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# **The Impact of Technology-Enabled Learning at Alupe University**





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## Executive Summary

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This report is an evaluation of blended learning implementation at Alupe University, Kenya. The study analysed the effectiveness of blended learning in terms of students' learning performance, as well as their perceptions of blended learning. The sample population for this study included 15 faculty members and 427 students. The students were enrolled in 12 courses offered during the August–December 2022 semester. Some students were enrolled in multiple blended courses; consequently, the total sample size for the blended courses was 451. Of these, 132 (29.3%) students took part in the survey.

A mixed-methods research design approach was used, whereby both quantitative and qualitative data were collected. Data collection was done using a questionnaire for students and in-person interviews for faculty. Survey data were collected using a convenience sampling method. Quantitative data analysis was performed using an independent sample *t*-test, a Pearson correlation coefficient test and a likelihood-ratio test. Word cloud analysis was performed on learners' sentiments about the blended course, which were collected using an open-ended question. The faculty members' interviews were analysed using an activity theory framework.

The analysed data indicated that students studying through blended learning performed better than the students studying through the non-blended mode. The learning performance assessment showed no significant difference in performance by gender. There were significant relationships between (i) course design and digital literacy, (ii) learning experience and digital literacy, (iii) personal factors and course design, (iv) personal factors and learning experience, (v) attention and course design, (vi) attention and learning experience, (vii) attention and personal factors, (viii) relevance and personal factors, (ix) relevance and attention, (x) confidence and attention, and (xi) confidence and relevance. The analysed data showed no significant relationship between final scores and learner attributes, including gender. All the key words dominantly used by the learners to describe how they perceived the blended learning environment implied they had had a positive experience interacting with their learning content through the learning management system.

The study offers several recommendations: (i) Faculty members need continuous training on the different technologies they can use to make blended courses more appealing and interactive. (ii) Learners should be treated equally during blended learning, regardless of gender, as there is no significant difference in their course performance. (iii) Learners should be provided with frequent technical support for the technology used in their studies, as blended learning is likely to be a new experience for the majority of students. (iv) Regular and immediate feedback should be provided to learners through the learning management system to foster their engagement in the courses. (v) Since learners expressed positive responses to their blended learning experience, more courses should be taught through the blended learning format. (vi) The number of access points should be increased to enable all students to comfortably access the university's learning management system content.





# 1. Introduction

Technology-enabled learning (TEL) is the process of utilising technology in teaching and learning. The enhanced expansion of network and communication technology constitutes the primary driver of TEL. The conventional pedagogical approach prioritises face-to-face interaction and is teacher centred, with the teacher as the main creator of information (Fosnot, 2013). In contrast, TEL is based on a connectivist model, which is connected to knowledge in the open environment through the Internet, via sites and services such as Google, YouTube, and WordPress (Jirasatjanukul, Pakprod, & Khammungkul, 2021). TEL encourages group interaction and discussion, enabling students to offer different viewpoints and positions when making choices, solving problems, and understanding data. It also encourages learning through online communities, blogs, and other public spaces, shifting the teacher to the role of knowledge curator (Utecht & Keller, 2019). Learners are empowered to create new knowledge on their own when connected to the desired sources of knowledge and generate new meaning through these interactions (Kop & Hill, 2008).

The face-to-face synchronous approach was founded on the need to direct the human spirit towards the development of social order. Social order, in turn, is based on assigning roles and responsibilities to individuals within a predefined matrix. This model for distributing knowledge centres on the teacher and has lasted for a long time, propagating the institutionalisation of knowledge.

The new predominance of TEL is driven by the ever-changing necessities of a society built on knowledge networks. One of the outcomes of a networked society has been the liberalisation of knowledge (Lemke & Coughlin, 2009). This is reducing the dependence of learners on a teacher as the key source of knowledge, as they can acquire information from multiple sources. The development of the open access (OA) movement and the participation in it of prestigious higher educational institutions (HEIs) recognised for their fundamental research constituted the first disruption of the global knowledge supply chain. People from disadvantaged areas and communities who previously did not have access to quality education could now gain exposure to contemporary knowledge and realistically aspire to be on a par with their global peers. The only limiting factor was access to networks and communication tools.

Converting traditional learning content into digitised programmes or courses was a great challenge for learning institutions worldwide, prompting collaborations between HEIs (as knowledge authors) and web-based learning platforms (as knowledge distributors). Such co-operation brought about the second disruption in the knowledge supply chain, as students could affirm their knowledge through online accreditation programmes. Once employers began acknowledging these certificates as proof of cognitive achievements, online learning gained popularity and became established as a critical component of the knowledge production network.

These developments have led HEIs to re-examine how to carve their own niches within information-oriented societies and economies. The inescapable end of face-to-face teaching and learning, which is linked to the rise of networking technologies such as 5G, will lead institutions of higher learning into new territories for content creation and delivery.

