

Learner-System Interaction: Examining Learners' E-Learning Experience in Distance Education

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Abstract

Technology characterizes e-Learning for learner-system interaction, which supports the learner-content interaction, learner-instructor interaction and learner-learner interaction for learner retention. Therefore, the study sought to decipher the nature of learner-system interaction using Moodle LMS in Open, Distance and e-learning (ODEL), for a higher learning institution in Malawi. It further examined the learners' experiences with the technologies in learner-system interaction. The study employed a mixed-method, case study design for learners who belonged to two course modules in Agricultural undergraduate degree programmes, purposively selected because they utilised Moodle LMS. Using stratified proportionate random sampling from the two classes $N = 143$, a selected sample of $n = 104$ learners was obtained of which $n = 90$ voluntarily participated in the study. The present study focused on a 5-point Likert sub-scale survey of the learner-system interaction for quantitative analysis and open-ended questions for qualitative analysis of their experiences. The findings revealed that learners perceived moderate usability of Moodle in learner-system interaction based on their ability to use it for submitting assignments, and their proclaimed confidence of general use of the LMS. Additionally, learners seemed to perceive the usability of Moodle positively in terms of ease of use, flexibility and cost-effectiveness but reported challenges largely with internet access, but also lack of appropriate gadget and expertise amongst the factors that influenced the level of interactions. Overall, the findings demonstrated the viability of e-Learning in achieving basic assignments administration, but also weakened utilization for the other types of interaction as a result of limited internet access. The study findings inform distance education institutions of the significance of learner-system interaction, and for learners to have sound access to mediating technologies and internet.

Keywords

Learner-System Interaction, Interaction, Distance Education, E-Learning Experience

1. Introduction

Learner-system interaction is one of the key constructs of interaction for successful delivery of Open, Distance and e-Learning (ODeL). Introduced as learner-interface interaction by Hillman, Willis and Gunawardena (1994), the learner-system interaction defines the usability of technology in mediating Moore's three constructs of interaction. According to Moore (1989), the three constructs of interaction, namely; learner-content interaction (LCI), learner-instructor interaction (LII) and learner-learner interaction (LLI) define distance education.

Majority of institutions of higher learning in the world have implemented the ODeL mode to meet the demand for increased access to higher education (Mays, Combrinck, & Aluko, 2018). For Malawi, investing in human capital development through increased access to quality education is one of the key agendas of the Malawi 2063 vision (MW2063, 2020). This is in line with regional and international commitments such as the Southern African Development Community (SADC, 2020) and United Nations Sustainable Development Goals 2030, Education for All (UN-SDG, 2015). Accordingly, the Government of Malawi emphasized the use of ICT in distance education in its development goals for education (GOM, 2017). In essence, e-Learning constitutes use of ICT systems to achieve learning activities that include engaging with learning resources, discussion forums and e-assessments (Keskin & Yurdugül, 2022). According to Bashir (2019), e-Learning is multidimensional, comprising of the constructs of interaction. Nonetheless, high learner dropout continues to pose a challenge in the success of ODeL. Muljana and Luo (2019) asserted that dropout rates are considerably higher in ODeL as compared to traditional mode. For example, the dropout rates in South Africa in the year 2017, registered at 28.1% in distance education in second year of study, as compared to 10.3% in traditional mode (McKay, 2022). As a result of such challenges, there is risen interest in research surrounding this non-tradition educational mode (Greenland & Moore, 2022). Especially, many institutions are transitioning to blended learning in the post Covid-19 pandemic era (Si, 2022; Muzammil, Sutawijaya, & Harsasi, 2020; Kuo & Belland, 2016; Gameel, 2017; Weidlich & Bastiaens, 2018; Alqurashi, 2019). For the majority of those that considered the four types of interaction and satisfaction, their studies used self-reported survey questionnaire (Weidlich & Bastiaens, 2018; Nguyen, 2021). For example, Nguyen (2021) established a positive relationship between factors that create interaction on Learning Management System (LMS) and learner satisfaction based on self-reported learner

perception.

