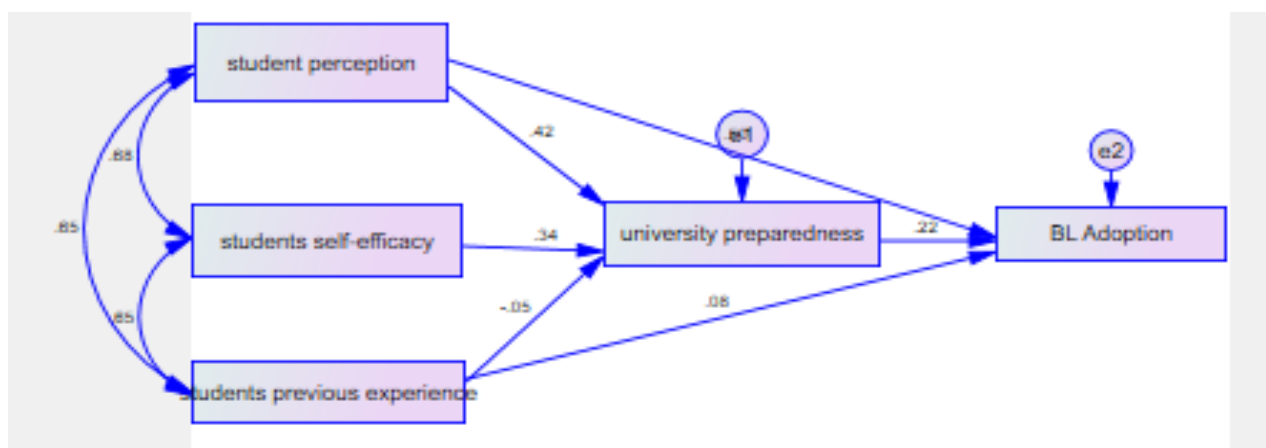


Figure 3: Model 2: standardized model



Apart from university preparedness having an inverse relationship with previous experience, the rest of the pathways had positive variances; meaning that one unit change in exogenous variables caused a positive change in Blended learning adoption as shown in Table 2.

Table 2: Regression weights

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
University preparedness	<--	Students' perception	.476	.097	4.912	***	
University preparedness	-						
University preparedness	<--	Students' self-efficacy	.389	.098	3.951	***	
University preparedness	-						
University preparedness	<--	Previous experience	-.060	.094	-.641	.521	
University preparedness	-						
BL Adoption	<--	University preparedness	.182	.058	3.153	.002	
BL Adoption	-						
BL Adoption	<--	Previous experience	.077	.069	1.126	.260	
BL Adoption	-						
BL Adoption	<--	Students' perception	.482	.077	6.218	***	
BL Adoption	-						

This implied that, to maximize learning outcomes among B. ED students using Blended learning, public universities needed to focus more on students' perception, self-efficacy, and preparedness. Figure 4 shows the best model with the three critical paths identified in Table 2.

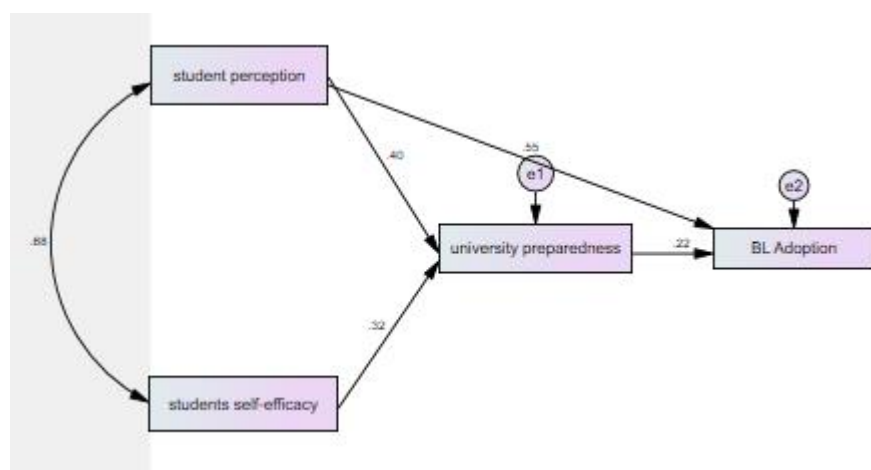


Figure 4: Best students' pedagogical model (Standardized model)

According to the model in Figure 4, there was a significantly strong correlation between student perception and Self-efficacy. The correlation between students' perception and self-efficacy improved from 0.036 to a coefficient of 0.68. Based on the standardized regression weights,



students' perception and adoption of blended learning (0.550) was the strongest path, followed by university preparedness and BL adoption (0.399).

