The use of learning management system (LMS) moodle in the midst of covid-19 pandemic: Students’ perspective

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1. Introduction

The outbreak of Covid-19 in 2020 across the globe has caused lockdown of most countries borders and public institutions including schools. The lockdown was done to limit the spread of the infection across countries and also cities. Restricting human movements to help prevent the spread of the infection were lessons drawn from previous pandemic outbreaks. In 2009, the city of Oita, Japan successfully decreased the number of infected students during the peaking of the H1N1 Flu pandemic (Kawano & Kakehashi, 2015). Davis, et al. (2015) revealed that closure of schools in UK interrupted the course of infection of the Swine Flu outbreak in 2009. The closure of schools and public institutions reduced the spread and also bought time for research and production of vaccines. Closure of schools could be national, regional and local in response to infection rates. Over 107 countries implemented national school closure in relation to Covid-19, affecting 862million children and young people (UNESCO, 2020). Although closing down of schools may help curb the spread of Covid-19, the challenges and consequences it has brought is numerous. School closure does not only affect students, teachers, and families, but have far-reaching economic and societal consequences, (Lindzon, 2020).

Some economic and social challenges and consequences identified are interrupted learning of children, poor nutrition among children, confusion and stress for teachers, parents unprepared for distance and home schooling, challenges creating, maintaining and improving distance learning, gaps in childcare by working mothers, high economic costs, unintended strain on health-care systems, rise in school dropout rates,
increased exposure to violence of children and sexual exploitation of female girls, social isolation and challenges measuring and validating learning (UNESCO, 2019). These challenges and consequences made governments all over the world to worry about the extent of the devastation of this outbreak on their economy and education. Education, the core of development, needs to be sustained to ensure future economic growth. Therefore it is imperative that teaching and learning must continue in the midst of Covid-19 and school closure.

For teaching and learning to go on, the Government of Ghana through the Ministry of Education charged all levels of educational institutions including the Universities to roll out various e-Learning programmes. The University of Education, Winneba introduced the Learning Management System (LMS) Moodle as a replacement to the traditional face-to-face classroom. Moodle is an acronym for Modular Object-Oriented Dynamic Learning Environment. The LMS is a course management system through the internet. The Moodle is free and has no licensing cost attached (Brandle, 2005; Su, 2006) and runs on the major platforms of Windows, Mac OS X, Linux and Unix (Wu, 2008). The rolling out of the LMS to all students was to ensure smooth continuation of academic work, to bring the 2019/2020 academic year to a successful end. The rolling out of the Moodle was also to help achieve the objective of the introduction of Information and Communication Technology for Accelerated Development (ICT4AD) policy. The ICT4AD policy statement sets out the road map for the development of Ghana’s information society and economy and provides a basis for facilitating the socio-economic development of the country in the emerging information, knowledge and technological age to be dominated by information and knowledge based economy. Hence to transform Ghana into an information and knowledge-driven ICT literate nation. To help achieve this policy one of the policy objectives is to promote and improve educational system within which ICTs are widely deployed to facilitate the delivery of educational services at all levels of the educational system. The enactment of the ICT4AD policy in the University of Education, Winneba in particular was to promote and encourage distance education including electronic distance education and virtual learning, focusing on tertiary level education and training in all fields and disciplines to broaden access to educational and training resources and services to a larger section of the society (Republic of Ghana, 2003).

The LMS Moodle developed by the University of Education, Winneba powered by the IT service Directorate has been in used since 2018 by the Institute for Distance and e-Learning (IDeL) of University of Education, Winneba. The LMS Moodle offers students the opportunity to access lessons, assignments, comments, wikis, forums, chats, workshop and quizzes among others with ease anywhere and anytime. The system enables students to interact and communicate freely anytime with lecturers, submit assignments and take quizzes. The assignments and quizzes are graded and feedback sent to students which can be accessed online. Similarly, lecturers support students to learn by providing them with learning resources, relevant links and monitoring their progress regularly. These features on the Moodle enables participants to learn through interaction, promoting student centered, problem-solving and social constructivist approach to learning (Westermann, 2014; Saghafi et al., 2014; Gonzàles-Gómez et al., 2016).