A networked society depends on people with the abilities required to operate in a dynamic environment. The scope of knowledge has also shifted from single-discipline systems to a multidisciplinary system in which knowledge creators are required to demonstrate their

adaptability and versatility. Professionals are now expected to upgrade their knowledge frequently, to align with and pursue their organisation's strategic objectives. This change in the working environment has left HEIs with little option but to zero in on outdated courseware and has necessitated the evolution of educational platforms that cater to the dynamic requirements of employers.

These factors have revived the TEL debate, as well as brought into the limelight HEIs' core mandate and their dependence on fundamental teaching and learning principles. To address some of their shortcomings, HEIs are adopting technologies that improve the accessibility of their information delivery methods.

The general model of TEL as characterised by HEIs involves open and distance learning (ODL), massive open online courses (MOOCs), and blended learning (BL) (Perraton, 2012). Among these, the ODL model involves online delivery of the whole programme, face-to-face interaction between students and teachers, and online discussion forums. Formative assessment is carried out all through the course and may involve an element of adaptive learning; summative assessment is conducted online using a secure browser at a physical examination centre. MOOCs, on the other hand, are based on learner-directed learning, where the user is expected to complete a specific set of learning objects and activities in order to obtain a certificate.

Various researchers have offered definitions of BL. For instance, Graham (2006) described it as a combination of face-to-face and computer-aided learning. BL is a creative approach that provides the best of both classroom teaching and technology-enabled learning, and it can involve offline and online learning. The blended approach incorporates collaborative learning, constructive learning, and computer-assisted learning (Lalima & Dangwal, 2017). Some of its most apparent drawbacks are the constraints on modifying course content to suit evolving scenarios.

Programmes offered by HEIs are governed by specific regulatory requirements. In Kenya, programmes are certified by the Commission of University Education (CUE) and undergo periodic reviews over specified timeframes. Accreditation requires that HEIs comply with specific programme and course learning outcomes. The content of each course is predetermined, and content modification requires approval and endorsement from the governing body of the HEIs. The process for obtaining regulatory approval for courses and programmes that address rapidly evolving domains of knowledge is one of the factors limiting content adaptation.

## **The Study Environment**

Alupe University (AU) is a public university in the Republic of Kenya. It was established through the Alupe University College Order 2015, Gazette Notice No. 163 of 24 July 2015 and was chartered on 2 August 2022.

AU is a science-focused institution, specialising in health, biomedical/biological, physical, computer, and agricultural sciences, but it also has programmes in education, business management, and hospitality and hotel management. It offers programmes at different levels, ranging from diplomas to master's degrees. Its current enrolment is 2,251 students.

The Commonwealth of Learning (COL) has been highly instrumental in guiding AU through the systematic establishment of TEL since 2022. During this period, COL facilitated a baseline study and published the study results (Asenahabi & Okumu, 2022), guided the development of a TEL policy at

AU, supported the faculty in building capacity to develop blended learning courses, and developed 20 blended courses. As part of a systematic approach to TEL implementation, COL has supported the following capacity-building workshops at AU:

- Policy Development for Technology-Enabled Learning
- Designing Blended Learning Courses Using Moodle
- Blended Course Development
- Facilitating Blended and Online Learning

## 2. Research Questions

This exploratory study was authorised by COL to answer the following questions in the context of the Alupe University learning management system (AlupeLMS) and evaluate the interventions supported by COL:

1. Is there any significant difference between students' learning performance in blended courses and non-blended courses?
2. Is there any significant difference in learner performance between genders?
3. Is there any significant relationship between learners' perceptions, motivation, digital literacy, attitude towards learning, and final grade in a blended course?
4. How do learners describe the effectiveness of the blended learning environment in their course of study?
5. What impact does a training and mentoring programme have on the teachers' experience of designing and teaching in a blended learning environment?

## 3. Literature Review

Following the rapid technological advancements necessitated by the Covid-19 pandemic, blended learning is gradually being embraced by higher education institutions (Cobo-Redon et al., 2022). Blended learning as a mode of delivery combines face-to-face lectures and e-learning, enabling learners to enjoy the advantages of both modes while also reaping benefits such as greater flexibility and reduced costs (López-Pérez, Pérez-López, & Rodríguez-Ariza, 2011). According to a study by Spring and Graham (2017), North America dominates in the use of blended learning, and most research on BL to date has been conducted in English-speaking countries.

The effectiveness of blended learning for enhancing learner academic performance has been hailed across multiple studies in different disciplines and age groups. It creates a better learning environment than traditional scenarios. A study by Tong, Uyen, and Ngan (2022) pointed out that blended learning has a positive impact on learner performance academically, increases student-teacher interaction, and improves learner self-study abilities and learning attitudes. This is in agreement with work by Prasad and colleagues (2018), who emphasised that blended learning brings flexibility to accessing course material, is cost-effective, and creates a conducive environment for learners to interact with instructors.