Even though many studies found a correlation between interaction and satisfaction, the current study aimed to verify these findings in a different context, adding to knowledge in the field. Particularly, the present study focused on learner-system interaction as critical in mediating interaction and learning in distance education. For this reason, the study attempted to provide an in-depth focus on the learner-system interaction by integrating self-reported survey and opened learner-perceptions. The study also sought to respond to Greenland and Moore (2022: p. 11) who identified “learner context and experience” such as constraints of learning resources, internet and systems usage as one of the main factors causing persisting dropout.

1.1. Statement of the Problem

In advocating for increased access to higher education, one of the public institutions in Malawi, Lilongwe University of Agriculture and Natural Resources (LUANAR) implemented ODeL mode. However, LUANAR faced high attrition rates, which stood at 51% in 2019 (LUANAR, 2019). Main reasons for such withdrawals remain unclear, but when construed on anecdotal evidence, some of the reasons include academic grounds, financial problems and dissatisfaction with the blended learning approach. Such being the case, the efforts made to increase access to higher education are undermined, when problems that lead to high attrition rates are not addressed.

Previous research indicated that LUANAR adopted Moodle LMS as an official platform for teaching and learning and management of formative e-assessments (Nyirongo & Sanga, 2018). The institution recognized the importance of this system and put in measures such as conducting relevant technical and pedagogical capacity building for instructors and learners, required in distance education (Nyirongo & Sanga, 2018). Considering the attrition problems and the strategies adopted, it is not clear how interaction on Moodle, particularly the learner-system interaction contributes to learner satisfaction as no known related studies have yet been conducted for this context. A previous paper by the same authors reported on facilitation of interactions in a blended programme (Nyirongo & Mbano, 2024), by exploring ways that instructors offered ongoing support in the distance mode of blended learning. However, this study considered the learners’ perception of the learner-system interaction.

1.2. Objectives of the Study

Primarily, the study sought to examine how the learner-system interaction on Moodle LMS supports types of interaction in blended learning. The specific objectives were to:

- Determine the learners’ perception of their experiences in usability of technology in learner-system interaction.
- Examine the benefits and challenges that learners experience in use of Moodle

for learner-system interaction.

2. Literature Review

2.1. E-Learning

E-Learning supports the distance mode of blended learning. Scholars have illustrated the blended learning model as the integration of face-to-face, distance and e-learning (Rasheed, Kamsin, & Abdullah, 2020). Allen and Seaman (2016) indicated the implementation of e-Learning in distance education as fully online delivery at 80% or above, and between 30% and 79% online in blended mode. According to Ghanem (2020: p. 1), e-Learning is an enabler of the attainment of the Sustainable Development Goal 4 (SDG4) for access to education through “diversification of learning opportunities and modalities to allow all youth and adults to develop knowledge, skills and competencies for decent work and life”. However, Zawacki-Richter and Qayyum (2019) asserted that the degree of adoption of e-Learning is higher in developed countries, whereas developing countries are lagging behind due to limited resources.

A study of Iraq public universities e-Learning was challenged by low internet bandwidth, lack of financial support, inadequate training in ICT, lack of technical support, inadequate ICT infrastructure, unclear implementation plans and policies, frequent power shortages, lack of ICT and e-learning literacy and lack of awareness, interest and motivation (Al-Azawei, Parslow, & Lundqvist, 2016). Innocent and Masue (2020), undertook a study to investigate the applicability of e-Learning in Tanzania. They noted that learners experienced insufficient bandwidth, internet costs, power blackouts, lack of computers and inadequate skills. In Malawi’s education institutions, similar experiences were observed (Kayange, 2019; MOEST, 2019).

The LMS has become the most popular, all-encompassing technology to meet most learning needs in e-learning (Baragash & Al-Samarraie, 2018). It allows hosting of learning resources such as lecture slides, interactive e-book, recorded lecture for learner-content interaction, while integration with other tools like virtual classroom, email, discussion forum drive the learner-instructor interaction and learner-learner interaction (Baragash & Al-Samarraie, 2018). Moodle is one of the most popular open source, LMS solution that registered 167,650 sites in 242 countries by 2022 (Moodle, 2022).