2. Literature

The LMS Moodle is a form of e-Learning that involves the use of technological tools. This helps learners to study anytime and anywhere, hence extending the classroom to the web. The term e-Learning according to Maltz, Deblois and The EDUCAUSE Current Issues Committee (2005) is applied in different perspectives, including distributed learning, online-distance learning, as well as hybrid learning. The Organization for Economic Co-Operation and Development (OECD) (2016, 2005) also define e-Learning as the use of information and communication technologies (ICT) in diverse processes of education to support and enhance learning in institutions of higher education, and includes the usage of information and communication technology (ICT) to improve students' traditional learning experiences and these technologies will act as a catalyst if a similar change process occurs. E-learning is also defined as a method of teaching and learning that fully or partially signifies the educational model used, based on the use of
Students found themselves better equipped for solving general science problems during face-to-face classroom and laboratory activities González et al. (2016). In addition, Saghafi et al. (2014) argued that both the face-to-face and web-based learning environments have their respective uses but also their limitations. According to them face-to-face support hands-on skills training, while the e-learning turns out to be better suited for constructive discussion. Hence, e-learning could be more appropriate in social
science and humanities than the fields of science. There could also be difficulty in accessing the platform. This happens when there are many users logged on the platform, the servers are unable to manage information properly when there are many users on the platform. This may bring about unanticipated costs both in time and money disadvantages (Akkoyunlu & Soylu, 2006; Almosa, 2002; Collins et al., 1997; Hameed et al., 2008; Klein & Ware, 2003; Lewis, 2000; Marc, 2002; Scott et al., 1999).

The implementation of the LMS Moodle is in its early stages in the University of Education, Winneba. Usually, new system may fail due to the unacceptability of it users because they may not see any benefits from using the system or the system may be difficult to access and use. This study used Technology Acceptance Model (TAM) to measure the student’s acceptance of LMS Moodle as e-Learning system in the University of Education, Winneba. The TAM developed by Al-Maroof and Al-Emran in 2018, evolved from the original TAM developed by Davis (1989). Davis (1989) defined Perceived usefulness (PU) as the degree to which a person believes that using a particular system would enhance his or her job performance and Perceived ease-of-use (PEOU) as the degree to which a person believes that using a particular system would be free from effort. It is one of the various theories of technology to appreciate the perception of students. Behavioural Intention (BI) refers to an individual’s intention to perform a behaviour and is a function of Attitude and Perceived Usefulness (Davis et al., 1989). According to Davis et al. (1989), Actual Use (AU) of a particular system is defined as a behavioural response, measured by the individual’s action. The relationships between the mentioned constructs are presented in figure 1. TAM describes that a person’s behavioural intention to use E-learning is determined by perceived usefulness and perceived ease of use (Mahdizadeh et al., 2008). Perceived usefulness (PU) and perceived ease of use (PEOU) are considered predictors for Behavioural Intention (BI) and Actual Use (AU) and that the predictors PU and PEOU are the most influential elements of the model (Toland et al., 2014). TAM in educational technology acceptance has proved its effectiveness as compared with the other theoretical models (Al-Qaysi, et al., 2018). The TAM model has become a robust model that is appropriate for predicting the acceptance of several technologies (Al-Busaidi, 2013; Al-Emran et al., 2018). TAM have been successfully adopted to study technology acceptance and usage by many scholars (Al-Emran et al., 2016; Al-Maroof & Al-Emran, 2018; Almarabeh, 2014; Salloum, et al., 2019; Tagoe, 2012) since it provides a solid background for the effectiveness of a new technology. Gamble in 2017 used TAM to exploring EFL University students’ acceptance of e-learning and Al-Maroof and Al-Emran in 2018 used TAM to explore students’ acceptance of google classroom using PLS-SEM approach. The purpose of the study was to measure the student’s acceptance of LMS Moodle as e-Learning system in the University of Education, Winneba. The study also sought to identify some limitations using LMS Moodle as a learning system in the University of Education, Winneba.

![Figure 1. Original Technology Acceptance Model (TAM)](image-url)
3. Methodology

3.1. Research Model/Design

This study employed a descriptive survey methodology and was carried out at the University of Education, Winneba in Ghana. Descriptive survey design seeks to explain people’s perceptions and behaviour on the basis of information obtained at a point in time (Fraenkel & Wallen, 2009). However, it is limited because the results consist of self-reporting data based solely on what people say they believe or like or dislike (Thomas et al., 2005). Despite this disadvantage it elicits a good number of responses from numerous people at a time and provides a meaningful picture of events. In this case, the survey design provided the researcher an opportunity to identify the perceived.