Several researchers have studied the effect of gender on blended learning performance (see, for example, Boyte-Eckis et al., 2018; Cai, Fan, & Du, 2017), yielding controversial results. For instance, female learners could perform better academically compared to male learners due to the former's persistence and commitment (Richardson & Woodley, 2003). The stronger self-regulation

expressed by female learners compared to male learners has been said to positively contribute to their better online learning performance (Alghamdi et al., 2020). Elsewhere, Nistor (2013) identified no significant gender differences in learning outcomes, and two other studies also revealed no difference between male and female learner performance in e-learning and blended learning (Kintu, Zhu, & Kagambe, 2017). A study by Harvey et al. (2017) found no significant gender difference in the satisfaction of online learners.

The effect of learners' perceptions and attributes on their blended learning performance has been investigated by several authors. For instance, Owston, York, and Murtha (2013) studied how learners perceived the blended learning environment with respect to their academic performance. The study revealed a significant relationship between learners' perceptions and their final grades. A study carried out by Vo, Zhu, and Diep (2017) to measure how effective blended learning is compared to traditional classroom instruction for learners in higher education uncovered a small but significant effect, suggesting blended learning could result in better learning performance for students in higher education.

A study by Zhao and colleagues (2021) investigated the influence of learner attitude, educational background, and gender on knowledge gain in a serious games-enhanced programming course. The results of the study revealed that the overall impact of the different blended learning activities had a positive effect on the learners' academic performance. Despite their perception that e-learning activities alone would not affect the students' final grades, the results revealed that these activities supported and complemented face-to-face classes and thus made a beneficial contribution towards the number of learners taking the final examination.

Alkiş and Temizel (2018) in their study about the impact of motivation and personality on academic performance in online and blended learning environments found no significant relationship between personality traits and the use of the learning management system. Darlis and Sari (2023) studied the effectiveness of blended learning by investigating the impact of students' characteristics and digital literacy on their performance. Their research revealed no significant relationship between learner characteristics or digital literacy and learner performance in blended learning. A study performed by Kintu, Zhu, and Kagambe (2017) identified predictors of blended learning effectiveness. Learner background and course design features were considered independent variables, while learner performance was a dependent variable. Multiple regression analysis results revealed that features of blended learning design such as technological quality, online tools, and face-to-face support, as well as learner characteristics such as attitude and self-regulation, predicted learner satisfaction.

It is essential to study the perception and satisfaction of students as a way of establishing the state of a blended learning environment (Naaj, Nachouki, & Ankit, 2012). Various studies have been performed to assess learners' perceptions about blended learning environments. Lu (2021) investigated students' perceptions of a blended learning environment designed to promote critical thinking. The study revealed that the students had positive perceptions of the blended learning environment and improved their critical thinking skills. A study by Bendania (2011) at King Fahd University of Petroleum and Minerals, in Saudi Arabia, investigated learners' attitudes and found they had a positive mindset about the blended learning environment.

Some studies, however, reported negative perceptions of the blended learning environment (Smyth et al., 2012). According to Sagarra and Zapata (2008), negative student attitudes towards the

blended learning environment can primarily be attributed to inadequate design.

## 4. Methodology

### 4.1 Research Approach

This study used a mixed-methods research design, with qualitative research gathering open-ended data without predetermined responses while quantitative research collected closed-ended data (Asenahabi, Busula, & Ronoh, 2019). To collect the quantitative data, the survey method was employed via a questionnaire. The qualitative data were collected from learners' responses to the open-ended questions in the questionnaire and faculty members' responses during interviews.

### 4.2 Target Population

The target population included 427 students who were enrolled in 12 blended learning courses offered during the August–December 2022 semester, plus 20 faculty members who had actively taken part in developing these courses. Some students were enrolled in multiple blended courses, leading to a student target population of 451. A total of 132 students voluntarily participated in the study, for a sample size of 29.3%. Fifteen of the faculty members participated in the interview process.

### 4.3 Data Collection

As described in section 4.1, the survey used closed- and open-ended questions to collect data from students. This study employed the questionnaire developed by Koneru (2019) and later adjusted by Bhagat et al. (2023). The questions addressed the students' experience with blended learning. Qualitative data from the faculty members were collected using individual interviews based on the work of Mishra (2017). The interview questions addressed their experience of designing and teaching a blended course.

### 4.4 Quality Control

Quality control for the questionnaire was achieved by subjecting it to both validity and reliability tests. Four questionnaire sections were used for data collection: Digital Literacy and Access to Technology (DLAT), Blended Learning Course Experience Survey, Course Interest Survey, and Attitudes Toward Thinking and Learning Scale. Apart from the demographic information, all the survey items were measured on a five-point Likert scale, with 1 signifying strongly agree and 5 signifying strongly disagree.

DLAT included three items, and the overall Cronbach's  $\alpha$  for DLAT was 0.778. The Blended Learning Course Experience Survey (BLCES) was adopted from an instrument developed by Koneru (2019) to measure learners' blended learning experience. A group of five experts validated the items in the BLCES. Principle component analysis (PCA) was carried out to examine the factor structure construct validity of the BLCES. The developed scale had three subscales containing 19 items: a nine-item Course Design subscale; a seven-item Learning Experience subscale; and a three-item Personal Factor subscale. The three factors of the BLCES had adequate reliability (Cronbach's  $\alpha$  = 0.746, 0.602, and 0.769 for Course Design, Learning Experience, and Personal Factor, respectively). The overall Cronbach's  $\alpha$  for the BLCES was 0.629.