While Moodle provides many functionalities to support e-learning, other institutions are unable to reap its full benefits due to challenges of resources. For instance, Cao (2023) found that 100% of instructors and 90% of learners’ experienced unstable internet and ineffective integration of interactive e-lessons. In relation to LMS usage, researchers analysed log data as an element of interest in determining learner performance, interaction or other variables (Zacharis, 2015; Estacio & Raga, 2017; Darko, 2021). According to Estacio and Raga (2017), typical log data maintains a record of accesses to events by learners and instructors, and timestamp for each access with start time and end time.

2.2. Types of Interaction

Existing research demonstrates that the four types of interaction, namely learner-content interaction (LCI), learner-instructor interaction (LII), learner-learner interaction (LLI) and learner-system interaction are required in distance education, but the level of significance varies. According to Moore (1989), the LCI is the most significant type, in offering learners an opportunity to engage with content for self-directed study. Most research findings are in consensus with Moore's assertion (Kuo & Belland, 2016; Gameel, 2017; Alqurashi, 2019). It was ascertained that the interactions with content are activity bound, supported through tools such as "lesson, assignment, glossary, quiz, SCORM Package, survey and links" (Nguyen, 2017: p. 8).

It was perceived that the LII concerns facilitation of learning, tutoring and guidance and may extend to teaching in situations where learners struggle to do independent study (Dintoe, 2018). As a result, the LII occurs via various forms of mediating tools. A study by Çardak and Selvi (2016), used discussion forum feature on Moodle to tackle diverse topic activities. In another investigation by Kuo, Belland, Schroder and Walker (2014), video conferencing was utilized to facilitate synchronous LII as well as asynchronous interactions through blackboard LMS.

The LLI occurs when learners engage with each other, with or without support from the instructor, in a class or group setting (Moore, 1989). According to Çardak and Selvi (2016), LLI involves sharing of ideas, discussing topics, commenting, asking questions or simply providing guidance. Çardak and Selvi (2016) indicated that discussion forum is a popular method for mediating LLI. Nonetheless, the LSI supports the three types of interaction, the LCI, LII and LLI.

2.3. The Learner-System Interaction (LSI) for Mediating Interaction

The learner-system interaction characterizes e-Learning. According to Hillman et al. (1994), it concerns the usability of systems for mediating learning objectives. Wakil and Jawawi (2017), defines the attributes of the umbrella term "usability" as learnability, efficiency, memorability, error tolerance and satisfaction. While Huang, Chandra, DePaolo, Cribbs and Simmons (2015: p. 20), expands it as "knowledge of media use, choice of media use, usability, visualization and functionality". Sancar (2022), considered accessibility, usability, attitude, technological facilities and self-efficacy as key aspects in investigating technological aspects of distance education.

Weidlich and Bastiaens (2018) stated that LSI is relevant in studies of interaction considering the rapid software developments requiring user orientation on usage. They further argued that the other three types of interaction are less effective without the mediating LSI. Mensah, Mensah, Gyapong and Taley (2021), found that LSI as the most significant predictor of success of delivery of e-learning courses. In their new instrument, Huang et al. (2015) considered LSI, as an important measure for transactional distance.

Additionally, Keskin and Yurdugül (2022) suggested that features in the three

types of interaction including content and discussion forums and assessments, make up the components of LSI. Depending on a study context, the four types of interaction are significant as they are unique and distinct. According to Xiao (2017), all four types of interaction complement with each other in order to achieve desirable results. The literature review has established that LSI is instrumental in supporting the other forms of interaction in distance education.

3. Methods

3.1. Research Design

This study was part of a larger study on interaction in formative e-assessment: predicting learner satisfaction in blended learning for LUANAR. Nyirongo and Mbanjo (2024) reported the first part in a paper. The study utilized mixed-methods, case study design. Specifically, the study used triangulation design with quantitative Moodle log data and qualitative open-ended questions.