3.2. Data Collecting Tools

The instrument for the study was an online questionnaire consisting of three sections. The main advantage of the questionnaire is that it can be administered to a large number of respondents at the same time, and can be mailed when necessary (Jack & Norman, 2003). Section A of the questionnaire gathers demographic information on students. The section B is to measure the student’s acceptance of LMS Moodle as e-Learning system in the University of Education, Winneba using TAM. Technology Acceptance Model (TAM) developed by Al-Maroof & Al-Emran in 2018 to measure students’ acceptance of E-learning in Oman was adapted for this study. The TAM instrument consists of 18 items distributed among 4 factors. These factors include: the Perceived Usefulness (PU) which had seven items, Perceived Ease of Use (PEOU) had six items, the Behavioural Intention (BI) had three items, and the Actual Use (AU) had two items. All the items were measured using a four-point likert-type scale ranged from Strongly Disagree = 1, Disagree = 2, Agree = 3 to Strongly Agree = 4. The section C of the questionnaire contained open ended question that elicited information on challenges faced by students using the LMS as e-Learning system.

3.3. Sampling or Study Group

The sample of the study consist of 392 undergraduate students from the Department of Integrated Science Education who enrolled on the LMS platform for the second semester of 2019/2020 academic year. The students from Department of Integrated Science Education were purposively selected because the researchers were teaching selected courses at the Department. The courses are Energy and energy transformation (level 100), Carbohydrates, proteins and lipids (level 200) and The Reproductive system (level 300).

3.4. Data Analysis

Descriptive analysis was employed for section A and B. To determine the acceptance of the LMS Moodle by students, respondents were asked to indicate the intensity of their responses to each item on a four-point Likert scale. The responses were organised into frequency counts, percentage frequency and mean score. The responses from section C was summarised and presented in frequency counts and percentage frequency.

3.5. Validity and Reliability

The face validity of the instrument was enhanced by senior science educators and professors in the faculty of Science Education in the University of Education, Winneba. They reviewed the wording and clarity of the items with respect to the factors of the TAM. They were satisfied the items addressed the factors of the TAM. The adapted TAM instruments was pilot tested and the Cronbach Alpha value for the instrument calculated was 0.8. According to Fraenkel and Wallen (2009) a reliability figure should be at 0.7 and preferably higher and therefore, 0.8 is a good value. Therefore the instrument is highly reliable.
Table 1. Cronbach’s alpha values for the factors

| Factors                      | Number of Items | Cronbach’s alpha |
|------------------------------|-----------------|------------------|
| Perceived Usefulness (PU)    | 7               | .817             |
| Perceived Ease of Use (PEOU) | 6               | .873             |
| Behavioural Intention (BI)   | 3               | .833             |
| Actual Use (AU)              | 2               | .735             |

3.6. Research Procedures

The questionnaire was uploaded on the LMS Moodle for integrated science students taking Energy and energy transformation (level 100), Carbohydrates, proteins and lipids (level 200) and The Reproductive system (level 300) as a course to respond to.

4. Findings and Discussions

The demographic information of respondents, their responses on LMS Moodle Acceptance and limitations using the LMS are presented here. Table 2 shows the demographic information of the respondents.

Table 2: Demographic Information of Respondents

| Item                          | Variables          | Frequency | Percentage |
|-------------------------------|--------------------|-----------|------------|
| Gender                        | Male               | 305       | 77.8%      |
|                               | Female             | 87        | 22.2%      |
| Device used                   | Smart phones       | 256       | 65.3%      |
|                               | Computers          | 107       | 27.3%      |
|                               | Other device       | 29        | 7.4%       |
| Year of study                 | Level 100          | 183       | 46.7%      |
|                               | Level 200          | 127       | 32.4%      |
|                               | Level 300          | 82        | 20.9%      |
| Experience with LMS          | Less than 3 months | 254       | 64.8%      |
|                               | More than 3 months | 128       | 32.6%      |
|                               | More than 1 year   | 10        | 2.6%       |
| Preferred mode of delivery    | Face-to-face       | 128       | 32.6%      |
|                               | LMS                | 29        | 7.4%       |
|                               | Hybrid (face-to-face and LMS) | 235 | 60.0% |

N= 392

A total of 392 participated in the study with most of them being male (77.8%). More than half of the students (65.3%) used their smart phones in accessing the LMS. In terms of year of study, most of them were in level 100 (46.7%) followed by level 200 (32.4%) and level 300 (20.9%). The results also show that 64.8% had less than three months experience with the LMS in their education. The results indicate that majority of the students (60.0%) preferred the hybrid (face-to-face and LMS) mode of teaching and learning, followed by face-to-face (32.6%) which is the traditional mode of teaching and learning then LMS (7.4%) respectively.
Table 3. Frequency and Percentage Distribution of Student Responses on LMS Moodle Acceptance.