The researcher also determined the intercept value. As an intercept, university preparedness significantly influenced BE Students' adoption of blended learning as shown $p=0.04$ in Table 3.

Table 3: Intercepts for predicting endogenous variables

	Estimate	S.E.	C.R.	P	Label
University preparedness	.112	.055	2.053	.040	
BL adoption	.241	.040	6.081	***	

It meant that university preparedness significantly moderated students' perception and self-efficacy in adopting BL. The results of the study in Table 3 implied that public universities needed to promote institutional measures to mediate the use of blended learning. Examples of measures included anchoring BL on policies, structures, and good infrastructure. In addition, the universities should establish good technical support systems, Q & A systems, strong bandwidth internet and train students and lecturers thoroughly on BL.

Model tests of fit

The researcher used the Chi-square (CMIN test), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) to determine if the data fit well in the model. The chi-square results were less than 0.05, $p=0.011$ as shown in table 4.

Table 4: Chi-square test of model fit

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	13	6.447	1	.011	6.447
Saturated model	14	.000	0		
Independence model	8	328.019	6	.000	54.670

The chi-square results indicated that the data did not fit well in the model because $p < 0.05$. The second and third tests were TLI and CFI as in Table 5.

Table 5: Tucker-Lewis Index (TLI) and Comparative Fit Index (CFI)

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.980	.882	.983	.899	.983
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000



Again, TLI was 0.899 which was less than the threshold of 0.95. However, CFI was 1.00, greater than the 0.90 threshold; which meant that data fitted well in the model. Finally, the researcher carried out the RMSEA test as shown in Table 6.

Table 6: Root Mean Square Error of Approximation (RMSEA)

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.180	.069	.322	.030
Independence model	.564	.513	.616	.000

According to the rule of thumb, data fitted well in the model if the RMSEA was less or equal to 0.8. In this case, the RMSEA readings are 0.18, far below the threshold; implying data fitted well with the model. Conclusively, out of the four model fit tests, two proved that data fitted well in the model as shown in Table 7.

Table 7: Summary of the model fit tests

Test	Chi-square	TLI	CFI	RMSEA
Threshold	$P \geq 0.05$	$TLI \geq 0.95$	$CFI \geq 0.90$	$RMSEA \leq 0.8$
Actual	$P = 0.11$	$TLI = 0.899$	$CFI = 1.00$	$RMSEA = 0.18$
Conclusion	Not fit to the data	Not fit to the data	Good fit to the data	Good fit to the data

Though Chi-square and TLI in Table 7 did not find a good fit, the rest of the tests found the data fit well in the model. This is an indication that the exogenous variable predicted university preparedness and adoption of blended learning among B.ED students in the public Universities.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The last set of findings addressed, ‘What pedagogical model best explains institutional characteristics that influence the use of blended learning for teaching and learning among B. ED students in public universities in Kenya?’ The study found significant pathways in the model; 1) University preparedness and students’ perception (regression estimate = .399; $P < .05$); 2) university preparedness and students’ self-efficacy (regression estimates = .389; $P < .05$); and 3) BL adoption and students’ perception (regression estimates = .55; $P < .05$). Finally, the researcher observed that the implementation of blended learning suffered from the weak and high cost of internet connectivity, poor scheduling of classes, breakdowns of ICT, difficulty in lecturer-student interaction, lack of digital devices and unsupportive environment.

Recommendations

Recommendations for practice

- a) Universities should focus on fostering an ecosystem that focuses on university preparedness, student self-efficacy, and perception/attitudes.



Recommendations for policy

- b) Universities should develop policies that focus on improving students' proficiency, efficacy, and attitudes towards blended learning.
- c) The GoK, through MOEST, should develop policies and guidelines on BL use for curriculum delivery in universities

Recommendations for further studies

- a) Further studies should be done on appropriate BL models for TVET and secondary schools in Kenya.

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