EFFECT OF LEARNING MANAGEMENT SYSTEM ON STUDENTS' ACADEMIC ACHIEVEMENT IN SCIENCE EDUCATION IN OGUN STATE-OWNED TERTIARY INSTITUTIONS

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Abstract

This study examined the effect of LMS on students' academic achievement in science education at the tertiary institutions' level in Ogun state. The study adopted a quasi-experimental research design, using a population of all the undergraduate students in Sikiru Adetona College of Education, Science and Technology, Ogun state. A sample of an intact class of four hundred and fifty (450) 300-level students was used for the study. Data were collected using an instrument titled Academic Achievement Test (AAT). Data collected were analyzed using mean and standard deviation and Analysis of Covariance (ANCOVA) to test the hypotheses at 0.05 level of significance. The findings revealed that there was no statistically significant difference between the pre-test mean scores of students in the Learning Management Systems Approach (LMSA) group and those in the Conventional Physical Classroom Approach (CPCA) group. However, a statistically significant difference was found between the post-test mean scores of the two groups, with the LMSA group performing better. Gender was found to influence students' academic achievement at the pre-test level, with male students achieving higher mean scores than female students, although the difference was not significant in the LMSA group. Notably, gender did not significantly affect students' academic achievement at the post-test or delayed post-test levels. Based on these findings, the study recommends organizing workshops and seminars for teachers and students to enhance their understanding of using LMS. Additionally, it suggests that student participation in LMS activities should be monitored regularly to ensure engagement in online learning activities.

Keywords: academic achievement, conventional lecture method, learning management systems, science education

Introduction

A significant paradigm shift is occurring in higher education worldwide, yet it has received little attention. In recent years, Learning Management Systems (LMS), also known as integrated computer systems, have emerged rapidly, significantly impacting teaching and learning in tertiary institutions. LMS are internet-based platforms, such as WebCT and Blackboard, that integrate a variety of pedagogical and course administration tools. These systems can effectively create virtual learning environments for full-time students on campus. In Nigeria, for instance, fully online institutions like the National Open University of Nigeria (NOUN) and various distance learning programs are being established using LMS. Globally, LMS is gaining popularity in tertiary institutions, adding a virtual dimension even to the most traditional campus-

based settings. The potential of online LMS to transform teaching and learning is unprecedented. A standard LMS fosters an inclusive learning environment that supports academic progress through structures that promote online collaboration, professional training, discussions, and communication among users (Oakes, 2002; Dias and Dinis, 2014; Jung and Huh, 2019). According to Nasser, Cherif, and Romanowski (2011), LMS usage provides online learners with consistent information about their performance. Furthermore, it allows them to become more independent (Blau and Hameiri, 2017).

Learner engagement is more sustainable when online users utilize a Learning Management System (LMS) to monitor their progress (Selwyn, Hadjithoma-Garstka, & Clark, 2011; Al-Fraihat, Joy, Masa'deh, & Sinclair, 2020). An LMS is an online program that serves as both a learning and communication platform for students (Borboa, Joseph, Spake, & Yazdanparast, 2017; E-learning Basics, 2021). As described by Brush (2019), Brown (2020), Bradley (2021), and Jhoselle, Mark, and Nicole (2021), a Learning Management System is a software application or web-based technology designed for the planning, execution, and evaluation of specific learning processes. Research indicates that there is a positive correlation between the use of LMS and students' achievement levels (Owston, 1997; Neuhauser, 2002; Hardy, Bates, Antonioletti, & Seed, 2005; Ebardo & Valderama, 2009; Moore, Dickson-Deane, & Galyen, 2011; Ivana, Jelena, & Sandra, 2012; Ahmad, 2013; Ally, 2013; Herlo, 2014; Al-Aonizi & Ally, 2014; Bryson & Jenkins, 2016).

