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LMS Affects Teaching Effectiveness: Depending on LMS Platforms, Lecturer Qualification, and Lecturer Age

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Abstract: LMS Affects Teaching Effectiveness: Depending on LMS Platforms, Lecturer Qualification, and Lecturer Age. The ability of lecturers to manage the LMS affects the effectiveness of their teaching. Each LMS platform has differences in the user interface and the available features. Educational qualifications and the age of lecturers affect the mastery of LMS applications. So, the type of LMS platform, educational qualifications, and age of the lecturers affect teaching effectiveness. **Objective:** This study aims to examine the effects and comparisons between the three groups. **Methods:** The comparison of the LMS platform group consists of Moodle and Google Classroom; the educational qualification group consists of master's and doctoral degrees; and the age group is ≤ 45 years and > 45 years. **Findings:** The analysis results with the three-way ANOVA found that the three groups had an interaction effect of 74% on the effectiveness of their teaching. **Conclusion:** LMS Moodle, doctoral educational qualifications, and younger lecturers (≤ 45 years) have a higher average of lecturer teaching effectiveness.

Keywords: LMS, learning management system, lecturer qualification, lecturer age, teaching effectiveness.

Abstrak: LMS Mempengaruhi Keefektifan Mengajar: Bergantung pada Platform, Kualifikasi Pendidikan, dan Usia Dosen. *Kemampuan dosen dalam mengelola LMS berpengaruh terhadap keefektifan pengajarannya. Tiap platform LMS memiliki perbedaan baik dari user interfacenya maupun pada fitur yang tersedia. Kualifikasi pendidikan dan usia dosen mempengaruhi penguasaan aplikasi LMS. Jadi, baik itu jenis platform LMS, kualifikasi pendidikan, dan usia dosen adalah berpengaruh terhadap keefektifan pengajaran.* ***Tujuan:*** *Penelitian ini mengkaji pengaruh dan perbandingan di antara ketiga kelompok itu.* ***Metode:*** *Komparasi Kelompok platfom LMS terdiri dari Moodle dan Google Classroom, kelompok kualifikasi pendidikan terdiri dari magister dan doktor, dan kelompok usia terdiri dari ≤ 45 tahun dan >45 tahun.* ***Temuan:*** *Hasil analisis dengan Anova Tiga Jalan ditemukan bahwa ketiga kelompok secara bersama memiliki pengaruh interaksi sebesar 74,1% terhadap keefektifan pengajarannya.* ***Kesimpulan:*** *dari hasil penelitian ini adalah LMS Moodle, kualifikasi pendidikan doktor, dan dosen yang lebih muda (≤ 45 tahun) memiliki rata-rata yang lebih tinggi terhadap keefektifan pengajaran dosen.*

Kata kunci: *LMS, sistem manajemen pembelajaran, kualifikasi pendidikan, usia dosen, keefektifan pengajaran.*

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INTRODUCTION

The blended learning model became widespread and mandatory during the Covid-19 pandemic when conventional learning in the classroom became impossible because students and educators had to stay at home for a long time (Mali & Lim, 2021). In these conditions, well-organized blended learning is needed, not just using online applications and spontaneous teaching from educators. All synchronous and asynchronous learning activities must be accommodated in blended learning (Cuesta Medina, 2018). The whole learning process can and is easy to implement in blended learning applications. To manage all learning activities and resources, it is better if these blended learning activities are managed in an integrated online application (Suartama et al., 2019). This integrated blended learning application is commonly known as the Learning Management System (LMS) (Holmes & Prieto-Rodriguez, 2018).