The Course Interest Survey (CIS) was designed by Keller (2010) and contained 32 items. PCA was carried out to examine the factor structure construct validity of CIS. The developed scale had three subscales with 32 items: a 17-item Attention subscale; a ten-item Relevance subscale; and a five-item Confidence subscale. The three factors in the questionnaire had adequate reliability (Cronbach's  $\alpha = 0.756, 0.786, \text{ and } 0.535$  for Attention, Relevance, and Confidence, respectively). The overall Cronbach's  $\alpha$  for the CIS was 0.750. The Attitudes Toward Thinking and Learning Scale was developed by Galotti and colleagues (1999) and contained 20 items. The overall Cronbach's  $\alpha$  was 0.916.

Learners' scores for students who were enrolled in 12 blended courses offered during the August–December 2022 semester and 12 similar courses offered through the non-blended mode offered during the August–December 2021 semester were collected from the university's examination department.

## 4.5 Data Analysis

For the quantitative data analysis, descriptive data analysis was performed using frequency distributions, and the results are presented as percentages; inferential data analysis was performed using independent sample *t*-tests, a Pearson correlation coefficient, and a likelihood-ratio test (Asenahabi & Ikoha, 2021). For the qualitative data analysis, a word cloud was generated from cleaned transcripts of the faculty members' interviews. Afterwards, the transcribed data were analysed using an activity theory framework (Engestrom, 2000).

## 4.6 Ethical Considerations

To ensure that the respondents willingly took part in the study, the researcher sought their written consent before they filled out the questionnaires. The data gathered were treated with utmost confidentiality and used for research purposes only.

# 5. Results and Discussion

## 5.1 Demographic Information

The demographic information collected included the respondent's gender, age, and course being taken. Table 1 summarises the results. The gender distribution was males = 83 (63.4%), females = 49 (36.4%). Most of the respondents were below the age of 20 (57.6%), with 41.7% aged 21 to 25.

## 5.2 Impact of Mode of Learning on Learner Performance

An independent sample *t*-test was performed to compare the performance of learners in the non-blended and blended groups. Table 2 presents the sample *t*-test results for the students' final scores.

Based on the analysed data, there was a significant difference between the mean scores of the non-blended group ( $M = 57.47, SD = 10.056$ ) compared to the blended group ( $M = 60.06, SD = 9.860$ ); [ $t(258) = 2.114, p < .05$ ]. The calculated effect size (Cohen's *d*) is 0.620, which is considered a medium effect (Selya et al., 2012). This implies that learners studying through the blended mode of learning outperformed those studying through the non-blended mode.

**Table 1. Demographic information**

Measure	Category	Frequency	Percentage (%)
<b>Gender</b>	Female	48	36.4
	Male	84	63.4
	Total	132	100
<b>Age (Years)</b>	Below 20	76	57.6
	21-25	55	41.7
	26-30	1	0.8
	Total	132	100
<b>Course</b>	COM 320	18	13.6
	LIT 221	11	8.3
	EDF 111	11	8.3
	MLB 114	12	9.1
	BBM 122	4	3.0
	SPC 221	13	9.8
	GEO 221	15	11.4
	HIS 120	19	14.4
	BHM 421	3	2.3
	SBE 104	5	3.8
	STA 218	6	4.5
	MAT 400	15	11.4
	<b>Total</b>	<b>132</b>	<b>100.0</b>

**Table 2. Independent sample *t*-test for the final scores**

Group	<i>N</i>	Mean	SD	<i>t</i> -value
Non-blended	132	57.47	10.056	2.114*
Blended	126	60.06	9.860	

\* $p < .05$ ; SD = standard deviation

Looking at specific courses, there was a significant difference between non-blended and blended courses in the students' learning performance in one course (Population Geography), with the blended mode students displaying substantially better performance than the non-blended. In total, students taking the courses Principles of Accounting II, Ethics and Law, Population Geography, Introduction to African History Since 1884, Events and Convention Management, Business Communication, Introduction to Time Series Analysis, East African Oral Literature, Philosophy of Education, Medical Physiology, or Digital System Design via the blended mode performed better than those who studied through the non-blended mode. On the other hand, students in the non-blended Analytic Applied Mathematics course performed better than those who studied through the blended mode. Table 3 presents the mean, standard deviation, and *t*-value results for the learners' final scores in the blended and non-blended courses.