3.2. Study Context

The study investigated ODeL programmes delivery in a dual mode in higher learning institution that offered several programmes in conventional face-to-face and four programmes in Agricultural discipline offered in ODeL at the time of the study. There were 1460 registered learners in ODeL by 2020 (LUANAR, 2020). With guidance from an ODeL officer, the researcher identified two courses that utilized Moodle for management of assessment, in order to meet information rich data for the study. As a result, the unit of analysis consisted of i) first year, semester 2 Basic Science course module for learners across the four programmes (CLASS ODL1), ii) third year, semester 5 (CLASS ODL2) for a course in one programme of specialization.

The blended learning model adopted comprised of two-weeks, face-to-face residential facilitation session at the main campus, conducted at the beginning of the semester. The distance mode followed for the remainder of the semester with expected duration of 12 to 14 weeks. Pedagogically, the distance mode was independent study mediated by Moodle, which mainly hosted text-based lessons, PowerPoint slides, notes and complete downloadable module. The expectations of the course instructors were to administer at least two assignments per course and provide ongoing support to facilitate learning. While examinations were administered physically at Satellite Centers located in three regions of the country.

3.3. Study Sample and Participants

The reason for selecting the given sample comprising of two diverse classes, one with learners who had completed their first semester of their study and the other that was mid-way into their programme as already alluded to, was to provide a close representation of the perceptions of learners in ODeL in response to the objective of the study.

There were 102 active learners enrolled in Class ODL1, and 41 learners in Class ODL2. The study employed stratified proportionate random sampling. Thus, these formed the target population and the foregoing two groups of the population strata, $N = 143$:

$$N = (\text{Class ODL1} + \text{Class ODL 2})$$

$$102 + 41$$

$$N = 143$$

The sample size was calculated using a precision-based formula for small populations.

A sample size $n = 104$ was obtained using Windows 10, Microsoft Excel, and was deemed a reasonable sample size from the target population.

$$n = 1.96^2 * 0.5 * 0.5 * 143 / (0.06^2) * (143 - 1) + 1.96^2 * 0.5 * 0.5 = 104 .$$

Hence, the representative sample was selected from each stratum, using proportionate stratification, which constituted the required 104 participants. Following this, 74 participants were randomly sampled from class 1, and 30 from class 2 as the required sample:

$$\frac{102}{143} \times 104 \approx 74 \text{ Learners were selected from the First years in Semester 2, and}$$

$$\frac{41}{143} \times 104 \approx 30 \text{ Learners in semester 5.}$$

Therefore, the invitation to the targeted sample for the survey questionnaire was sent to 73% ($n = 104$) of the entire population of 143 learners. This number represented a statistically significant sample of the population obtained from the stratified random sampling calculation. In addition, the sample size fell within published tables. [Singh and Masuku \(2014\)](#) suggested that sample size can be obtained based on published tables that take into account “precision, confidence level and variability”, p. 11. For example, given population size $N = 150$, having a minimum sample size of 110 for ($\pm 5\%$) or 73% is acceptable. Consequently, a total of $n = 90$ participants voluntarily participated in the present study. Therefore, there was 87% of the required sample, and overall, 63% response rate of the entire population, falling within acceptable range. According to [Hong et al. \(2019\)](#), the recommended sample size for a quantitative study should be greater than 60%.

The demographic information of the sample ($n = 90$) indicated that male participants were 69 (77%), while females were 21 (23%). The majority of the participants were aged between 18 - 25 years (58%), followed by those aged between 26 - 36 years (36%) and few were aged 36 - 45 years (7%). In regards to the distance from nearest satellite center and where the participants lived, most lived close to the satellite center within 20 kilometers (34%), and a substantially high number lived the farthest 81kilometers and above (33%), the rest (14%) lived 21 - 40 km, (9%) lived 41 - 60 km and (9%) lived the farthest about 61 - 80 kilometers from the nearest satellite center. About 70 participants reported that they used smartphone for accessing Moodle, 23 participants reported to have used laptop, 7

participants used tablet, 4 participants used PCs available at satellite center and only 2 participants used Desktop PCs.