| Factor                  | Item                                                                 | Strongly agree | Agree | Disagree | Strongly Disagree | Mean |
|-------------------------|----------------------------------------------------------------------|----------------|-------|----------|-------------------|------|
|                         | F                      | %              | F     | %        | F                 | %    |                      |
| Perceived usefness PU   | LMS enhances my efficiency.                                         | 176            | 44.90 | 151      | 38.52             | 29   | 7.40                 |
|                         | LMS enhances my learning productivity.                               | 165            | 42.09 | 132      | 33.67             | 49   | 12.50                |
|                         | LMS enables me to accomplish tasks more quickly.                      | 132            | 33.67 | 177      | 45.15             | 51   | 13.01                |
|                         | LMS improves my performance.                                         | 154            | 39.29 | 176      | 44.9              | 38   | 9.69                 |
|                         | LMS saves my time.                                                   | 14             | 3.57  | 17       | 4.34              | 274  | 69.9                 |
|                         | LMS doesn’t have any distinctive useful features.                    | 163            | 41.58 | 154      | 39.29             | 24   | 6.12                 |
|                         | LMS is not applicable to all academic courses                        | 266            | 67.86 | 107      | 27.3             | 11   | 2.81                 |
| Perceived ease of use (PEOU) | LMS is easy to use.                                           | 194            | 49.49 | 103      | 26.28             | 42   | 10.71                |
|                         | LMS allows me to access the course material.                         | 302            | 77.04 | 58       | 14.80             | 19   | 4.85                 |
|                         | LMS is convenient and user-friendly.                                 | 269            | 68.62 | 47       | 11.99             | 43   | 10.97                |
|                         | LMS allows me to submit my assignments                               | 316            | 80.61 | 51       | 13.01             | 13   | 3.32                 |
|                         | LMS requires no training.                                            | 196            | 50.00 | 127      | 32.40             | 23   | 5.87                 |
|                         | LMS makes it easier to avoid future academic difficulties            | 152            | 38.78 | 139      | 35.46             | 58   | 14.80                |
| Behavioural intention to use (BI) | I intend to increase my use of the LMS                              | 156            | 39.80 | 146      | 37.24             | 33   | 8.42                 |
|                         | It is worth to recommend LMS for other students.                     | 146            | 37.24 | 154      | 39.29             | 49   | 12.50                |
|                         | I’m interested to use the LMS more frequently in the future.         | 147            | 35.08 | 175      | 41.77             | 55   | 13.13                |
| Actual use (AU)         | I use the LMS on daily basis.                                        | 168            | 42.86 | 136      | 34.69             | 47   | 11.99                |
|                         | I use the LMS frequently.                                            | 174            | 44.39 | 138      | 35.20             | 33   | 8.42                 |

N= 392

The percentage responses of the students to measure their acceptance of LMS Moodle as e-Learning system is presented in Table 3.

From Table 4, most of the respondents 327 (83.42%) admit that the LMS enhances their efficiency and learning productivity 297 (75.76%). Again, students positively affirm that LMS enable them to accomplish more task quickly 309 (78.82%) and improves their performance 330 (84.19%). About 62 (16.08%) agreed that LMS save them time while 330 (84.19%) disagreed to the statement. Also, 62 (16.08%) disagreed that the LMS is not applicable to all academic courses however, 373 (95.16%) of the respondents agreed to the statement. The average mean score (2.75) indicates that the use of LMS Moodle for teaching and learning is perceived as useful.

In terms of Perceived ease of use, most students 297 (75.77%), positively affirm that the LMS is easy to use, enables them to access the course material 360 (91.84%) and very convenient and user-friendly 316 (80.61%). Again students 367 (75.77%) agreed that the LMS also allows them to submit their assignments, 323 (82.4%) requires no training and 291 (74.24%) makes it easier to avoid future academic difficulties.
With the mean score ranging between 3.02 and 3.71, indicate that students agree to the factor ‘Perceived ease of use’ of the LMS Moodle.

On Behavioural intention to use (BI), more students 302 (77.04%) intend to increase their use of the LMS, however 90 (22.96%) of them declined. Similarly, students 322 (77.57%) agreed to use the LMS more frequently in the future and 300 (76.53%) also recommended for other students. The average mean (3.02) suggest that students intend to adapt the use of LMS in their future learning.

On Actual Use, majority of students 304 (77.55%) agreed to using the LMS on daily basis although 88 (22.45%) disagreed to this. More so, respondents 312 (79.59%) agreed to use of the LMS frequently while 80 (20.44%) disagreed. The average mean (3.06) also suggest that students actually want to use the LMS in their learning.

The section C of the questionnaire asked the undergraduate students to identify limitations of LMS course delivery. The responses were categorized into the following themes/categories and presented in Table 4.