Several studies have explored the relationship between the use of Learning Management Systems (LMS) and students' achievement levels. For instance, research by Firat (2016), Nur and Afiz (2016), Coleman and Mitshazi (2017), Syaad and Hidayat (2018), Khawlah and Mujo (2019), Ümmühan and Esin (2022), Emel and Eylem (2020), Deepa and Navdeep (2021), Oguguo, Nannim, Agah (2021), Usman (2021), Ümmühan (2022), and Furqon, Parlindungan, Liliasari, and Lala (2023) indicates a positive correlation between LMS usage and student achievement. However, other research studies, such as those by Bernard, Borokhovski, Schmid, Tamim, and Abrami (2014), Nabeel (2015), Broadbent (2016), Dell, Low, and Wilke (2016), McGraw-Hill (2016), Chaw (2018), and Jhoselle, Mark, and Nicole (2021), show no significant difference in outcomes between online learning and traditional classroom settings.

Statement of Problem

Many academic institutions, particularly at the tertiary level, are utilizing Learning Management Systems (LMS) and adopting blended learning approaches to improve student performance and enhance learning experiences. Despite the reported positive effects of LMS on student learning, research on its implications, specifically regarding pedagogical issues in Ogun State's tertiary institutions and Nigeria as a whole—is still lacking. Therefore, this paper examines the implications of incorporating LMS into the teaching and learning programs of tertiary institutions by investigating its impact on students' academic achievement in public tertiary institutions in Ogun State.

Research Hypotheses

The following hypotheses were formulated and tested at a 0.05 level of significance:

Ho_1: There is no significant difference in the pre-test scores of academic achievements between students in the Learning Management Systems Approach (LMSA) group and the students in the Conventional Physical Classroom Approach (CPCA) group.

Ho_2: There is no significant difference in the post-test scores of academic achievements between students in the Learning Management Systems Approach (LMSA) group and the students in the Conventional Physical Classroom Approach (CPCA) group.

Ho_3: There is no significant difference in the delayed post-test scores of academic achievements between students in the Learning Management Systems Approach (LMSA) group and the students in the Conventional Physical Classroom Approach (CPCA) group.

Ho_4: There is no significant difference in the pre-test, post-test, and delayed post-test scores of academic achievements between male and female students in the Learning Management Systems Approach (LMSA) group and the students in the Conventional Physical Classroom Approach (CPCA) group.

Methodology

The study employed a 2 x 2 quasi-experimental design, which included two instructional groups: an experimental group using a Learning Management Systems (LMS) approach and a control group using a conventional physical classroom approach. The study also considered two levels of gender: male and female. The target population consisted of undergraduate students from Ogun State-owned tertiary institutions. The sample included four hundred and fifty (450) third-year students from the intact departments of the Sikiru Adetona College of Education, Science and Technology (SACOETEC), Omu-Ajose, Ogun State. The course utilized during both the virtual LMS and physical classroom teaching was a general methodology course, EDU 314: Educational Research and Statistics. Students had not previously been exposed to this course before the experiment.

To gather data for the study, The Academic Achievement Test (AAT) was developed to assess students' academic achievement in educational research and statistics through pre-tests, post-tests, and delayed post-tests. It comprised forty multiple-choice questions adapted from past harmattan (1st semester) examination questions in the same subject area. These exam questions are standardized as they have undergone both internal and external moderation, ensuring their reliability. After grading the students' responses, item analysis was conducted to determine the difficulty and discrimination indices. The difficulty index for the test items ranged from 0.18 to 0.76, while the discrimination index ranged from 0.00 to 0.45.

Procedure

A one-week training program was organized to instruct students on the effective use of the learning management system. The experimental group, which followed the LMS approach, received virtual instruction on educational research and statistics and participated in LMS activities. In contrast, the control group was taught using the conventional lecture method in a

physical classroom. The AAT was administered as a pre-test before the treatment to assess the students' baseline knowledge of the topics. After the treatments were completed, the post-test was conducted within one week to minimize maturation effects, using the same set of forty multiple-choice questions from the pre-test. A delayed academic achievement test was administered three weeks after the post-test to evaluate students' retention of the topic taught.