3.4. Data Collection Instruments and Procedures

The study administered an online survey questionnaire with a 5-point Likert scale and open-ended questions. Being part of the large-scale study, the questionnaire had four subscales of the four constructs of interaction and satisfaction as variables. The measures for the 5-point Likert scale represented 1 (strongly disagree) to 5 (strongly agree). For this study, the focus was on the Learner-System Interaction subscale in response to the research objective. In addition, the open-ended questions intended to find out what were the benefits and challenges of interaction in LSI. [Mudiamu \(2020: p. 87\)](#), asserted that open-ended questions are a rich source for “descriptions of thoughts and experiences from an emic perspective”.

The mixed methods research, in the main study employed triangulation design to establish both validity and reliability ([Nyirongo & Mbanjo, 2024](#)). According to [Farquhar, Michels and Robson \(2020\)](#) contended that triangulation of different methods helps to authenticate and increase the credibility of findings. The study participants agreed to participate in the study through an informed consent. In regards to confidentiality, codes replaced the actual identification information, namely Class ODL1, Class ODL2 for the two classes, and RSP1 to RSP90 for participants. In addition, the survey responses were set to anonymous.

3.5. Data Analysis

To determine the learners’ perception of their experiences in usability of technology in learner-system interaction, it was analyzed using two ways. First, using IBM SPSS version 29, descriptive statistics to obtain means and standard deviation was done in accordance with the research objectives of the current study, then item level analysis of the learner-system interaction sub-scale was performed where increasing rating of the mean score for an item confirmed increased level of satisfaction. The open-ended responses were coded and themed based on recurring responses for the LSI.

4. Findings

The findings of the study centered on; the learners’ perceived level of usability of Moodle in learner-system interaction, the benefits and challenges experienced in use of Moodle.

4.1. The Learners’ Perceptions of their Experience in Use of Technology in Learner-System Interaction

Findings show that the aggregate mean score for the learner-system interaction sub-scale was agree ($M = 3.65$, $SD = 0.64$), as indicated in [Table 1](#). According to [Pimentel and Pimentel \(2019\)](#), the 0.79 interval scale difference for 5-point Likert scale for mean (2.60 - 3.39) is neutral, (3.40 - 4.19) agree, and (4.20 - 5.00) as strongly agree.

Table 1. Learner perceptions of learner-system interaction.

S/N		1	2	3	4	5	<i>M</i>	<i>SD</i>
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)		
Learner System Interaction								
1	I am confident in my abilities to use Moodle	1 (1.1)	3 (3.3)	10 (11.1)	47 (52.2)	29 (32.2)	4.11	0.81
2	I was able to deal with most difficulties encountered when using Moodle	5 (5.6)	10 (11.1)	17 (18.9)	47 (52.2)	11 (12.2)	3.54	1.03
3	I was able to get ICT support from technicians when needed	5 (5.6)	6 (6.7)	16 (17.8)	38 (42.2)	25 (27.8)	3.80	1.09
4	I was able to access online guidelines for using Moodle	4 (4.4)	13 (14.4)	21 (23.3)	40 (44.4)	12 (13.3)	3.48	1.04
5	I received adequate training for use of Moodle	6 (6.7)	15 (16.7)	12 (13.3)	41 (45.6)	16 (17.8)	3.51	1.16
6	I am confident with steps required in assignment submission on Moodle	0	2 (2.2)	7 (7.8)	44 (48.9)	37 (41.1)	4.29	0.71
7	The Moodle website is always reachable whenever I connect to Internet to access it.	3 (3.3)	10 (11.1)	18 (20.0)	38 (42.2)	21 (23.3)	3.71	1.05
8	Access to a Computer with Internet was not a challenge	9 (10.0)	29 (32.2)	25 (27.8)	14 (15.6)	13 (14.4)	2.92	1.21
9	My experience with computers is adequate	4 (4.4)	16 (17.8)	21 (23.3)	33 (36.7)	16 (17.8)	3.46	1.11
10	Access to a smartphone with Internet is not a challenge	3 (3.3)	11 (12.2)	18 (20.0)	37 (41.1)	21 (23.3)	3.69	1.07
	Aggregate Score for LSI						3.65	0.64

Furthermore, it was noted that the majority of the learners strongly agreed that they were confident with steps required for assignments submission on Moodle ($M = 4.29$). In addition, majority of them agreed on items 1 - 5, 7, 9, and 10 ($3.41 < M < 4.20$), which included having: general ability to use Moodle, ability to address technical challenges by self, and through technical support, access to guidelines, reliable access to Moodle website, experience in use of computer and access to smartphone. The item which had low rating as neutral was on the opinion that access to a computer with Internet was not a challenge ($M = 2.92$).

