



# Adoption and utilization of Moodle learning management system for emergency remote teaching: A UTAUT perspective

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**CITATION:** Korsah, D. P. (2024). Adoption and utilization of Moodle learning management system for emergency remote teaching: A UTAUT perspective. *Educational Point*, 1(2), e111.

## ARTICLE INFO

Received: 27 August 2024

Accepted: 5 December 2024

## OPEN ACCESS

## ABSTRACT

This study evaluates the adoption of Moodle learning management system (LMS) for emergency remote teaching during the COVID-19 era by colleges of education (CoE) teachers in Ghana. The research highlights the level of experience of CoE teachers in their use of e-learning applications as well as the factors that influence their acceptance of Moodle LMS within the Unified Theory of Acceptance and Use of Technology framework. Three research questions guided the study: 1. What is the level of experience of CoE teachers in the use of e-learning applications? 2. What is the influence of performance expectancy, effort expectancy, and social influence of teachers on their behavioral intention to use Moodle LMS? 3. What is the influence of Facilitating Conditions, Service Quality, and Behavioral Intentions on teachers' Use Behavior of Moodle LMS? The study used a descriptive cross-sectional survey approach to assess the experiences of CoE teachers in their use of e-learning applications as well as their behavioral intentions, and actual usage behaviors concerning Moodle. The quantitative approach was used to collect and analyze data. The findings reveal that social influence played the most crucial role in shaping educators' behavioral intentions towards using Moodle, while performance expectancy and effort expectancy have a lesser impact. The study highlights the need to prioritize the service quality of learning management systems in CoEs. This can include routine system updates, intuitive user interfaces, and effective technical support to provide a smooth experience for educators. Recommendations are provided to enhance the adoption and utilization of Moodle, emphasizing the need for targeted professional development and improved infrastructural support. Implications of the results for understanding Moodle LMS adoption in emergency remote teaching contexts are discussed.

**Keywords:** Moodle LMS, e-learning, emergency remote teaching, UTAUT model, colleges of education educators

# INTRODUCTION

In the year 2020, the COVID-19 interrupted the activities of educational institutions around the world. This compelled universities, colleges and some pre-tertiary institutions to transition to one form of online learning or the other (UNESCO, 2020). The adoption and effective implementation of e-learning applications, including learning management systems (LMSs) became necessary given the extraordinary circumstances, to ensure that teaching and learning continued without disruptions (Dhawan, 2020). Moodle is one of the widely used LMSs in Ghana. It provides critical support for the emergency remote learning activities that were instituted on the instructions of the government of Ghana in the midst of the pandemic (Dampson, 2021). Colleges of education (CoE) and other tertiary institutions were encouraged to use virtual tools like social media, video conferencing, educational web services like Google Classroom (or mini LMSs) as well as full-fledged learning management systems to engage in online teaching. This was intended to enhance the delivery of online teaching and learning to ensure that students had more interaction with teachers during the difficult times induced by COVID-19. The perceptions and behaviors of teachers in the use of e-learning applications such as Moodle LMS is key to ensuring its successful integration and effective utilization (Salloum et al., 2019). It is believed that, if the factors that influence teachers' acceptance and usage of these educational technologies are well understood, it will promote effective development of effective strategies and policies to support the integration of e-learning within educational institutions. According to the Unified Theory of Acceptance and Use of Technology (UTAUT) model, the preparedness of teachers to embrace e-learning technologies is mainly influenced by their perceived usefulness and perceived ease of use of the system. Other factors, including their level of digital literacy can also impact their adoption and continued use of these technologies (Venkatesh et al., 2003).

In order to shape teachers' attitude and behaviors towards the use of these applications, there should be a clear demonstration of the benefits of e-learning and what it offers. This can be achieved through a well-structured institutional support for e-learning programs (Pedro & Kumar, 2020). It is evidently clear that when the human factors that influence the adoption of e-learning are addressed, educational institutions can better facilitate the successful integration of e-learning and ensure its effective usage in the teaching and learning processes. This study seeks to investigate the extent of e-learning application usage, including Moodle LMS, among teachers in Ghanaian colleges of education during the COVID-19 pandemic. Additionally, it seeks to explore the influence of factors such as performance expectancy, effort expectancy, social influence, facilitating conditions, service quality, and behavioral intentions on teachers' adoption and use of Moodle LMS.