Results

Table 1: Descriptive statistics comparing students' mean scores in LMSA and CPCA groups

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Pretest	LMS	230	13.72	1.176	.078	13.56	13.87	12	15
	Physical Class	220	13.57	3.408	.230	13.12	14.02	10	25
	Total	450	13.64	2.525	.119	13.41	13.88	10	25
Posttest	LMS	230	34.48	1.321	.087	34.31	34.65	32	37
	Physical Class	220	23.06	2.310	.156	22.75	23.37	20	32
	Total	450	28.90	6.012	.283	28.34	29.45	20	37
DPosttest	LMS	230	35.73	.686	.045	35.64	35.82	35	37
	Physical Class	220	19.25	1.771	.119	19.01	19.49	16	23
	Total	450	27.67	8.352	.394	26.90	28.44	16	37

Table 1 reveals the scores of students in the LMSA group compared to those in the CPCA group. According to the table, at the pre-test level, the mean score of students in the LMSA group (N=230, M=13.72, SD=1.716) was slightly higher than the mean score of students in the CPCA group (N=220, M=13.57, SD=3.408). Additionally, the standard deviation for the LMSA group was lower than that of the CPCA group. At the post-test level, the mean score for students in the LMSA group (N=230, M=34.48, SD=1.321) was significantly higher than the mean score of students in the CPCA group (N=220, M=23.06, SD=2.310). Similarly, the standard deviation for the LMSA group remained lower than that for the CPCA group. In the delayed post-test, the mean score of the LMSA group (N=230, M=35.73, SD=0.686) continued to exceed the mean score of the CPCA group (N=220, M=19.25, SD=1.771). Again, the standard deviation for the LMSA group was lower than that of the CPCA group. Overall, the dispersion of scores from the mean among the CPCA students was higher at all academic achievement levels compared to the LMSA group. Consequently, the Standard Error of Measurement (SEM) for students in the LMSA group was lower than that for students in the CPCA group. This indicates that the students in the LMSA group demonstrated more consistent scores than those in the CPCA group.

Test of Hypotheses

Ho_1: There is no significant difference in the pre-test scores of academic achievements between students in the Learning Management Systems Approach (LMSA) group and the students in the Conventional Physical Classroom Approach (CPCA) group.

Ho_2: There is no significant difference in the post-test scores of academic achievements between students in the Learning Management Systems Approach (LMSA) group and the students in the Conventional Physical Classroom Approach (CPCA) group.

Ho_3: There is no significant difference in the delayed post-test scores of academic achievements between students in the Learning Management Systems Approach (LMSA) group and the students in the Conventional Physical Classroom Approach (CPCA) group.

Table 2: *One-way ANOVA comparing students' mean scores in LMSA AND CPCA groups*

		Sum of Squares	df	Mean Square	F	Sig.
Pretest	Between Groups	2.503	1	2.503	.392	.532
	Within Groups	2860.608	448	6.385		
	Total	2863.111	449			
Posttest	Between Groups	14662.468	1	14662.468	4190.284	.000
	Within Groups	1567.623	448	3.499		
	Total	16230.091	449			
DPosttest	Between Groups	30524.331	1	30524.331	17201.274	.000
	Within Groups	794.993	448	1.775		
	Total	31319.324	449			

Table 2 revealed that there is no significant difference in the pre-test mean scores (f=.532, p>0.05) of academic achievements between students in the Learning Management Systems Approach (LMSA) group and the students in the Conventional Physical Classroom Approach (CPCA) group. The table further shows that there was a significant difference in the posttest mean scores (f=.000, p<0.05) of academic achievements between students in the Learning Management Systems Approach (LMSA) group and the students in the Conventional Physical Classroom Approach (CPCA) group. Similarly, there was a statistically significant difference in the delayed post-test scores (f=.000, p<0.05) of academic achievements between students in the Learning Management Systems Approach (LMSA) group and the students in the Conventional Physical Classroom Approach (CPCA) group. Hence, the first hypothesis is acceptable, while the second and third hypotheses are not.

H_{O4}: There is no significant difference in the pre-test, post-test, and delayed post-test scores of academic achievements between male and female students in the Learning Management Systems Approach (LMSA) group and the students in the Conventional Physical Classroom Approach (CPCA) group.