LMS was developed from information and communication technology (ICT) with computer media or gadgets connected in a network. LMS is a software platform delivered to users (learners) by instructors via the internet and by using some hardware, to transfer knowledge quickly in an educational management cycle, which involves data and information (Dobre, 2015). In higher education, LMS is an essential component of a college. Most universities with good management already have an integrated LMS, and some are still in the development stage. Although many universities already have an integrated LMS, using an LMS is not an easy thing for some lecturers (Munir, 2010). This is because the level of ICT mastery varies among the lecturers themselves (Polla, 2010). Although many lecturers master ICT well, some LMS platforms' user interface is indeed rather complex (Aldiab et al., 2019). LMS commonly used are LMS with platforms Moodle, Schoology, Quizlet, Canvas, Edmodo, and Google Classroom. Each LMS has a different complexity and user interface experience (Kasim & Khalid, 2016). According to the author, Google Classroom is the simplest and easiest because users are accustomed to using Google platform applications on Android devices and PCs.

Moodle LMS is a platform that provides everything needed for an LMS, such as account registration, personalization, access differentiation, learning process management, recording learning outcomes and evaluation results, integration with synchronous and asynchronous mechanisms, and integration with external information systems (Kerimbayev et al., 2017). Moodle stands for Modular Object-Oriented Dynamic Learning Environment. Moodle can be a Course Management System (CMS) where online learning classes can be designed and presented with quality (Saraswat, 2014). Moodle allows a virtual educational environment where interactive communication features are available among learners (Kerimbayev et al., 2020). The Moodle LMS-based e-learning system enables the integration of mobile technology into the educational process and the implementation of the Mobile Learning Management System (MLMS) (Zabolotniaia et al., 2020).

Google Classroom is a Google Apps for Education (GAFE) application that can be used as an LMS because its features support learning management. There is support for synchronous learning (Google Meet) and asynchronous with Google Drive Cloud support and Google Forms. The app provides a central location for communicating with students, asking questions, and creating assignments. Google Classroom helps facilitate online learning for today's digital learners (Ketut Sudarsana et al., 2019). With Google Classroom, teachers can uniquely set up

virtual classrooms as a blended learning model. Some of the advantages of Google Classroom are: easy to use, time-saving, cloud-based, flexible, accessible, and of course, mobile-friendly (Iftakhar, 2016). Although the user interface of Google Classroom is straightforward, there are still many educators who find it challenging to apply it in their learning (Azhar & Iqbal, 2018).

In previous studies, it turns out that there are differences in teaching effectiveness in the application of different LMS. Several LMS platforms are found to be more effective and have a more positive effect on learning outcomes when these LMS are compared (Yana & Adam, 2019). Some users (learners) consider specific LMS easy to use, while others consider other LMS quite challenging (Sudiana, 2016). Online learning with LMS becomes effective if learning components such as discursive, adaptive, interactive, and reflective are integrated into one digital learning ecosystem (Oktavian & Aldya, 2020). In general, it was found that the LMS-based online learning process during the Covid-19 pandemic was quite effective. However, there were some barriers to social interaction and technical problems with the network not being fully prepared (Abidin et al., 2020). The thing that needs to be researched is the effectiveness of the teaching staff and the readiness and ability of educators to apply LMS in their learning. Among the LMS widely used by educators, namely Moodle and Google Classroom, it can be studied which one is more effective if viewed from the side of the educators.

Some of the issues encountered in learning at Manado State University (in Indonesian abbreviation as **Unima**) include different student perceptions of using LMS in learning in each of their courses (Lensun et al., 2021). A phenomenon is found where some LMS content considered good is perceived as mediocre from the student's point of view. There is also a tendency for students not to like learning using the LMS so much. As a result, the question of whether using LMS in learning is always effective arises (Imbar & Mesra, 2022). What factors influence teaching effectiveness? The author tries to examine this problem by making teaching lecturers research objects.