## Statement of the Problem

The sudden emergence of the COVID-19 pandemic revealed significant gaps in the adoption and use of digital learning platforms in educational institutions Meng et al. (2024), Brasca et al. (2022) which compelled a quick transition to emergency remote teaching and learning in educational institutions. The pandemic brought to light the inequalities in educators' competence and preparedness to deploy e-learning technologies for instruction (United Nations, 2020; Amarh, 2022). One of the main platforms used by educational institutions to deliver online courses during this period was the Moodle LMS (Gamage et al., 2022). But throughout this period, many difficulties surfaced such as inadequate technical knowledge of lecturers on online technologies including Moodle's features, which led to less engagements with students by lecturers which ultimately led to minimal student involvement and participation in some instances. The deployment of online technologies was further hindered by problems like lack of access to required devices, erratic internet availability, high cost of internet services, digital divide between rural and urban areas and a lack of technical support for students as well as lecturers (Adedoyin & Soykan, 2020).

These bottlenecks in the successful implementation of the emergency remote learning sparked worries about the implementation of e-learning in various institutions in Ghana with specific emphasis on the obstacles that

lecturers encounter in their bid to effectively utilize Moodle LMS and other e-learning technologies. Apart from the infrastructural and technical issues, other challenges related to the acceptance and adoption of e-learning systems are essential for a smooth online engagement. In order to understand the extent to which key factors influence Moodle's acceptance, it is essential to examine it through a technology acceptance framework like UTAUT. The UTAUT framework identifies key determinants; performance expectancy, effort expectancy, social influence, and facilitating conditions as affecting behavioral intentions. Behavioral intentions in turn affect users' acceptance of technology (Mulik et al., 2018). It is important to investigate how these factors, including the service quality of Moodle system interact to either facilitate or hinder the adoption of Moodle in the case of Ghanaian colleges of education. Moreover, the social dynamics within these institutions can significantly affect teachers' willingness to integrate e-learning technologies. An appreciation of these issues is important to developing well-tailored interventions that can enhance the effective use of Moodle LMS among CoE lecturers. To summarize, efforts to address the gaps in the adoption and acceptance of Moodle is important for equipping educators with the necessary tools and support to manage future crises which will require emergency remote engagement with students. This study aims to investigate the adoption of Moodle LMS within the UTAUT framework. The research is guided by the following research questions:

**RQ1:** What is the level of experience of CoE teachers in the use of e-learning applications?

**RQ2:** What is the influence of Performance Expectancy, Effort Expectancy, and Social Influence of teachers on their Behavioral Intention to use Moodle LMS?

**RQ3:** What is the influence of Facilitating Conditions, Service Quality, and Behavioral Intentions on teachers' Use Behavior of Moodle LMS?

Hypotheses:

**H0:** There is no significant difference between male and female teachers' level of experience in their use of Moodle LMS.

**H1:** There is a significant difference between male and female teachers' level of experience in their use of Moodle LMS.

## LITERATURE REVIEW

The adoption and use of Moodle LMS by lecturers in colleges of education in Ghana, especially for emergency remote teaching during the COVID-19 pandemic represents an important area of enquiry. The UTAUT model offers a robust framework to theoretically understand the key determinants influencing technology adoption and use such as performance expectancy, effort expectancy social influence and facilitating conditions (Dewi et al., 2023). The main constructs of the UTAUT model provide a strategic outline to explain how users come to adopt and use a technology (Shams et al., 2022). Performance expectancy refers to the perception that using a technology will enhance their job performance, making it an important factor for users to adopt a technology. Effort expectancy refers to the perception that a technology will be easy to use. Social influence addresses the degree to which individuals perceive that people who are important to them believe that they should use a technology, often shaped by peer pressure, institutional directives or societal norms. Facilitating conditions, which directly affect use behavior involves the resources and support available to users while they use a technology or an IT system. These involve access to infrastructure, technical assistance and training programs. While performance expectancy, effort expectancy and social affects behavioral intentions, facilitating conditions directly influences usage behavior (Venkatesh et al., 2003). Understanding these key factors can guide the design of targeted administrative interventions to galvanize the use and adoption of e-learning technologies including Moodle. The following sections focuses on e-learning adoption in tertiary education

context, focusing on the application of UTAUT in educational contexts and its relevance to Moodle LMS in Ghanaian colleges.

## Moodle LMS in Ghanaian Educational Context

Moodle, a popular open-source LMS, is a versatile and scalable platform that offers fully online courses as well as blended courses. With Moodle, educators are able to create more interactive learning environments with the help of modules that allows teachers to create assignments, quizzes, discussion forums and also have real time communication with their students. It has gained widespread acceptance among many students and teachers worldwide as a result of its user-friendliness, affordability and customization options; features that largely caters for institutional requirements.