### 5.3 Relationship Between Learning Performance and Gender

To determine whether there was any statistically significant difference in the learners' performance based on gender, an independent sample *t*-test was performed. Based on the data analysis, there was no significant difference between the mean scores of the female learners ( $M = 60.37$ ,  $SD = 10.77$ ) compared to the male learners ( $M = 59.88$ ,  $SD = 9.35$ ); [ $t(132) = 0.274$ ,  $p = 0.785$ ]. Table 4 displays the results. This is in agreement with studies carried out by other researchers who sought to determine whether there is a gender-based difference in learning performance and found no

significant difference (Harvey, Parahoo, & Santally, 2017; Nistor, 2013).

**Table 3. Independent sample *t*-test for the final scores for different courses**

Course Name	Non-blended M (SD)	Blended M (SD)	<i>t</i> -value
Principles of Accounting II	56.00 (6.928)	61.25 (4.573)	1.265
Ethics and Law	58.00 (6.390)	62.54 (1.913)	1.294
Population Geography	54.53 (11.370)	64.93 (11.931)	2.444*
Introduction to African History Since 1884	59.95 (10.261)	62.89 (8.837)	0.975
Events and Convention Management	55.67 (14.012)	58 (10.149)	0.234
Business Communication	49.60 (10.714)	56.40 (8.173)	1.128
Introduction to Time Series Analysis	59.50 (7.369)	61.83 (4.070)	0.679
Analytic Applied Mathematics	56.60 (6.010)	53.20 (6.349)	1.506
East African Oral Literature	57.00 (6.245)	63.09 (11.476)	1.546
Philosophy of Education	60.73 (9.819)	62.18 (11.643)	0.317
Medical Physiology	56.50 (7.891)	57.67 (8.0)	0.359
Digital System Design	51.42 (8.317)	55.89 (9.10)	1.364

**Table 4. Independent sample *t*-test of final scores for each gender**

Group	N	Mean	SD	<i>t</i> -value
Female	49	60.37	10.77	0.274
Male	83	59.88	9.35	

## 5.4 Relationship Between Learners' Perceptions and Final Grade in a Blended Course

The five-point Likert scale (i.e., strongly agree, agree, neither agree nor disagree, disagree, strongly disagree) was collapsed into a three-category scale: agree (i.e., strongly agree and agree), neutral (i.e., neither agree nor disagree), and disagree (i.e., disagree and strongly disagree). The likelihood-ratio test was used to determine whether there was a significant difference between the proportions of agreeing, neutral, and disagreeing (Table 5).

**Table 5. Frequency of student responses to categorised questionnaire items**

Questionnaire Item	Agree	Neutral	Disagree	$\chi^2$
<b>DIGITAL LITERACY AND ACCESS TO TECHNOLOGY</b>				
My digital literacy skills (use of MS Office, browse the Web and navigate through the AULMS learning management system) are excellent.	129	3	0	169.360*
My access to and use of digital tools (laptop, smartphone) are excellent.	130	2	1	
My ability to access and use the AULMS learning management system is excellent.	129	2	1	
<b>Combined Score for Items</b>	<b>129</b>	<b>2</b>	<b>1</b>	
<b>BLENDED LEARNING COURSE EXPERIENCE SURVEY</b>				
<b>Course Design</b>				
The description of course objectives, learning activities and assignments in the online course was excellent.	130	2	0	158.775*
The expression of performance expectations for the course (e.g., in online forums, assignments and quizzes) was excellent.	130	1	1	
The instructor's overall organisation of the course was	127	5	0	



great.				
The continuity between face-to-face class and online learning was good.	126	5	1	
The pace of the course was user friendly.	128	3	1	
The lecturer's interest in my learning was good.	130	2	0	
The lecturer's feedback on assignments and quizzes and on my participation in the forums was very helpful.	127	4	1	
The lecturer's orientation on the use of online resources, activities and the AULMS learning management system was very helpful.	130	2	0	
Overall, the course experience was excellent.	130	1	1	
<b>Combined Score for Items</b>	<b>128</b>	<b>3</b>	<b>1</b>	
<b>Learning Experience</b>				
Multimedia resources on the AULMS learning management system enriched my learning experience.	129	3	0	155.587*
Communicating online with students and the lecturer improved my learning.	128	4	0	
Blended learning improved my time-management skills.	128	4	0	
Blended learning improved my digital literacy.	129	3	0	
Blended learning improved my performance in the mid-semester test and end-of-semester exam.	130	2	0	
Blended learning enabled me to learn at any time and any pace, from anywhere, using a device of my choice.	127	4	1	
Using the Moodle Classic mobile app for viewing/reading learning resources; interacting with faculty and peers in forums; and submitting assignments and quizzes were all satisfactory.	129	3	0	
<b>Combined Score for Items</b>	<b>128</b>	<b>4</b>	<b>0</b>	
<b>Personal Factor</b>				
I feel more anxious in this course.	18	58	56	164.711*
I have trouble using the technologies in this course.	7	69	56	
This course required more time and effort.	14	67	51	
<b>Combined Score for Items</b>	<b>13</b>	<b>65</b>	<b>54</b>	
<b>COURSE INTEREST SURVEY</b>				
<b>Attention</b>				
The instructor knows how to make us feel enthusiastic about the course's subject matter.	125	2	2	124.068*
My curiosity is often stimulated by the questions asked or the problems given on the subject matter in this class.	109	17	3	
The instructor creates suspense when building up to a point.	114	5	10	
The students in this class seem curious about the subject matter.	121	6	2	
The instructor does unusual or surprising things that are interesting.	124	3	2	
The instructor uses an interesting variety of teaching techniques.	122	6	1	
The things I am learning in this course will be useful to me.	116	11	2	
In this class, I try to set and achieve high standards of excellence.	119	7	3	
The content of this course relates to my expectations and goals.	125	4	0	
The students actively participate in this class.	121	7	1	