Table 4. Limitations of LMS course delivery identified by respondents

| Themes/categories                        | Yes F | %  | No F | %  |
|-----------------------------------------|-------|----|------|----|
| Challenges with connectivity            | 364   | 92.8| 28   | 7.2|
| Difficulty in accessing LMS due to locality | 247   | 63.0| 145  | 37.0|
| Lack of immediate feedback from lecturers | 329   | 83.9| 63   | 16.1|

N= 392

Below are samples of responses that participants provided as limitations encountered using the of LMS course delivery Moodle:

“I mostly use my phone to download course material, to take quizzes and to search for information from the internet since I do not have a computer of my own. But when it comes to working and submitting my assignments I visits nearby private internet café which cost me a lot of money and time”.

“Because of my locality I have to travel some distance to assess the internet café and when I log on to the LMS navigating the system was easy and friendly”.

“Also there is lack of immediate feedback from lecturer on our performance, it takes weeks before I get responses on our performance”.

“I had connectivity problems when taking quizzes. It seems the system could not handle many users at a time”.

“Because we went online we could not complete all our science practical for the semester in the laboratory”.

“The use of the chat, discussion forum was not regular”.

The results of study show the acceptance of LMS by the students of the Department of Integrated Science Education at University of Education, Winneba. With respect to Perceived Use (PU) most of the student admits that the LMS enhanced their efficiency, learning productivity, and improved their performance. This response by students could be that they had to do a lot of reading, and find information mostly on their own from sources such as the internet and textbooks with the guide and links provided by the lecturers as they research and read wide they are better informed on the concepts taught therefore students become active
learners and critical thinkers. However, students disagreed 330 (84.19%) that the LMS save them time. This results support other findings of Almosa, 2002; Akkoyunlu & Soylu, 2006; Collins et al. 1997; Hameed et al, 2008; Klein & Ware, 2003; Lewis, (2000); Marc, 2002; Scott et al. 1999); which reveal that this may bring about unanticipated costs both in time and money disadvantages. Again, students agreed 373 (95.16%) that the LMS is not applicable to all academic courses. This finding was as a result of the nature of their programme. The B.Sc. Integrated Science Education is a programme comprising theory and practical work. Students again identified this statement as a limitation ‘Because we went online we could not complete all our science practical for the semester in the laboratory’. Affirming Gonzàles-Gómez et al. (2016) and Saghafi et al. (2014) findings that face-to-face support hands-on skills training.

The average mean score of 2.75 indicates that the use of LMS Moodle for teaching and learning was perceived as useful. This finding is consistent with Henderson’s (2005) study conducted on the role of computer and Internet access in business students’ acceptance of e-learning technology. Students also responded that it is easy to access course materials, submit assignments. In fact the LMS is very convenient and easy to use. These reaction could be because majority (65.3%) of the students uses their smartphones in assessing the LMS everywhere and anytime as far as they are connected to a network. This finding agrees with the study conducted by Arthur-Nyarkoa and Kariuki (2019) at the College of Distance Education, University of Cape Coast. Hence, there is the likelihood that students who have a higher level of access to digital devices such as computer, smartphones, tablets and the Internet would respond positively to e-Learning delivery and the opposite is equally probable Arthur-Nyarkoa,: & Kariuki (2019). The results also showed that most of the students (64.8%) had less than three month experience with the LMS but they indicated they required no training this may be student taking Information and Communication Technologies (ICT) as general and mandatory course as part of their 4-year degree programme. It can be concluded that students have acquire basic skills in ICT. By using ICT the teacher’s role is being transformed from a traditional profession to an intermediate supporter towards the facilitation of the students to conquer knowledge (Kalogiannakis 2010). Therefore, e-Learning has the potential to transform people, knowledge, skills and performance.

Out of the 392 students who participated in the study, 60.0% of them preferred the hybrid (face-to-face and LMS) mode of teaching and learning, to face-to-face (32.6%) and LMS (7.4%). This finding comes as no surprise as the integrated science programme has both practical and theoretical aspect. This finding support Singh (2003) who argues that while fully-online involves a single mode of delivery, blended learning combines multiple delivery media that are designed to complement each other and promote learning and application-learned behaviours. Again, mixed mode, web-supplemented and web-dependent hold more promise than fully online (Buzzette-More, 2008; Tagoe, 2013). Consequently, students will be able to undertake their practical lessons in the laboratory and theory lessons online.