Its usefulness and ease of use features has made it gain notable acceptance in higher education, Wichadee (2018) as it promotes active student participation and an engaging learning experience.

As part of initiatives to integrate ICT into teacher training, colleges and universities that specialize in education have found the integration of Moodle as one of the means to achieve quality teacher training in Ghana (Bervell & Arkorful, 2020). With Moodle, teachers are able to engage students in a virtual-classroom environment, providing flexibility in submitting assignments, increased access to course materials and in some cases assessment of content during the period of instruction. In Ghana, the successful implementation of e-learning is shaped by factors that influence technology acceptance including perceived usefulness and perceived ease of use of educators.

Other variables like available technical support and social influence have contributed to its widespread adoption in tertiary institutions. Recent research have highlighted that the perceptions and behaviors of teachers are important in the adoption of Moodle and other e-learning technologies (Husain et al., 2021). In line with technology acceptance theories, lecturers who find Moodle LMS to be advantageous and easy to use will be more inclined to use it. Facilitating conditions, which include institutional support like the availability of ICT infrastructure and effective professional development sessions in schools, is crucial for the ongoing success of Moodle in colleges and universities.

## Teachers' Perceptions and Behaviors towards E-learning Applications

The perceptions of teachers play a critical role in the acceptance and adoption of e-learning systems like Moodle LMS. According to the UTAUT model, two key determinants of user acceptance of technology – performance expectancy and effort expectancy significantly influence teachers' intentions to adopt and use educational technology. Research has shown that when students and teachers have positive perception of Moodle's ability to enhance teaching and learning, there is a better likelihood of their adoption of the LMS. For example, when educators believe the Moodle can improve their efficiency in online teaching and assessment, their intention to use the system intensifies (Bervell & Umar, 2017).

Furthermore, teachers who find Moodle easy to use and navigate would be more inclined to incorporate it into the semester teaching activities. A positive behavioral intention, however, does not always translate into actual usage. Facilitating conditions such as institutional support, access to reliable ICT infrastructure, unstable electricity supply, and ongoing professional development opportunities can either hinder actual use behavior. While many educators demonstrate favorable intentions towards adopting Moodle LMS, in the context of CoEs, challenges such as internet connectivity issues, limited digital skills of teachers, and lack of technical support for teachers often obstruct the effective use of Moodle (Quansah & Essiam, 2021). Finally, addressing these bottle necks are essential for enhancing the integration of Moodle LMS and other e-learning technologies in educational institutions, ensuring that positive intentions result in meaningful usage.

## Gaps in the Acceptance of Moodle Literature

In spite of the fact that existing research has examined the theoretical foundations and general trends in e-learning adoption in colleges and universities, there is the need for more research into specific factors that affect the acceptance and adoption of e-learning applications, especially Moodle LMS, among educators in the colleges of education in Ghana. One of the areas that have been largely overlooked is teachers' perception of the constructs that contribute to the acceptance of Moodle within the framework of UTAUT, with specific reference on the service quality of the LMS.

This study intends to enhance the ongoing discourse about the acceptance of Moodle through the UTAUT framework by incorporating the service quality construct into the model. As a result, this research will explore how the key constructs of UTAUT, performance expectancy (PE), effort expectancy (EE), social influence (SI) behavioral intention (BI), as well as how facilitating conditions (FC), service quality (SQ), and behavioral intention affect actual usage behavior (UB) with regards to teachers' engagement with the Moodle LMS.

## METHODOLOGY

### Participants

Three hundred and twenty-seven (327) teachers participated in this study that used the descriptive and confirmatory cross-sectional survey approach to find the factors that had influenced acceptance of Moodle LMS among CoE teachers. A cross-sectional study design is a type of observational study or descriptive research, that involves analyzing information about a population at a specific point in time (Simkus, 2023). The participants were selected using a multi-stage sampling technique. First, purposive sampling was used to select 12 colleges of education for the study. For the purpose of anonymity and ease of analysis, the colleges were coded from College A to College L. These colleges were chosen due to the proactive use of e-learning platforms to engage their students during the emergency remote teaching occasioned by COVID-19. Stratified random sampling was further used to select the teachers for the study. The stratification was based on the departments that the teachers belong to: Languages (N = 61), Sciences (N = 54), Social Sciences (N = 20), Mathematics/ICT (N = 54), Education (N = 108) and TVET (N = 74). A pilot study was carried out in a college of education with similar characteristics as the selected colleges.