4.2. Benefits and Challenges of Moodle LMS

Findings of qualitative data from open-ended questions helped to further discern the positive and negative learner experiences in use of technology for learner-

system interaction on Moodle. In the main study, themes were categorized on the four constructs of interaction, but this study focused on the learner-system interaction main theme from which four sub themes emerged as benefits and five sub themes were challenges as depicted in **Table 2**. Therefore, this study is limited in reporting of the findings to this effect.

Table 2. Benefits and challenges of moodle for learner-system interaction.

	Theme	Code	No of Responses
			(n = 90)
Benefits			
LSI			
1	Easy to use	EU	27
2	flexibility	FL	27
3	Cost saving	CS	14
4	Other benefits	OB	3
Challenges			
LSI			
1	Poor Network/Internet access	PN	71
2	Cost of Access to LMS	CI	30
3	Lack of appropriate gadget	AG	14
4	Limited of expertise of LMS	LE	10
5	Other technical challenges	OC	3

4.2.1. Benefits of Use of Moodle

The major benefits of use of Moodle observed in the study were easy to use, flexibility, followed by cost saving and other miscellaneous benefits.

1) Easy to use (EU) relates to the participants' experience on usability of the Moodle. 27 participants (30%) responded within this theme. For example:

"Easy submission of assignments, easy access of learning materials" RSP24

"Easy to access when network is reliable" RSP59

"It's simple and straight forward to manage" RSP25

2) Flexibility (FL) concerned the nature of distance learning such as convenience. 27 (30%) responses emerged. For example:

"E-Learning gives me time to continue my job and provide me time to continue my studies" RSP50

"This is a welcoming platform that allows access to resources and study materials including a few tutorials, and as seen by the Covid-19 e-learning was very effective and learning was undisturbed" RSP16

"It enables me to make my own plans, when to download materials and study" RSP84

3) Cost saving (CS) explains the potential of reduced costs because of the mode of learning, and was reported by 14 (16%) of the participants. For example:

“This minimizes my academic costs compared to costs I may encounter if I could use physical connection with satellite center” RSP54

“It minimizes wastage of resources and time” RSP55

“As long as you have internet, it saves transportation cost if submission was to be by hand” RSP52

4) Other Benefits (OB) had responses ranging from security and privacy from 3 (3%) participants. For example:

“For safety of assignment, it is a good platform” RSP39

“It provides security to the users” RSP71

“Secure and reliable” RSP 41

4.2.2. Challenges of Use of Moodle

The major challenges that the learners highlighted were poor network/internet access, cost of internet bundle, lack of appropriate gadget, limited expertise and other technical challenges.

1) Poor Network/Internet access (PN)

This challenge noted the experiences learners had with network coverage or quality of internet services to access Moodle, having 71 responses, from (79%) participants. Findings showed that the network/internet challenge was twofold:

Firstly, 60 participants reported that network is not optimal for access to Moodle platform due to poor quality Internet, such as:

“Somehow slow due to network problems in Malawi” RSP19

“Unreliable because it depends a condition of network” RSP70

Secondly, 11 respondents indicated poor network coverage in remote areas as an access challenge:

“As it is a network dependent, and due to network problems in the country especially those residing in remote areas, we miss important activities” RSP3

“It is a challenge to those of us from remote areas when it comes to internet connection” RSP36

2) Cost of Internet bundle (CI)

The theme indicated costs of internet, as was reported by 30 (33%) participants. For example,

“It becomes so costly when internet is not responding as required” RSP6

“High cost for internet bundles” RSP31

“Using internet is somehow expensive. It is costly to download and print learning materials on Moodle when you are running out of money” RSP76

3) Lack of appropriate ICT Gadget (AG)

This concerned access to compatible gadget for accessing Moodle, according to 14 participants (16%). About 7 participants specified lack of smartphone to access the LMS. For instance:

“Lack of smartphones and access to internet” RSP13

“Another point is smartphone I am using; you find that the phone battery is low while you’re using Moodle” RSP43

Whereas, others implied inability to own electronic gadget in general, either a smartphone or personal computer, for example:

“Those who don't have access to electronic gadgets cannot access Moodle that's a big challenge” RSP2

“It may not be possible for all student to own portable gadget to use at all times” RSP84

4) Limited of expertise in LMS (LE)

The theme covered skill level in using Moodle, where 10 (11%) of the participants indicated the need for appropriate training to use Moodle, as attested:

“Without proper training it just gets you confusing”. RSP16

“It becomes hard when not trained properly”. RSP37

About 5 participants perceived the importance of knowledge to use the LMS effectively. For example:

“It needs some expertise in its operations from both students and ICT technicians” RSP8

“Being a technological tool, it can become a challenge for some students who have hard time with technology” RSP18

5) Other Technical Challenges (OC)

Few of the participants, about 3 (3%) reported other technical challenges such as electricity problems:

“There are frequent blackouts.” RSP29

“It requires electricity in order to access information and therefore, the cases of blackouts it becomes risky too” RSP33

5. Discussion

The discussion of the findings is in terms of the learners’ perception of usability of technology in learner-system interaction, including the benefits and challenges they experienced in use of Moodle.

5.1 The Learners’ Perceptions of Their Experience in Use of Technology in Learner-System Interaction

Overall, the participating learners indicated a positive and moderate rating for learner-system interaction, further confirmed by the reported benefits and challenges of use of Moodle. It is clear that the aspect of usability for learner-system interaction on Moodle was supported, but with underlying barriers. The most highly rated item indicated that learners were able to achieve the designated purpose of Moodle in the course, which was dominantly for submitting assignments. Similarly, in other studies learners prioritized the LMS for assessment tasks (Estacio & Raga, 2017; Darko, 2021).

In addition, the findings highlighted learners’ confidence to use Moodle, suggesting that they were skilled enough to use it for course activities. This was

consisted with a study by Prifti (2022), who found a positive relationship of technological self-efficacy with learner satisfaction when they could comfortably use the LMS in their course. The majority of related studies have established that some classes tend to give priority to assessment tasks over learning resources, while others allocate more time to resources for their course design (Estacio & Raga, 2017; Darko, 2021).

Furthermore, findings showed some structures in place to facilitate usability of Moodle. This is evident from the multiple positive responses that demonstrated this in terms of self-efficacy with Moodle such the ability to self-address technical challenges, access to technical support and access to usage guidelines and computer literacy. However, the low and neutral rating regarding access to a computer with internet suggests a challenge that it posed on use of Moodle. This indicated that usability went beyond possessing knowledge and skills, but having good access to internet was critical. Thus in agreement with Prifti (2022), who determined that accessibility of the LMS was an important factor to consider besides confidence to use it, to access content and for promoting critical thinking.

5.2. Benefits and Challenges of Use of Moodle in Learner-System Interaction

The reported benefits highlighted ease of use, flexibility, cost effectiveness and also privacy and security. These findings indicate reasonable acceptance of the LMS in mediating access to learning resources and activities. The significant number of responses on ease of use of Moodle suggests that user friendliness of the LMS was one of the motivating factors to use it. This finding is related to a study by Annamalai, Ramayah, Kumar and Osman (2021), who found that ease of use highly influenced attitude for adoption of LMS.

The perceived flexibility of Moodle shows that learners were encouraged by the opportunities of distance learning mode to support asynchronous learning. This finding is consistent with other studies that established that learners were drawn to e-learning due to its flexibility and convenience to study at own pace and time (Phutela & Dwivedi, 2020; Bouilheres, McDonald, Nkhoma, & Jandug-Montera, 2020; Salleh, Azman, & Zahari, 2021). As for the cost-effectiveness brought about through use of Moodle, it implied saving on travel costs. Thus, helping to cushion the financial burden that would have resulted if they had to access education physically on campus. Phutela and Dwived (2020) noted similar findings in their study. Regarding the existence of security and privacy when they engaged with Moodle, that a few of the learner participants revealed, it meant that the learners perceived a level of trustworthiness of the LMS. Salimovna et al. (2019) stipulated that privacy and security are important attributes of LMS in the online environment.