The personal benefits of this course are clear to me.	119	7	3	
It is difficult to predict what grade the instructor will give my assignments.	126	2	0	
As I am taking this class, I believe that I can succeed if I try hard enough.	118	6	4	
I get enough feedback to know how well I am doing.	115	10	3	
I have to work very hard to succeed in this course.	120	7	1	
I feel rather disappointed with this course.	119	6	3	
The amount of work I have to do is appropriate for this type of course.	118	9	1	
<b>Combined Score for Items</b>	<b>120</b>	<b>7</b>	<b>2</b>	
<b>Relevance</b>				
I do not see how the content of this course relates to anything I already know.	45	37	47	139.244*
This class has very little in it that captures my attention.	37	22	70	
I often daydream while in this class.	46	25	58	
I do not think I will benefit much from this course.	41	37	51	
I find the challenge level in this course to be about right: neither too easy nor too hard.	81	19	28	
I feel that the grades or other recognition I receive are fair compared to other students.	101	16	11	
I enjoy working on this course.	111	11	6	
I am pleased with the instructor's evaluations of my work compared to how well I think I have done.	124	3	1	
I feel satisfied with what I am getting from this course.	115	8	5	
I feel that I get enough recognition for my work in this course by means of grades, comments or other feedback.	113	12	3	
<b>Combined Score for Items</b>	<b>82</b>	<b>19</b>	<b>28</b>	
<b>Confidence</b>				
To accomplish my goals, it is important that I do well in this course.	107	16	6	150.343*
The instructor makes the subject matter of this course seem important.	111	13	5	
I feel confident that I will do well in this course.	118	9	2	
You have to be lucky to get good grades in this course.	122	3	3	
I feel that this course gives me a lot of satisfaction.	119	6	3	
<b>Combined Score for Items</b>	<b>116</b>	<b>10</b>	<b>4</b>	
<b>ATTITUDE TOWARDS THINKING AND LEARNING</b>				
I like to understand where other people are "coming from," what experiences have led them to feel the way they do.	122	4	0	131.633*
The most important part of my education has been learning to understand people who are very different to me.	124	2	0	
I feel that the best way for me to achieve my own identity is to interact with a variety of other people.	118	8	0	
I enjoy hearing the opinions of people who come from backgrounds different from mine — it helps me to understand how the same things can be seen in such different ways.	118	7	1	
I am always interested in knowing why people say and believe the things they do.	122	3	1	
I try to think with people instead of against them.	121	3	1	
I'm more likely to try to understand someone else's opinion than to try to evaluate it.	119	6	0	

I tend to put myself in other people's shoes when discussing controversial issues, to see why they think the way they do.	119	5	1
I can obtain insight into opinions that differ from mine through empathy.	121	4	0
When I encounter people whose opinions seem alien to me, I make a deliberate effort to "extend" myself into that person, to try to see how they could have those opinions.	120	4	1
In evaluating what someone says, I focus on the quality of their argument, not on the person who is presenting it.	119	5	1
I like playing devil's advocate — arguing the opposite of what someone is saying.	118	2	5
I find that I can strengthen my own position through arguing with someone who disagrees with me.	118	3	4
I often find myself arguing with the authors of books that I read, trying to logically figure out why they're wrong.	117	5	3
It's important for me to remain as objective as possible when I analyse something.	120	3	2
I have certain criteria I use in evaluating arguments.	118	6	1
I try to point out weaknesses in other people's thinking to help them clarify their arguments.	120	5	0
One could call my way of analysing things "putting them on trial" because I am careful to consider all the evidence.	120	3	1
I value the use of logic and reason over the incorporation of my own concerns when solving problems.	122	2	0
I spend time figuring out what's "wrong" with things. For example, I'll look for something in a literary interpretation that isn't argued well enough.	121	2	1
<b>Combined Score for Items</b>	<b>120</b>	<b>4</b>	<b>1</b>

\* $p < 0.05$

For the DLAT scale, the overall score showed a significantly higher proportion of respondents agreeing (97.7%) than disagreeing (0.75%), while (1.5%) were neutral.

For the BLCES scale, with respect to course design, the learning experience and the personal factor, course design and learning experience had more participants agreeing with the statements than disagreeing. However, the opposite was true for the personal factors, where 9.8% of the respondents agreed, 40.9% disagreed, while 49.2% were neutral.