### Instruments

Structured questionnaires made up of 57 questions were used for data collection. The instruments were developed by the researcher based on the objectives of the study, the UTAUT framework as well as literature review. The questionnaires were given to subject matter experts in technology acceptance and online teaching for their input. A 5-point Likert scale was used. There were five closed-ended questions and one open-ended question each for performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating condition (FC), service quality (SQ), behavioral intention (BI) as well as use behavior (UB). Content validity was established by pre-testing the instruments with fifty-three (53) teachers in a college with similar characteristics as the participating colleges. The questionnaires were made available to experts in the area of structural equation modelling (SEM) and technology acceptance research to assess its face and construct validity. Cronbach's Alpha was calculated on the various item sets of the questionnaire. The questionnaire had an average reliability of 0.81.

**Table 1.** Gender distribution of teachers

Gender	Frequency	Percent
Male	240	73.39
Female	87	26.61
<b>Total</b>	<b>327</b>	<b>100.00</b>

**Table 2.** Age distribution of teachers

Age	N	Percent
31–36	68	20.80
37–42	56	17.12
43–48	81	24.77
49–54	79	24.15
55 and above	43	13.15
<b>Total</b>	<b>327</b>	<b>100.00</b>

## Data Analysis

The data was analyzed quantitatively specifically using frequency distribution tables, t-test, correlation and regression analysis. Analysis of Moment Structures (AMOS) software package was used to model the influence of the independent variables on the dependent variables. Data was cleaned by removing errors, duplicates and incomplete responses. Frequency distribution tables were intended to address research question one, while the correlation and regression analysis were to address research questions 2 and 3.

## RESULTS

Frequency distribution tables were used to represent results for research question 1. Structural equation modelling (SEM) was used to present results for research questions 2 and 3. The modelling of the UTAUT and Service Quality constructs was done with the help of AMOS software.

### Background Information of Respondents

**Table 1** shows the gender distribution of teachers who participated in the study. As many as 73.39% were males while the rest (26.61%) were females. This is in conformity with statistics from Ghana Tertiary Education Commission, formerly, Ghana Accreditation Board which shows that there are more males (75.48%) as compared to females (25.52%) among the teaching staff of CoEs (National Accreditation Board, 2019).

From **Table 2**, it could be seen that most CoE teachers who participated in the study (24.77%) were between the ages of 43–48 years. This was followed by those between the ages of 49 to 54 (24.15%). Those who are 55 years and above were the least (13.02%).

### Level of Experience of Teachers with e-learning Applications

From **Table 3**, very few teachers (7.03%) said they were very experienced with the use of e-learning applications. The majority of them (55.66%) said they were experienced with the use of e-learning applications. This is followed by more than a quarter of the teachers who said they are neither experienced nor inexperienced. About 9.48% said they are inexperienced while 2.45% felt they are very inexperienced.

**Table 3.** How experienced teachers are with the use of e-learning applications

Level of experience	N	Percent
Very experienced	23	7.03
Experienced	182	55.66
Neither experienced nor inexperienced	83	25.38
Inexperienced	31	9.48
Very inexperienced	8	2.45
<b>Total</b>	<b>327</b>	<b>100.00</b>

**Table 4.** Regression weights (Group number 1 – Default model)

Dependent variable	Independent variable	Estimate	S. E.	C.R.	P
BI	← PE	.215	.129	1.659	.097
BI	← SI	1.000			
BI	← EE	.166	.122	1.363	.173
UB	← SQ	.381	.086	4.429	***
UB	← BI	.360	.051	7.095	***
UB	← FC	.568	.096	5.896	***

**Table 5.** Standardized regression weights (Group number 1 – Default model)

Dependent Variable	Independent Variable	Estimate
BI	← PE	0.140
BI	← SI	0.587
BI	← EE	0.115
UB	← SQ	0.269
UB	← BI	0.408
UB	← FC	0.376