Table 3: *Descriptive statistics comparing Male and Female students' mean scores in LMSA and CPCA groups*

Dependent Variable	Method	Gender	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Pretest	LMS	male	13.770	.242	13.295	14.245
		female	13.677	.212	13.260	14.094
	Physical Class	male	12.390	.242	11.915	12.865
		female	14.550	.221	14.116	14.984
Posttest	LMS	male	34.510	.187	34.142	34.878
		female	34.454	.164	34.131	34.776
	Physical Class	male	23.240	.187	22.872	23.608
		female	22.908	.171	22.573	23.244
DPosttest	LMS	male	35.800	.133	35.538	36.062
		female	35.669	.117	35.440	35.899
	Physical Class	male	19.360	.133	19.098	19.622
		female	19.158	.122	18.919	19.397

Table 3 shows the scores of male and female students in LMSA group and those in CPCA group. According to the table, the mean score of male students in LMSA, at the pre-test level, (N=100, M=13.77) was slightly higher than the mean scores of female students in LMSA group (N=130, M=13.68). While the mean score of male students in CPCA group was lower (N=100, M=12.39) than the mean score of female students (N=120, 14.55). At the post-test level, the mean score of male students in LMSA group (N=100, M=34.51) was slightly lower than the mean score of female students (N=130, M=34.45). In the same vein, the mean score of male students in the CPCA group (N=100, M=23.240) was higher than the maen score (N=130, M=22.91) of female students. At the delayed post-test level, the mean score of male students in LMSA group (N=100, M=35.80) was slightly higher than the mean score of female students in the (N=130, M=35.67). Similarly, the mean score of male students in CPCA group (N=100, M=19.36) was slightly higher than the mean score of female students in the (N=130, M=19.16). The Standard Errors of Measurements (SEM) of male students in LMSA and CPCA groups at both posttest and delayed posttest levels were higher than the standard errors of measurements of female

students. This implies that the female students in the two groups had more consistent scores than the male students in both groups.

Table 4: *Tests of Between-Subjects Effects*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Squared
Gender	Pretest	118.587	1	118.587	20.298	.000	.044
	Posttest	4.175	1	4.175	1.192	.275	.003
	DPosttest	3.068	1	3.068	1.728	.189	.004
Method * Gender	Pretest	140.910	1	140.910	24.119	.000	.051
	Posttest	2.107	1	2.107	.602	.438	.001
	DPosttest	.140	1	.140	.079	.779	.000

Table 4 reveals that there was a statistically significant difference in the mean scores between male and female students in the LMSA and CPCA groups at the pre-test level (f=.000, $p<0.05$). The male students had higher mean scores than the female students in the LMSA and CPCA groups. However, there were no statistically significant differences in the mean scores between the male and female students in the LMSA and CPCA groups at the post-test and delayed post-test levels (f=.275 & f=.189, $p>0.05$). Table 4 also reveals that gender and method had a statistically significant interaction effect on the mean scores of male and female students at the pre-test level (f= .000, $p<0.05$). However, table 4 also reveals that gender and method did not interact significantly to influence students' academic achievement at both post-test and delayed post-test levels (f=.438 and f=.779, $p>0.05$).

Discussion

Findings from this study indicated that there was no statistically significant difference in the pre-test mean scores of academic achievements between students in the Learning Management Systems Approach (LMSA) group and those in the Conventional Physical Classroom Approach (CPCA) group. This was attributed to the fact that neither group had received instruction in the course, specifically educational research and statistics, before the study. However, the results revealed a statistically significant difference in pre-test, post-test, and delayed post-test scores between the LMSA group and the CPCA group. This finding is consistent with research conducted by Owston (1997), Neuhauser (2002), Moore, Dickson-Deane, and Galyen (2011), Ivana et al. (2012), Ahmad (2013), Firat (2016), Nur and Afiza (2016), Syaad and Hidayat (2018), Khawlah and Mujo (2019), Ümmühan (2022), Emel and Eylem (2020), Deepa and Navdeep (2021), Oguguo, Nannim, Agah (2021), Usman (2021), Ifeanyi and Chinonso (2023), and Furqon, Parlindungan, Liliasari, and Lala (2023), all of which provided empirical evidence showing a significant positive impact of LMS on learning outcomes. The study found that students in the LMSA group demonstrated improvement in their scores at both the post-test and

delayed post-test levels. However, these findings contradict those of Bernard, Borokhovski, Schmid, Tamim, and Abrami (2014), Nabeel (2015), Broadbent (2016), Dell, Low, and Wilke (2016), McGraw-Hill (2016), Chaw (2018), and Jhoselle, Mark, and Nicole (2021), which suggested there was no significant difference in academic achievement between online and traditional learning approaches.