On Behavioural intention to use (BI), most students 302 (77.04%) intend to increase their use of the LMS, however 90 (22.96%) of the students declined. Similarly, 322 (77.57%) students agreed to use the LMS more frequently in the future and also 300 (76.53%) recommend for other students. The average mean (3.02) suggest that students intend to adapt the use of LMS in their future learning. Because the respondents are undergraduate students hence may consider using online for their postgraduate programme in the near future without necessarily vacating their job post. With these intention students will ensure to stay abreast of current technology to promote teaching and learning. On the whole students’ behavioural intention to use the LMS Moodle was high and similar to the findings of Henderson (2005).

On Actual Use, majority of students 304 (77.55%) agreed to use the LMS on daily basis and 312 (79.59%) respondents agreed to use of the LMS frequently. The average mean (3.02) also suggested that students actually want to use the LMS in their learning. The positive response on the use of LMS can be attributed to easy internet access with their phones and computers at home and private internet cafés. This is similar to the findings of Arthur-Nyarkoa & Kariuki (2019) in their study reporting 78.4% have access to.
smartphones, 65.2% have access to computers and 93.0% of their respondents have access to internet connectivity. According to Lee, et al., 2009, Liu & Wang, 2009, Rissa, 2014; Welsh, et al. 2003 and Wentling et al. 2000, the e-learning depends on computers and networks, but it is likely it will progress into systems comprising of a variety of channels such as wireless and satellite, and technologies such as cellular phones.

5. Conclusion and Suggestions

This study focused on measuring students’ acceptance of LMS Moodle as e-Learning system in the University of Education, Winneba using Technology Acceptance Model (TAM). The students’ responded positively in all the four factors of the TAM with an average mean score of 3.2, which is considered relatively high. This show that students were pleased with the Learning Management System (LMS) Moodle to ensure effective teaching and learning however, student preferred the hybrid mode of teaching and learning where students will be able to undertake their practical lessons in the laboratory and theory lessons online wherever they find themselves. It is therefore timely to integrate the LMS Moodle into the teaching and learning of all courses at the University of Education, Winneba.

Based on the research findings the following suggestions were made to improve upon the acceptance of LMS Moodle as e-Learning system of teaching and learning by students at the University of Education, Winneba:

1. Special arrangements should be made with telecommunication providers to improve the speed, strength and bandwidth of the internet connectivity for students to access the LMS Moodle everywhere across Ghana.

2. Much efforts should be made by lecturers to give immediate feedback to students on their performance.

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References

Akkoyunlu, B. & Soylu, M. Y. (2006). A study on students’ views on blended learning environment. *Turkish Online Journal of Distance Education, 7*(3), ISSN 1302-6488.

Almarabeh, T. (2014). Students’ perceptions of E-learning at the University of Jordan. *International Journal of Emerging Technologies in Learning, 9*(3), 31–35. https://doi.org/10.3991/ijet.v9i3.3347

Al-Busaidi, K. A. (2013). An empirical investigation linking learners’ adoption of blended learning to their intention of full e-learning. *Behaviour and Information Technology, 32*(11), 1168-1176.

Al-Maroof, R. A. S. & Al-Emran, M. (2018). Students’ acceptance of google classroom: an exploratory study using pls-sem approach. *International Journal of Emerging Technologies in Learning, 13*(6), 112-123. https://doi.org/10.3991/ijet.v13i06.8275

Almosa, A. (2002). *Use of Computer in Education*, (2nd ed), Riyadh: Future Education Library

Al-Emran, M. Elsherif, H. M. & Shaalan, K. (2016). “Investigating attitudes towards the use of mobile learning in higher education”. *Computers in Human Behaviour, 56*, 93–102.

https://doi.org/10.1016/j.chb.2015.11.03363,
Al-Emran, M. Mezhuyev, V. & Kamaludin, A. (2018). Technology acceptance model in m-learning context: A systematic review. *Computers & Education, 125*, 389-412.

Al-Qaysi, N. Mohamad-Nordin, N. & Al-Emran, M. (2018). A systematic review of social media acceptance from the perspective of educational and information systems theories and models. *Journal of Educational Computing Research, 57*(8), 2085-2109.

Arthur-Nyarko, E., & Kariuki, M. G. (2019). Learner access to resources for eLearning and preference for eLearning delivery mode in distance education programmes in Ghana. *International Journal of Educational Technology, 6*(2), 1-8.

Bernard, M. B., Borokhovski, E., Schmid, R. F., Tamim, R. M. and Abrami, Ph. C. (2014). A meta-analysis of blended learning and technology use in higher education: from the general to the applied. *Journal of Computing in Higher Education, 26*(1), 87-122.

Brandle, K. (2005). 2005. Are you ready to "MOODLE"? *Language Learning and Technology, 9*(2): 16-23.

Buzzetto-More, N. (2008). Student perception of various e-learning components. *Interdisciplinary Journal of E-learning and Learning Objects, 4*, 113-135.