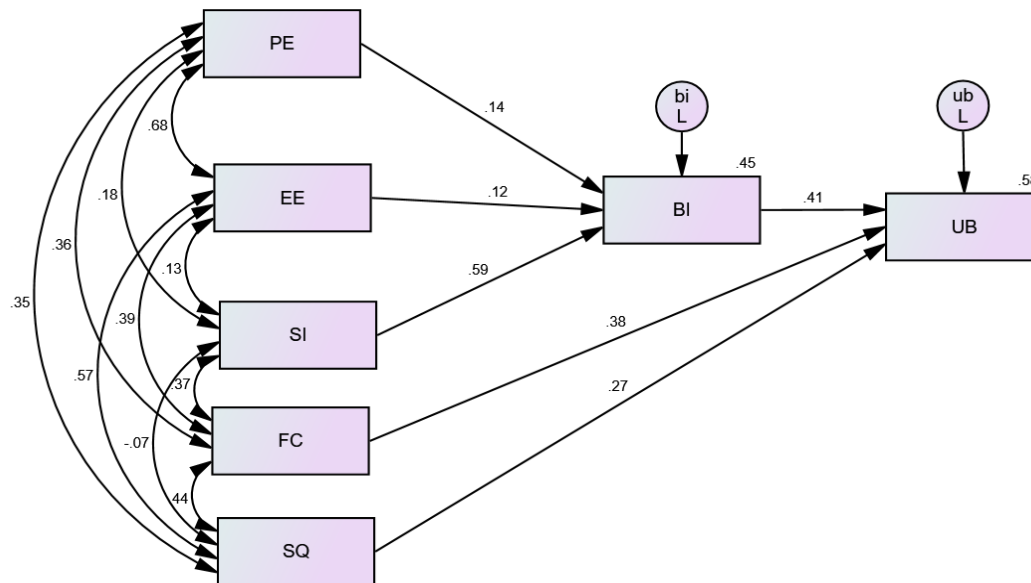
**Table 6.** Correlations (Group number 1 – Default model)

Independent Variable	Independent Variable	Estimate
PE	↔ EE	.676
SI	↔ EE	.130
SI	↔ FC	.373
SQ	↔ FC	.438
PE	↔ SQ	.349
SI	↔ SQ	-.073
SQ	↔ EE	.574
EE	↔ FC	.389
PE	↔ FC	.365
PE	↔ SI	.181

## Regression Statistics of Moodle LMS Acceptance among CoE Teachers

The regression statistics showed positive values of very low to high influence of the independent variables (performance expectancy, effort expectancy, facilitating conditions, social influence and service quality) on the dependent variables (behavioral intention and use behavior) among teachers. The influence of the independent variables on the dependent variables is presented in **Table 4** and **Table 5**.

Analysis of **Table 5** and **Table 6** shows a very weak influence of performance expectancy on behavioral intention (PE → BI,  $R^2 = 0.14$ ). This implies an increase in performance expectancy by a factor of 1 result in an increase in behavioral intention by a factor of 0.14. Another very weak influence was found of effort expectancy on behavioral intention (EE → BI,  $R^2 = 0.12$ ). The study also found a medium to substantial influence of social influence on behavioral intention (SI → BI,  $R^2 = 0.59$ ). Social influence had a moderately strong influence on behavioral intention of teachers to use Moodle LMS. A weak to moderate influence of facilitating conditions



**Figure 1.** Resultant model of Moodle LMS adoption among CoE teachers for emergency remote teaching

was found on use behavior ( $FC \rightarrow UB$ ,  $R^2 = 0.38$ ). A weak influence of service quality was found on use behavior ( $SQ \rightarrow UB$ ,  $R^2 = 0.27$ ). This implies an increase in service quality by a factor of 1 result in an increase of use behavior by a factor of 0.27. A medium influence of behavioral intention was found on use behavior ( $BI \rightarrow UB$ ,  $R^2 = 0.41$ ). This implies an increase in behavioral intention by a factor of 1 result in an increase in use behavior of Moodle LMS by a factor of 0.41 among teachers.

## Correlation Analysis of Teachers' Acceptance of Moodle LMS

Correlation analysis was conducted to determine the weights of the relationships between the constructs that influence teachers' acceptance and also to determine if there is multicollinearity among the independent variables.