For the CIS scale, the factor "attention" showed a significantly higher proportion of respondents agreeing (93%) than disagreeing (1.5%), but a sizeable number of learners (5.4%) were neutral in their view. The factor "relevance" also had significantly more learners agreeing (63.5%) than disagreeing (21.7%). These proportions were similar for "confidence," with significantly more students agreeing (89.2%) than disagreeing (3.0%), but (7.6%) expressed a neutral view.

For the Attitudes Toward Thinking and Learning Scale, the overall score showed a significantly higher proportion of respondents agreeing (96%) than disagreeing (0.8%), but a sizeable number of students (3.2%) were neutral.

The learners generally perceived blended learning in a positive manner, pointing out that blended learning enabled them to access the courses anywhere and at any time.

To establish whether there was any relationship between final scores and learner perceptions, a

correlation data analysis test was performed. Table 6 displays the results.

**Table 6. Inter-correlation among learners' perceptions, motivation, digital literacy, and scores**

	1	2	3	4	5	6	7	8
<b>Score (1)</b>	1							
<b>Digital Literacy (2)</b>	.097	1						
<b>Course Design (3)</b>	.066	.427**	1					
<b>Learning Experience (4)</b>	.027	.236**	.157	1				
<b>Personal Factors (5)</b>	.027	.158	.184*	.211*	1			
<b>Attention (6)</b>	.037	.166	.237**	.177*	.209*	1		
<b>Relevance (7)</b>	.019	.099	.012	.101	.303**	.206*	1	
<b>Confidence (8)</b>	.133	.106	.071	.016	.036	.285**	.368**	1

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

Based on the data analysis, there were significant relationships between the following:

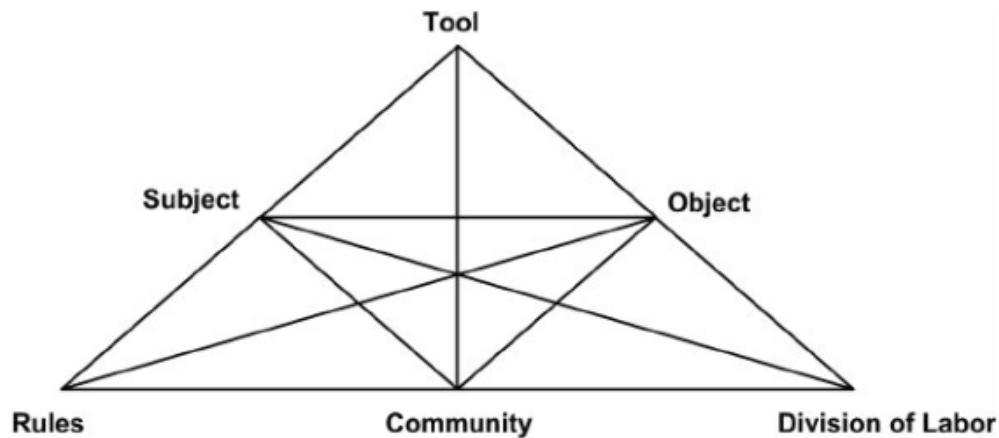
attention and course design	( $r = .237, p < .01$ )
attention and learning experience	( $r = .177, p < .05$ )
attention and personal factors	( $r = .209, p < .05$ )
confidence and attention	( $r = .285, p < .01$ )
confidence and relevance	( $r = .368, p < .01$ )
course design and digital literacy	( $r = .427, p < .01$ )
learning experience and digital literacy	( $r = .236, p < .01$ )
personal factors and course design	( $r = .184, p < .05$ )
personal factors and learning experience	( $r = .184, p < .05$ )
relevance and attention	( $r = .206, p < .05$ )
relevance and personal factors	( $r = .303, p < .01$ )

The analysed data showed no significant relationship between final scores and learner attributes. These results are in agreement with those of Alkış and Temizel (2018), who investigated the impact of motivation and personality on academic performance in online and blended learning environments and found no significant relationship between personality traits and academic performance. Darlis and Sari (2023) also studied the effectiveness of blended learning by investigating the impact of student characteristics and digital literacy on student performance, finding that neither set of factors had a significant impact on student performance in blended learning. In contrast, when Owston and colleagues (2013) conducted research to establish the relationship between learners' perceptions in a blended learning environment and their academic performance, they found a significant relationship between perceptions and final grades.

## 5.5 Effectiveness of the Blended Learning Environment

The survey contained a single open-ended question, intended to examine how the learners perceived the blended learning environment. Word cloud analysis was performed on the learners' sentiments as expressed in the responses. The first step was to clean the responses so that the key words could be picked out. Next, the data were uploaded to a word cloud generator using a CSV comma-delimited file. Finally, a word cloud output file was generated, assigning different sizes and colours to key words according to the number of times they appeared (Figure 1).