This study also examined the influence of gender on students' academic achievement and found some interesting results. At the pre-test level, male students had higher mean scores than female students, although the difference was not significant within the LMSA group. However, gender did not significantly impact students' academic achievement in either the post-test or delayed post-test assessments. This suggests that the traditional gender stereotypes regarding academic performance are becoming less relevant. Furthermore, the interaction between gender and teaching method showed a significant effect on students' academic achievement at the pre-test level. In contrast, this interaction was not significant at either the post-test or delayed post-test levels.

Conclusion

The findings of this study indicate that students in the LMSA group experienced significant improvement in their academic achievement during both the post-test and delayed post-test phases compared to their peers in the CPCA group. The learning management system (LMS) provided students with the flexibility to watch preloaded lecture videos at their convenience, allowing them to learn anywhere without distractions. This facilitated interaction among students and between students and lecturers on the LMS platform, which enhanced their understanding of the concepts taught. Consequently, the LMSA group was able to retain the concepts for a longer period than their counterparts in the Conventional Physical Classroom Approach group. These results suggest that learning management systems effectively enhanced students' learning and academic achievement.

Recommendations

Based on the findings of the study it was recommended that:

1. Attention must be given to computer skills and knowledge of technology for both teachers and students.
2. Workshops and seminars should be organized for both teachers and students to familiarize them with using Learning Management Systems (LMS).
3. Regular attendance should be taken to ensure that all students participate in online learning activities on the LMS.
4. Significant efforts should be made by the overseeing bodies of tertiary institutions to promote the adoption and use of LMS in the teaching and learning process.
5. Tertiary institutions must ensure a constant supply of electricity and provide reliable internet facilities.

References

Ahmad A. (2013). The efficiency of the Learning Management System (LMS) in AOU, Kuwait, as a communication tool in an E-learning system. *International Journal of Educational Management, 27(2),* 157 - 169.

Ally, M. (2013). Managing, designing, and implementing "blended learning" for flexible delivery. *Workshop handout at the first International Conference in Open Learnin*g, Kuwait.

Al-Aonizi, S. & Ally, M. (2014). The use of e-learning in higher education. *Paper submitted at the Global Forum for Innovation in University Teaching*, Imam Muhammad bin Saud Islamic University, Riyadh, Saudi Arabia.

Al-Fraihat, D., Joy, M., Masa'deh, R., & Sinclair, J. (2020). Evaluating e-learning systems success: An empirical study. *Computers in Human Behavior, 102*(1), 67-86. doi:10.1016/j.chb.2019.08.004

Aljarrah, A. (2011). University of Jordan students' attitudes towards the use of the Learning Management System as a learning tool. *Dirasat Journal, educational sciences. 38(4),* 1293 – 1304.

Bernard, R.M., Borokhovski, E., Schmid, R. F., Tamim, R. M., & Abrami, P.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). doi:10.1007/s12528-013-9077-3*, 2014, 87-122.

Blau, I., Hameiri, M. Ubiquitous (2017). Mobile educational data management by teachers, students and parents: Does technology change school-family communication and parental involvement? *Educ Inf Technol 22*, 1231–1247 https://doi.org/10.1007/s10639-016-9487-8

Borboa, D., Joseph, M., Spake, D., & Yazdanparast, A. (2017). Perceptions and use of learning management system tools and other technologies in higher education: A Preliminary Analysis. *Journal of Learning in Higher Education, 10(2)*, 17-23.