There are seven effective teaching practices (Mctighe & O'connor, 2005), namely: (i) using summative assessment to frame learning objectives, (ii) submitting learning contracts and evaluation criteria, (iii) conducting pre-teaching assessments, (iv) offering appropriate learning content, models and methods, (v) provide feedback, (vi) encourage students to conduct self-assessment to achieve learning objectives, and (vii) encourage students to correct their failures with better achievements. Educators apply these teaching practices in an LMS based on blended learning. In practice, there can be differences between teaching effectiveness in different LMSs, especially in comparing the use of Moodle and Google Classroom. The mastery ability of educators in using Moodle and Google LMS can also vary, so the effectiveness of teaching with LMS can also be different. The ability of educators to use LMS is determined mainly by the mastery of information and communication technology (ICT). The higher the mastery of ICT, the more influential the teaching applied by educators through LMS.

This research aims to examine the difference between teaching effectiveness on the use of LMS by Unima lecturers. The comparison made is on the use of the Moodle LMS and the Google Classroom LMS because most Unima lecturers use the two LMS (Lensun et al., 2021). Some use Moodle-based Unima LMS, and some only use Google Classroom. The two groups will be assessed for their teaching effectiveness through indicators of teaching effectiveness using LMS, where the effectiveness of teaching using LMS depends on the educational qualifications and age of the lecturers.

METHODS

Participants

Sixteen lecturers were randomly taken from each sub-group of samples from each sample group. It means that in all, 128 Unima lecturers are the research samples. All of them are spread across all faculties at Unima. The group arrangement uses the Three-Way ANOVA design, as shown in Table 1.

Table 1. Factors group of respondents

$A_1B_1C_1$	$A_2B_1C_1$	$A_1B_1C_2$	$A_2B_1C_2$	$A_1B_2C_1$	$A_2B_2C_1$	$A_1B_2C_2$	$A_2B_2C_2$
16	16	16	16	16	16	16	16

Research Design and Procedures

This study is a quantitative study with a comparative design between three sample groups in the lecturer population of Unima. The three sample groups can be seen in Table 2.

This research was carried out for 4 months, following the schedule from LPPM (the research institute) at Unima in 2022, from January to April.

Instrument

Data collection in this study was by using a questionnaire (Setyosari, 2016). The questionnaire distributed contained fifty instruments divided into eight indicators of the effectiveness of using LMS by lecturers. The eight indicators of the effectiveness of using LMS by lecturers are: using summative assessment to frame learning objectives; submitting learning contracts and evaluation criteria; conducting assessments before teaching; offering appropriate learning content, models and methods; providing feedback; encouraging students to conduct self-assessment to achieve learning objectives; encourage students to correct their failures with better achievements; and mastering information and communication technology (ICT) in supporting the use of LMS. These indicators can be seen in Table 3.

Table 2. Research sample group

LMS Platform Used by Lecturers (A)		Lecturer Education Qualification (B)		Lecturer Age (C)	
Moodle (Unima LMS) (A_1)	Google Classroom (A_2)	Master (B_1)	Doctor (B_2)	≤ 45 (C_1)	> 45 (C_2)

Table 3. Indicators and number of instrument items

No.	Indicators	Number of Instrument Items
1	Using summative assessment to frame learning objectives	6
2	Submit learning contracts and evaluation criteria	7
3	Conduct assessments before teaching	4
4	Offer appropriate learning content, models, and methods	7
5	Give feedback	6

6	Encourage students to conduct self-assessments to achieve learning goals	5
7	Encourage students to correct their failures with better achievement	5
8	Mastery of ICT in supporting the use of LMS	10
	Total items of the instrument	50

The results of the instrument item test showed that all of the instrument items were valid and reliable. This test was carried out on 32 lecturers at the Manado State Polytechnic. All instrument items were tested to be valid after the results of r arithmetic were more significant than the r table for n = 32 (r = .51 for a significance level of 5%). The instrument's item validity test results were obtained using the correlation function in Ms. Excel. The r count was obtained from the correlation between the instrument's item value and the total value. The instrument was tested to be reliable with a Cronbach's Alpha value of more than .60. The Cronbach's alpha value of the instrument obtained by reliability analysis using SPSS was 0.974 out of 50 instrument items.