**Table 6** shows negative, weak and medium correlations among the independent variables in the resultant model of Moodle LMS acceptance among teachers. The correlation between performance expectancy and effort expectancy among teachers was found to be 0.68 ( $PE \leftrightarrow EE = 0.68$ ). Social influence had a very weak relationship with effort expectancy ( $SI \leftrightarrow EE = 0.13$ ). The relationship between social influence and facilitating conditions was weak ( $SI \leftrightarrow FC = 0.37$ ). Service quality had a medium correlation with facilitating conditions ( $SQ \leftrightarrow FC = 0.44$ ). A weak correlation was found between performance expectancy and service quality ( $PE \leftrightarrow SQ = 0.35$ ). A negative correlation was however found between social influence and service quality ( $SI \leftrightarrow SQ = -0.07$ ). Service quality had a medium correlation with effort expectancy ( $SQ \leftrightarrow EE = 0.57$ ). Effort Expectancy and performance expectancy were weakly correlated with facilitating conditions ( $EE \leftrightarrow FC = 0.39$ ), ( $PE \leftrightarrow FC = 0.36$ ). Finally, a very weak correlation was found between performance expectancy and social influence ( $PE \leftrightarrow SI = 0.18$ ). **Figure 1** shows the resultant model of Moodle LMS adoption among CoE teachers during the emergency remote teaching occasioned by COVID-19.



**Table 7.** t-test-two-sample assuming equal variances

	Male	Female
Mean	3.5958	3.4483
Variance	0.8694	0.4130
Observations	240	87
Pooled Variance	0.7487	
Hypothesized Mean Difference	0	
df	325	
t Stat	1.3627	
P(T<=t) one-tail	0.0870	
t critical one-tail	1.6496	
P(T<=t) two-tail	0.1739	
t critical two-tail	1.9673	

## Model Validation: Regression and Multicollinearity

In validating correlation in structural equation modelling, Hu et al. (2020) believe that in simulation models with multiple correlated outputs, not only the uncertainty of the responses but also the correlation between them needs to be considered. Multicollinearity happens when independent variables in the regression model are highly correlated to each other (Wu, 2020). Multicollinearity (or collinearity) is a statistical phenomenon in multiple linear regression analysis where two (or more) independent or predictor variables are highly correlated with each other, or intercorrelated. The presence of multicollinearity violates one of the core assumptions of multiple linear regression analysis. When the model is multi-correlated, the predicted regression coefficients are not reliable anymore (Morrison, 2003). The resultant model of quality and acceptance of Moodle LMS among teachers is not multi-correlated. The model is thus fit for purpose and can thus be used to predict teachers' acceptance of Moodle LMS in colleges of education.

## Hypothesis Testing

- H0:** There is no significant difference between male and female teachers' level of experience in their use of Moodle LMS.
- H1:** There is a significant difference between male and female teachers' level of experience in their use of Moodle LMS.

The computed t-statistics value of 1.363 presented in **Table 7** is lower than both the one-tailed critical value of 1.650 and the two-tailed critical value of 1.967. It can thus be concluded that the difference in means between males and females is not enough to warrant statistical significance. The one-tailed P value of 0.087 exceeds the standard alpha value of 0.05. This implies that the difference in means is not statistically significant at the 5% level when considering a specific direction (like males having a higher mean). Likewise, the two-tailed P-value of 0.174 is also greater than 0.05. This reinforces the conclusion that the difference in means between males and females is not statistically significant in that direction as well. The t-test results imply that there is a difference in the mean scores. The mean score for males is 3.596 while that of females is 3.448, and this lacks statistical significance. In the light of the foregoing, the null hypothesis is rejected, which suggests that any difference observed between male and female means could likely be a result of random variation rather than an actual effect. Thus, it can be concluded that there is no significant difference in the experience levels with regards to the use of Moodle LMS between male and female teachers.

## DISCUSSION

The aim of the study was to evaluate the adoption and utilization of Moodle LMS among college of education lecturers during the COVID-19 emergency remote teaching in the context of UTAUT. The results show that the majority of the teachers (55.66%) in colleges of education view themselves as experienced in the use of e-learning applications. This reflects a positive trend in the integration of virtual tools among lecturers. That notwithstanding, a good number of teachers (25.38%) reported being neither experienced nor inexperienced, suggesting a moderate level of competence they might have acquired as a result of different levels of exposure and training. Furthermore, just 9.48% of teachers admitted to being inexperienced, suggesting that ongoing ICT training and technical assistance may be necessary to promote increased involvement in e-learning initiatives at educational institutions. Approximately 7.03% of respondents rated themselves as highly experienced, whilst 2.45% rated themselves as highly inexperienced. The possibility that educators will integrate digital technologies into their teaching methods can be influenced by their self-learning and ongoing professional development, according to prior study (Al-Emran et al., 2016; Tondeur et al., 2017). In order to improve teachers' confidence and proficiency with e-learning platforms and, eventually, improve student learning results, these findings highlight the necessity of continual professional development. The t-test results shed light on the gender-related concerns related to instructors' adoption of e-learning technologies. The findings indicate that male and female teachers in CoE have similar levels of experience, despite the perception of some educators that one gender may have more expertise or be more adept at using digital tools than the other. These results are consistent with similar studies that revealed that the use of technology in education is not always associated with traditional gender stereotypes (Qazi et al., 2022; Korlat et al., 2021; Beroiza-Valenzuela & Salas-Guzmán, 2024). Furthermore, the fact that there is no discernible gender difference in the use of Moodle LMS implies that male and female teachers face comparable difficulties or possess comparable levels of proficiency.