Bradley, V. M. (2021). Learning Management System (LMS) use with online instruction. *International Journal of Technology in Education (IJTE), 4*(1), 68-92. https://doi.org/10.46328/ijte.36

Broadbent, J. (2016). Academic success is about self-efficacy rather than frequency of use of the learning management system. *Australasian Journal of Educational Technology. Retrieved from https://pdfs.semanticscholar.org/e2eb/e11d685ba5098acc7611d593fc6c19681673*.

Brown, D. (2020). The 13 must-have features of a Learning Management System. Retrieved From https://www. peoplefluent.com/blog/learning/13-must-have-features-of-a-learning Management -system

Brush K. (2019). Learning Management System (LMS). Retrieved from https://searchcio.techtarget.com/definition/learning-management

Bryson, J. & Jenkins, A. (2015). Understanding and supporting 'blended learning', *teaching practices*, 2015 [Online] Available: www.edclements.com, [Accessed 02-Nov-2016]

Cavus, N. (2007). The Effects Of Using Learning Management Systems On Collaborative Learning For Teaching Programming Languages.

Chaw, L. & Tang, C. (2018). What Makes Learning Management Systems Effective for Learning? *Retrieved from https://doi.org/10.1177/0047239518795828.*

Coleman, E. & Mitshazi, S. (2017). Factors affecting the use and non-use of Learning Management Systems (LMS) by academic staff.

Dell, C.A., Low, C. & Wilker, J.F. (2016). Comparing student achievement in online and face-to-face class formats. *Journal of Online Learning and Teaching (*6), 30-42.

Deepa S. Kauts & Navdeep Kaur (2021). Effectiveness of Moodle-LMS on the Academic Achievement and Student Satisfaction among IX grade Mathematics Learners. *Turkish Online Journal of Qualitative Inquiry (TOJQI) 12(3)*, 1544- 1553.

Dias, S. B., & Dinis, J. A. (2014). Towards an enhanced learning in higher education incorporating distinct learner's profiles. *Educational Technology & Society, 17*(1), 307–319. Retrieved from https://bit.ly/2Wjo9H7

Ebardo, R. & Valderama, A. (2009). The Effect of Web-Based Learning Management System on Knowledge Acquisition of Information Technology Students at Jose Rizal University.

E-learning Basics (2021). A Learning Management System (LMS): Everything there is to know. Retrieved from https://www.ispringsolutions.com/blog/what-is-lms

Emel, A. and Eylem, K .G. (2020). The impact of learning management systems on students' achievement in language exams. *Turkish Online Journal of Distance Education ISSN 1302-6488, 21(4)*, 206-222. DOI: 10.17718/tojde.803410

Eyitayo, O. (2005). Experimenting eLearning with a large class. International Journal of Education and Development using ICT, 1(3).

Firat, M. (2016). Determining the effects of LMS learning behaviors on academic achievement in a learning analytic perspective. Journal of Information Technology Education: Research, 15, 75-87. Retrieved from http://www.jite.org/documents/Vol15/JITEv15ResearchP075-087Firat1928.pdf

Furqon, M., Parlindungan Sinaga, Liliasari Liliasari, & Lala Septem Riza (2023). The Impact of Learning Management System (LMS) Usage on Students. *TEM Journal 12(2),*1082-1089, ISSN 2217-8309, DOI: 10.18421/TEM122-54.

Hardy, J., Bates, S., Antonioletti, M., & Seed, T. (2005). Integrating e-learning and on-campus teaching II: evaluation of student use. In J.Cook and D.Whitelock (eds.): Exploring the frontiers of e-learning. Research Proceedings of the 12th Association of Learning Technology Conference (Manchester), pp. 140-153.

Herlo, D. (2014). Benefits of using 'blended learning' in 'performer' education master program. *Journal Plus Education* vol. 10 (2) http://search.ebscohost.com/login.aspx?dircct=true&db=ehh&AN=98932949&site=ehost-live&scope=site.