Chigeza, P. & Halbert, K., (2014). Navigating E-Learning and Blended Learning for Pre-service Teachers: Redesigning for Engagement, Access and Efficiency. Australian. *Journal of Teacher Education, 39*(11), 133–146.

Collins, J., Hammond, M. & Wellington, J. (1997). *Teaching and Learning with Multimedia*, London: Routledge.

Davis, B. M., Markel, H., Navarro, A., Wells, E., Monto, A. S., & Aiello, A. E.-0.-1.-L.. (2015). The effect of reactive school closure on community influenza-like illness counts in the state of Michigan During the 2009 H1N1 Pandemic. *Clinical Infectious Diseases, 60*(12), 132-141.

Davis, F. D. (1989). ‘Perceived usefulness, perceived ease of use, and user acceptance of information technology.’ *MIS Quarterly* 13(3) 319-340, https://doi.org/10.2307/249008

Fraenkel, J. R., & Wallen, N. E. (2009). How to design and evaluated research in education (7th ed.). New York: McGraw-Hill Inc.

Gamble, C. (2017). Exploring EFL university students’ acceptance of elearning using TAM. *Kwansei Gakuin University Humanities Review, 22*, 23-37.

González-Gómez, D., Jeong, J. S., Rodríguez, D. A. & Cañada-Cañada, F., (2016). Performance and perception in the flipped learning model: an initial approach to evaluate the effectiveness of a new teaching methodology in a general science classroom. *Journal of Science and Education Technology, 25*(3), 450-459.

Hameed, S., Badii, A. & Cullen, A. J. (2008). Effective e-learning integration with traditional learning in a blended learning environment. *European and Mediterranean conference on information system*, 25-26.

Henderson, R. (2005). *The role of computer and Internet access in business students’ acceptance of e-learning technology*. The University of North Carolina.
Hussein, Z. (2015). Explicating students’ behaviours of E-learning: A viewpoint of the extended technology acceptance. *International Journal of Management and Applied Science, 1*(10), 68-73.

Israel, M. J., (2015). Effectiveness of Integrating MOOCs in Traditional Classrooms for Undergraduate Students. *International Review of Research in Open and Distributed Learning, 16*(5), 102-118.

Jack, R. F., & Norman, E. W. (2003). *How to Design and Evaluate Research in Education*. Boston: MacGrawHill Publishers.

Kalogiannakis, M. (2010). Training with ICT for ICT from the trainer’s perspective. A Greek case study. *Education and Information Technologies, 15*(1), 3-17.

Kawano, S., & Kakehashi, M. (2015). Substantial impact of school closure on the transmission dynamics during the pandemic flu H1N1-2009 in Oita, Japan. *PLOS One, 10*(12), 186-198.

Khalid, N. (2014). The role of perceived usefulness and perceived enjoyment in assessing students’ intention to use LMS using 3-Tum. *Global Summit on Education GSE 2014* (E-ISBN 978-11768-5-6)

Khan, B. H. (2005). *Managing E-learning: Design, Delivery, Implementation and Evaluation*. Hershey, PA: Information Science Publishing.

Klein, D. & Ware, M. (2003). E-learning: new opportunities in continuing professional development. *Learned publishing, 16*(1) 34-46.

Krishnan K. S. T. & Hussin, H. (2017). E-learning readiness on Bumiputera SME's intention for adoption of online entrepreneurship training in Malaysia. *Management, 7*(1), 35-39.

Lee, B.C., Yoon, J.O. & Lee, I. (2009). Learners' acceptance of e-learning in South Korea: Theories and results. *Computer & Education, 53*(4), 1320-1329.

Lewis, N. J. (2000). The Five Attributes of Innovative E-Learning. *Training and Development, 54*(6), 47-51.

Lindzon, J. (2020). School closures are starting, and they'll have far-reaching Economic impacts. *Fast Company, 11*-13.

Liu, Y., & Wang, H. (2009). A comparative study on e-learning technologies and products: from the East to the West. *Systems Research & Behavioral Science, 26*(2), 191–209.

Maltz, L., Deblois, P. & The EDUCAUSE Current Issues Committee. (2005). Top Ten IT Issues. *EDUCAUSE Review, 40*(1), 15-28.

Marc, J. R. (2002). Book review: e-learning strategies for delivering knowledge in the digital age. *Internet and Higher Education, 5*, 185-188.