It is therefore important that training and development strategies aimed at promoting the adoption of Moodle LMS should focus on comprehensive initiatives that aim at assisting all teachers, irrespective of gender, rather than targeting specific groups. The similar level of competence also imply that future research could investigate other variables that influence LMS acceptance such as age, teaching experience and exposure to technology Venkatesh et al. (2003) which may provide deeper insights into diverse levels of Moodle LMS adoption among CoE lecturers. The study also showed a weak influence of performance expectancy and effort expectancy on teachers' behavioral intention to use Moodle LMS, suggesting that the perceived usefulness and ease of use of the platform have limited influence on their intention to adopt the system. This finding is contrary to the assertion that the key determinants of UTAUT that puts performance expectancy and efforts expectancy as the main determinants of technology acceptance (Davis, 1989; Venkatesh et al., 2003). The minimal impact of these factors might imply that their decisions to utilize the Moodle LMS are not primarily driven by considerations of the system's performance or the effort required to use it. The less prominent impact of these factors might be due to the fact that their decisions to use Moodle LMS are not primarily driven by considerations of the system's usefulness and user friendliness.

Social influence's stronger effect might be as a result of the fact the Moodle LMS was recommended for use by affiliate universities of the CoEs under study. Beyond the system's functionality and performance, teachers' intents to use the Moodle LMS are greatly influenced by the attitudes and opinions of their peers, colleagues, and supervisors. However, social factors had a moderate impact on CoE professors' behavioral intention to utilize Moodle LMS, according to the study. This finding supports previous studies that found social influence to significantly affect behavioral intentions (Guetz & Bidmon, 2022; Khatimah et al., 2019; Lai, 2017). Additionally, the analysis found a weak to moderate influence of facilitating conditions on teachers' actual use behavior of Moodle LMS. This finding is consistent with Cavus et al., (2021) who found facilitating conditions to have a positive influence on behavioral intention to use LMS in Nigeria during the COVID-19 era. The findings

imply that the availability of necessary resources, technical support and infrastructure has a positive effect on actual usage of Moodle LMS usage.

Furthermore, the study discovered that service quality positively affects usage patterns, which is consistent with other research showing that service quality improves user happiness (Liao et al., 2022; Supriyanto et al., 2021). This finding suggests that although service quality and facilitating conditions are important considerations, they did not impact lecturers' Moodle LMS usage patterns as much as social influence during the COVID-19 emergency remote teaching. The study also found a moderate effect of behavioral intention on teachers' use behavior with regards to Moodle LMS, indicating that teachers' likelihood or intention to use the system is a significant factor in their actual use behavior of Moodle. This gap suggests the presence of intervening factors such as access to resources, institutional support, or individual confidence levels that either facilitate or hinder actual use. To bridge this gap, it is critical to strengthen the link between intention and behavior by addressing practical barriers and reinforcing positive experiences with the platform. Providing adequate training, technical support, and incentives for consistent use can enhance teachers' commitment to integrating Moodle into their daily teaching practices. In a related study, (Lavidas et al., 2023) discovered that instructors' behavioral intention to use Moodle was moderately influenced. The likelihood that a person would actually use the Moodle learning management system is known as behavioral intention, and in the context of this study, it is influenced by social factors.

In a nutshell, these discussions highlight the complex interplay of factors that influence the adoption and use of Moodle LMS among CoE lecturers. It must be noted that while performance expectancy and effort expectancy have a limited influence on behavioral intention, social influence exerted a stronger influence on lecturers' intention to adopt Moodle LMS in the context of the emergency remote teaching occasioned by COVID-19. Furthermore, facilitating conditions and service quality had a less powerful effect in determining the use behavior of Moodle LMS among lecturers.