While there were significant benefits of using Moodle LMS, the findings further revealed that the learner-system interaction presented a number of demands. These were mainly related to access to resources such as internet and ICT gadgets, expertise to use the LMS and others. It showed that internet and network access

challenges majorly affected learners, as reported by 71 (79%) participants, which is more than half. The finding validates the low rating about access to computer with internet obtained from the sub-scale. Additionally, it is an indicator that limited internet access has a bearing on effectiveness of e-Learning. This finding is consistent with other studies in similar context (Muhuro et al., 2021; Innocent & Masue, 2020; Reginard & Singano, 2017).

The findings exposed that cost of internet was a challenge, as reported by 33% of the participants. This agrees with the situational statistics indicating that despite reduced prices for data, low-income countries still had to bear unaffordable cost, having the 2-gigabyte data basket costing six times more than the global average cost (ITU, 2022). It was highlighted in another study that implementation of online learning at a University in Uganda, the cost of internet was one of the important areas for consideration due to the learner's socio-economic needs (Saphina et al., 2021).

Furthermore, the study considered the significance of user end gadget for learner-system interaction as part of the e-learning trajectory. A good number of participants, 16% reported the lack of appropriate gadget as either a PC or smartphone. Considering that 34% of the sample lived within 20 kilometers from their nearest satellite center meant that they had an opportunity to use PCs and Internet at the center. It also implied that about 66% who lived farther away had to fend for themselves regarding the technological aspect; hence, they likely experienced technical difficulties. Given the circumstances, it was found that the majority, 78% owned a smartphone for accessing Moodle, while only 4% used Desktop PCs from their satellite center, and laptop ownership was 26%, a relatively small number.

Despite that many learners perceived ease of use of the LMS, there were still those (11%) who indicated limited expertise. This meant that learners struggled to use the system effectively, which may have also led to low utilization. In light of other challenges, a few learners shared that they experienced electricity black-outs. Electricity is important not only to provide power to electrical equipment for day-to-day operations, but also the ICT gadgets needed for e-Learning. Kayange (2019) supported this concern, by asserting that in Malawi electricity is inadequate, unreliable, and is least available in rural areas where 80% of the population lives.

6. Conclusion

The present study aimed to determine distance learners' perception of usability of technology in learner-system interaction, including the benefits and challenges that they faced with the Moodle LMS. In conclusion, the findings of the study demonstrated the viability of e-learning implementation for a developing world context in achieving increased access to education through ODeL. Given the moderate usability of the LSI afforded by the Moodle LMS in terms of confidence levels, ease of use, flexibility and cost effectiveness, the findings clearly revealed that

learners were able to fulfil assignment tasks satisfactorily. Despite the perceived benefits of the LMS, the challenge of internet access experienced by the majority of the learners has the ability to weaken the LCI, LII and LLI and overall e-learning implementation.

Therefore, the findings portray the deficiencies of e-Learning in developing world context and serve as a reminder to distance education institutions not to disregard internet access for learners and facilitators; that capacity of technological resources is crucial in implementation of e-Learning. Current e-Learning systems integrate synchronous and asynchronous tools for learner engagement which are dependent on Internet connectivity. For this reason, developed countries are disadvantaged. Therefore, the current study recommends the development of sustainable and flexible e-Learning innovations. For example, the fully packaged interactive learning experience on advanced courseware like facility can be as an alternative to printed module and adaptive e-Learning systems for personalized access. In addition, it is worthwhile for distance education institutions in similar context to explore alternative solutions that can mitigate challenges of internet, such as offline and mobile technologies. The Ministry of Education must make deliberate efforts to make internet access for e-Learning accessible and affordable. Future research should investigate: i) the knowledge and skill level of learners in use of key features of the LMS; ii) Given that this study was limited to one course per participant for the two course modules, future studies should conduct a similar study targeting more courses and participants for generalizability.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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