Ifeanyi , U. N., & Chinonso , S. (2023). The Impact of Learning Management System on Student's Academic Performance. *Asian Journal of Research in Computer Science, 16(3)*, 11–17. https://doi.org/10.9734/ajrcos/2023/v16i3341

Ivana Mijatovic, Jelena Jovanovic and Sandra Jednak (2012). Students' online interaction in a blended learning environment – a case study of the first experience in using an lms. 4th International Conference on Computer Supported Education, 445-454, ISBN: 978-989-8565-07-, DOI: 10.5220/0003963804450454 In Proceedings of the

Jhoselle, Tus Mark, A. C., Nicole, A. E, & Niña, E. P. (2021). Amidst the Online Learning Modality: The Usage of Learning Management System (LMS) and Its Relationship to the Academic Performance of the Filipino Students. *International Journal of Psychology and Behavioral Sciences, 11(4*), 9-21

Jung, S., & Huh, J. (2019). An Efficient LMS Platform and Its Test Bed. *Electronics, 8(2),* 154. https://doi.org/10.3390/electronics8020154

Khawlah Ahmed & Mujo Mesonovich (2019). Learning Management Systems and Student Performance. *International Journal of Sustainable Energy Development (IJSED), 7(1),* 582-591.

McGraw-Hill Education at a Glance (2016). Available: https://www.mheducation.com/about.html

Moore, J.L., Dickson-Deane C. & Galyen, K. (2011). E-Learning, online learning, and distance learning environments: Are they the same*? Internet and Higher Education*, (14), 129-135

Nabeel Al-Assaf, Tamara Almarabeh, and Lubna Nasir Eddin (2015). A Study on the Impact of Learning Management System on Students of the University of Jordan. *JSEA, 08*, 11590–601.

Nasser, R.N., Ellili Cherif, & Romanowski, M.H. (2011). Factors that impact student usage of the learning management system in Qatari schools. *The International Review of Research in Open and Distributed Learning 12(6):39.* DOI: 10.19173/irrodl.v12i6.985

Neuhauser, C. (2002). Learning style and effectiveness of online and face-to-face instruction. *The American Journal of Distance Education,* 16(2), Available: http://www.rhartshorne.com/fall-2012/eme6507-rh/cdisturco/eme6507-eportfolio/documents/neuhauser.pdf

Nur Sakinah and Afiza Mohamad (2016). Factors influencing the success of learning management system (lms) on students' academic performance. *International Young Scholars Journal of Languages* 1.1 (2016): 36-49.

Oguguo, B.C.E., Nannim, F.A., Agah, J.J., Sunday, C., Catherine, U.E., & Augustine, C.N. (2021). Effect of learning management system on Student's performance in educational measurement and evaluation. *Education and Information Technology* 26(2), 1-13 (2021). DOI:10.1007/s10639-020-10318-w

Oakes, K. (2002). The use of learning content management system (LMCS) on organizations. T+ D, 56(3), 73-75.

Owston, R. (1997). The World Wide Web: A technology to enhance teaching and learning? *Educational Researcher*, 26(2), 27-33

Syaad, P. & Hidayat, W. (2018). The Effectiveness of Learning Management System (LMS) on Computer Assisted Learning Course for Informatics Engineering Education Students. Advanced Science Letters, 24(4). Retrieved from

https://www.ingentaconnect.com/contentone/asp/asl/2018/00000024/00000004/art00111?crawler=true&mimetype=application/pdf&fbclid=IwAR1Sqw_8C0YQIBwKbpClblbk3QOpAXM4jADeVIy8RtCOquVj_KTaHKS6W4

Selwyn Neil (2011). 'It's all about standardisation' – Exploring the digital (re)configuration of school management and administration. *Cambridge Journal of Education 41(4),* 473-488. DOI: 10.1080/0305764X.2011.625003

Ümmühan Avcı & Esin Ergün (2022). Online students' LMS activities and their effect on engagement, information literacy and academic performance, I*nteractive Learning Environments, 30(1),* 71-84, DOI: 10.1080/10494820.2019.1636088

Usman, Ahmed Mohammed (2021). Effect of using learning Management System on academic Performance of Students in financial Accounting in Secondary School in Bauchi State. Unpublished master's degree in business education (accounting), Abubakar Tafawa Balewa University, Bauchi, Nigeria.