## Recommendations

In order to improve CoE lecturers' adoption of Moodle LMS for future integration into teaching and learning, the following recommendations are made: First, to effectively promote the adoption of Moodle among lecturers, it is crucial to design comprehensive training sessions that are intended to promote the performance expectancy and effort expectancy by highlighting the systems potential to improve teaching outcomes and simplify instructional tasks. In addition to introducing Moodle's technical features, the training sessions ought to show off how it may be used in actual educational environments. The focus should be on highlighting LMS features that promote student engagement and simplify administrative duties for lecturers, such as resource sharing, interactive assessments, communication tools, and course organization. By offering real-world, empirically supported examples of Moodle LMS adoption success in comparable educational settings, case studies can further increase the training's impact. These studies ought to describe how organizations or specific instructors overcame obstacles to successfully include Moodle into their instructional strategies. For instance, they could illustrate how Moodle features, like quizzes, forums and blogs have improved students' participation or how automated grading systems have reduced administrative burdens on lecturers. By aligning the training content with lecturers' specific needs and experiences, these sessions can create deeper appreciation of Moodle's value and its potential to improve the teaching and learning process.

The study also shows that lecturers' usage behavior is moderately impacted by service quality and enabling conditions. Therefore, it should be a top priority to enhance the Moodle LMS's facilitating conditions and service quality. Regular system updates, intuitive user interfaces, and effective technical support are all necessary to improve service quality and guarantee a smooth experience for educators. Establishing avenues for user input can also help with ongoing evaluation and improvement of the caliber of services supplied. Improving facilitating conditions involves the provision of enhanced technical infrastructure like reliable

internet access for both students and lecturers as well as ensuring device accessibility. Additionally creating a dedicated help desk to provide continuous 24/7 technical support to resolve students' and lecturers' issues promptly is important. Given that behavioral intention exerts a medium influence on actual usage, it is advisable for institutions to reinforce this through focused awareness campaigns. These efforts could highlight the advantages of utilizing the Moodle LMS, such as improved teaching efficiency and enhanced student learning outcomes. Showcasing successful case studies from within the institution can further strengthen teachers' intention to adopt and engage with the system.

## CONCLUSIONS

Based on the research findings regarding the adoption and use of the Moodle LMS among educators in Ghanaian colleges of education during the COVID-19 pandemic, the following conclusions are made: A considerable number of teachers expressed varying levels of experience with e-learning applications. Their study found social factors to significantly affect teachers' intentions to adopt Moodle LMS in the midst of COVID-19 emergency remote teaching and learning. This brings to the fore the need for collaborative platforms where educators can share their experiences and support one another in the bid to inculcate a greater use behavior of Moodle LMS and other e-learning applications. The study highlights that facilitating conditions including availability of IT resources and technical support, have moderate influence on use behavior, emphasizing the need for improvements in this area.

The findings reveal that performance expectancy and effort expectancy have a limited effect on behavioral intention. This suggests that promoting the advantages of Moodle alone may not suffice; rather, a more holistic approach is required that includes addressing the external and contextual factors influencing adoption. The results also showed a limited effect of performance expectancy and effort expectancy on behavioral intention, highlighting the need for a holistic approach in addressing the external and contextual factors influencing adoption instead of focusing on promoting the advantages of Moodle alone. Service quality was found to exert a moderate influence on usage behavior, implying that improving service quality of the Moodle platform can lead to enhanced user experience and increased engagement among educators.

Finally, a moderate influence of behavioral intention was found on use behavior. This indicates that while teachers may express willingness or plan to use Moodle, their intentions do not always translate into consistent or effective usage. In conclusion, a comprehensive approach, addressing social support, facilitating conditions, service quality and targeted continuous professional development is required for the effective adoption of Moodle LMS among lecturers in Ghanaian colleges of education. Colleges of education can create a more engaging and interactive use of Moodle LMS when they focus on these all-important areas.

## Implications for Future Studies

More research on the adoption and utilization of the Moodle LMS for COVID-19 emergency response teaching by Colleges of Education teachers in Ghana could explore a variety of areas: One of the significant aspects would be to investigate the long-term impact of Moodle adoption on teaching practices and student learning outcomes. Additionally, examining the barriers and challenges teachers face in their use of Moodle, and how they navigate these obstacles could provide valuable insights for implementing LMS in the future. The differences in Moodle implementation across the campuses of the various tertiary educational institutions could be another subject of research. Finally, comparative research between Moodle and other LMS platforms could provide a wider scope and better appreciation of best features and practices for improvements in virtual education especially in emergency contexts.

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