**Figure 2. Activity system triangle, based on Engeström (2000).**

The model is a representation of how the instructors perceived the professional training they underwent and the outcomes of the training. The different elements of the activity system are subject, object, tools, rules, community, and division of labour. *Subject* represents the faculty members who were trained. *Object* represents the intended output of the professional development training initiatives. *Tools* refers to the AlupeLMS platform, which the instructors used to develop and host their blended courses. *Rules* refers to the guidelines within the university's TEL policy. *Community* represents the instructors, trainers, Alupe University top management, technical staff, ICT Directorate, and others who attempted to make this training programme effective and successful. *Division of labour* refers to the time requirements, workload, and challenges the faculty members experienced while implementing blended learning. Using the activity theory framework, triads were developed to analyse the faculty members' interview data.

### 5.6.1 Subjects–Tools–Objects

The faculty members were satisfied with the BL course development training they underwent. The training familiarised the instructors with the different capabilities of the AlupeLMS, as some of them pointed out. For example, one indicated: "This training has equipped me with the skills necessary to come up with a quality blended learning course." Another stated: "I am now able to come up with a structured blended course." A third mentioned the training enabled him to comfortably generate his own videos to enrich the blended course. Notably, some faculty members had reservations about the technical infrastructure, with one pointing out: "The Internet access points should be increased to enable the students to access the AlupeLMS more frequently."

### 5.6.2 Tools–Rules–Division of Labour

The respondents commented that AU has an operational TEL policy, which was developed with the support of COL. The instructors also noted they are given technical support and are trained on a regular basis about how to offer blended courses. One stated: "AU is focused on improving the number of courses offered through the BL mode for every programme." As a way of motivating instructors to use the BL approach, the instructors were given awards to recognise their significant contributions to BL. Additionally, the instructors acknowledged how convenient the AlupeLMS was and that it saved them time. One respondent commented: "I can share with the learners, and it is easier to share enriched learning content with respect to what I want to teach them. I can also

prepare for my lectures at my convenience.”

### 5.6.3 Subjects–Rules–Community

The vice chancellor, deputy vice chancellor, and deans have ensured that AU has a conducive environment for faculty members to use BL mode in offering their courses. Additionally, the instructors worked together to come up with the e-learning content and helped each other as a team to come up with quality content as well as offer feedback to improve their courses. They also motivated their colleagues to adopt the BL mode of teaching by sharing their experiences of using BL. Notably, the TEL policy played a key role in promoting faculty awareness about BL.

### 5.6.4 Subjects–Community–Objects

Ongoing training for faculty members is required, as some of them have not yet embraced the BL mode of teaching. One respondent remarked: “There is a need to promote BL among all faculty members and offer BL training every academic year to the students.”

### 5.6.5 Objects–Community–Division of Labour

Faculty members agreed that collaboration is essential for generating quality blended courses. Collaboration can be in the form of working together to develop similar courses and giving peer feedback. As one respondent offered: “The lecturers can collaborate with others who are teaching similar courses in developing the blended courses. The lecturers can also collaborate by offering feedback to enhance the quality of developed courses.”

## 6. Conclusion

This study’s first research question was meant to establish whether there is an association between learners’ performance and their mode of learning. The findings showed that with the exception of one course, the learners studying through a blended mode of learning performed significantly better than those who studied through the non-blended mode.

The second question examined whether there was a relationship between the learners’ gender and their blended learning course performance. The results revealed that gender had no significant impact.

The third question sought to establish the relationships between learners’ perceptions, motivation, digital literacy, and final grades, with the aid of correlation analysis. The results pointed out that blended learning course experience played an important role in course interest. Digital literacy also played an important role in the learning experience and course design. However, learners’ perceptions had no association with their final score in blended learning.

The fourth question was concerned with learners’ sentiments about blended learning. Word cloud analysis showed that the learners had a positive blended learning experience. This demonstrated that blended learning is an effective approach for enhancing the learning performance and motivation of learners. Students found this mode of learning more convenient, flexible, and engaging.

The fifth question analysed the impact of training on the instructors’ experience of developing

content and teaching in a blended learning environment. An activity theory framework was deployed to analyse the qualitative data, yielding a model representing how the instructors perceived the professional training they had undergone and the outcomes of the training; this framework had six elements: subject, object, tools, rules, community, and division of labour.

## Recommendations

Based on the above findings, this study makes the following recommendations:

1. Faculty members need continuous training on the different technologies they can use to make blended courses more appealing and interactive.
2. Learners should be treated equally, regardless of gender, during their blended learning, as there is no significant difference in the course performance of females and males.
3. Learners should be provided with frequent technical support when using technology in their studies, since blended learning may be a new experience for the majority of AU's students. It is therefore recommended that when learners enrol in the university, they be briefed about the blended learning course structure and what will be expected of them.
4. Regular and immediate feedback should be provided to learners through the learning management system to foster their engagement in the courses.
5. Since learners expressed having positive blended learning experiences, more courses should be taught through the blended learning format.
6. The number of Internet access points at AU should be increased so students can access the LMS more frequently.

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