Mahdizadeh, H., Biemans, H & Mulder, M. (2008). Determining factors of the use of E-learning environments by university teachers. *Computers & Education, 51*, 142-154

http://dx.doi.org/10.1016/j.compedu.2007.04.004

Northey, G., Bucic, T., Chylinski, M. & Govind, R., (2015). Increasing student engagement using asynchronous learning. *Journal of Marketing Education, 37*(3), 171-180.

Organization for Economic Co-Operation and Development (OECD). (2016). *Innovating education and
educating for innovation: The power of digital technologies and skills. Paris: OECD Publishing.
Organization for Economic Co-Operation and Development (OECD). (2005) “E-learning in Tertiary Education”. Policy Briefs. http://www.oecd.org/dataoecd/27/35/35991871.pdf

Potter, J., (2015). Applying a hybrid model: Can it enhance student learning outcomes? Journal of Instructional Pedagogies, 17(11).

Republic of Ghana. (2003). The Ghana ICT for accelerated development policy (ICT4AD). Retrieved from www.ict.gov.gh

Rhema, A. (2013). An analysis of experiences and perceptions of technology based learning in higher education institutions in Libya: Informing the advancement of e-learning. Ph.D. dissertation, Victoria University, Melbourne, VIC, Australia.

Rissa, J. (2014). An empirical study on the e-learning acceptance among the Finnish labor. Master’s thesis submitted to the Department of Marketing, Aalto University School of Business, Helsinki, Finland.

Saghafi, M. R., Franz, J. & Crowther, P.H. (2014). A Holistic Model for Blended Learning. Journal of Interactive Learning Research, 25(4), 531-549.

Salloum, S. A., Alhamad, A. Q. M., Al-Emran, M., Monem, A. A., & Shaalan, K. (2019). Exploring Students’ Acceptance of E-Learning through the Development of a Comprehensive Technology Acceptance Model. AEEE Access, 7, 128446-128462

Scott B., Ken C. H. & Edwin M. G. (1999). The Effects of Internet-Based Instruction on Student Learning. Journal of Asynchronous Learning Network, 3(2), 98-106.

Singh, H. (2003). Building effective blended learning programs. Educational Technology, 43(6), 51–54

Su, C. (2006). Moodle for English Teachers. International Conference and Workshop on TEFL & Applied Linguistics, March 10-11, 321-330, Min Chuan University.

Tagoe, M. (2012). Students’ perceptions on incorporating e-learning into teaching and learning at the University of Ghana. International Journal of Education and Development using Information and Communication Technology (IJEDICT), 8(1), 91-103.

Tao, Y. H., Yeh, C. R., & Sun, S. I. (2006). Improving training needs assessment processes via the Internet: system design and qualitative study. Internet Research, 16 (4), 427–49.

Toland, S., White, J., Mills, D., & Bolliger, D. U. (2014). EFL instructors’ perceptions of usefulness and ease of use of the LMS Manaba. The JALT CALL Journal, 10(3), 221-236.

Thomas, J. R., Nelson, J. K., & Silverman, S. J. (2005). Research methods in physical activity (5th ed.). Champaign, IL: Human Kinetics.

Tselios, N., Daskalakis, S., & Papadopoulou, M. (2011). Assessing the Acceptance of a Blended Learning University Course. Educational Technology & Society, 14(2), 224-235.

Twigg C. (2002). Quality, cost and access: the case for redesign. In The Wired Tower. Pittinsky MS (ed.). Prentice-Hall: New Jersey. 111–143.
UNESCO. (2020). *Half of world’s student population not attending school: UNESCO launches global coalition to accelerate deployment of remote learning solutions*. Paris: UNESCO.

UNESCO (2019). *Adverse consequences of school closures: more on UNESCO’s COVID-19 Education Response*. Retrieved from [https://en.unesco.org/covid19/educationresponse/consequences](https://en.unesco.org/covid19/educationresponse/consequences)

Wagner, N., Hassanein, K. & Head, M. (2008). Who is responsible for E-learning in higher education? A stakeholders’ analysis. *Educational Technology & Society, 11*(3), 26-36.

Welsh ET, Wanberg CR, Brown EG, Simmering M.J. (2003). E-learning: emerging uses, empirical results and future directions. *International Journal of Training and Development, 7*, 245–258.

Wentling T. L, Waight C, Gallagher J, La Fleur J, Wang C, Kanfer A. (2000). E-learning - a review of literature. *Knowledge and Learning Systems Group NCSA, 9*, 1–73.

Westermann, E. B. (2014). A half-flipped classroom or an alternative approach? Primary sources and blended learning. *Educational Research Quarterly, 38*(2), 43-57.

Wu, W. S. (2008). The application of Moodle on an EFL collegiate writing environment. *Journal of Education and Foreign Languages and Literature, 7*, 45.