Data analysis

The data were analyzed using the Three-Way Analysis of Variance (ANOVA). There are three main effects: A (the LMS platform used by the lecturer), B (the educational qualification of the lecturer), and C (the age of the lecturer). There are also two interactions in the Three-Way ANOVA design (Vik, 2014). First, the main effect pairs (A*B, A*C, and B*C). Second is the interaction of mutual influence (AB*C, AC*B, BC*A, and A*B*C). The data analyzed by ANOVA must be data that is usually distributed and homogeneous. Therefore, it is necessary to make a normality test and a homogeneity test of the data first. The normality and homogeneity tests use SPSS assistance, where the normality test looks at the output of the significant value of Smirnov or Shapiro-Wilk. In contrast, the homogeneity test looks at the output of the statistical significance of Levene. All output of significant values is more than 0.05. The research data are normally distributed and homogeneous.

RESULTS AND DISCUSSION

The quantitative questionnaire data obtained were normally distributed and homogeneous. Value of Sig. (p-value) for all variables on the normality test results of Kolmogorov-Smirnov and Shapiro-Wilk are more than .05. In Table 5, it can be seen that the value of Sig. (p-value) of the Moodle-based LMS is .20, and the p-value of Shapiro-Wilk is .24. For Google Classroom LMS .20 and .22. For lecturers with master's education qualifications are .12 and .16. For lecturers with doctoral education qualifications of .20 and .56. For lecturers aged less than 45 years are .20 and .12. For lecturers who are more than 45 years old are .20 and .40. Similarly, the results of the homogeneity test of the data obtained that the value of Sig. (p-value) is more than .05, as shown in Table 6. In Levene Statistics .91, the p-value is .51. This means the research data meets the requirements for analysis with the Three-Way ANOVA.

From the results of descriptive analysis, the data in Table 7 shows that the average teaching effectiveness of lecturers who use the Moodle LMS platform is 78.33, and those who use Google Classroom are 60.00. Meanwhile, the average teaching effectiveness of lecturers with master's education qualifications is 65.42, and those with doctoral qualifications are 72.92.

Table 4. Tests of normality

Learning Effectiveness		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	*df*	*Sig.*	*Statistic*	*df*	*Sig.*
LMS Platform Used by Lecturers	Moodle-based LMS	*.15*	*24*	*.20*	*.95*	24	.24
	Google Classroom	.13	24	.20*	.95	24	.22
Lecturer Education Qualification	Master	.16	24	.12	.94	24	.16
	Doctor	.10	24	.20*	.97	24	.56
Lecturer Age	≤ 45 years	.14	24	.20*	.93	24	.12
	> 45 years	.13	24	.20*	.96	24	.40

Table 5. The results of the homogeneity test

Levene Statistic	df_1	df_2	*Sig.*
.91	7	40	.51

Likewise, the average teaching effectiveness of lecturers aged less than 45 years is 74.58, and those aged more than 45 years are 63.75.

In general, the teaching effectiveness of lecturers who use the Moodle platform LMS is higher than that of lecturers who use Google Classroom. Lecturers with doctoral qualifications have higher teaching effectiveness than lecturers with master's qualifications. Furthermore, lecturers who are less than 45 years old have higher teaching effectiveness than lecturers who are more than 45 years old.

Table 6. Mean value of each group

Teaching Effectiveness					
LMS Platform Used by Lecturers		Lecturer Education Qualification		Lecturer Age	
Moodle LMS	Google Classroom	Doctor	Master	<= 45 years	> 45 years
Mean					
78,33	60.00	72.92	65.42	74.58	63.75

The primary influence and interaction effect analysis results can be seen in Table 8. If the p-value is less than .05, then H0 is rejected, and if it is more than .05, then H0 is accepted. For F = 70,66, the p-value is .00, which means that the type of LMS platform used by the lecturer affects the effectiveness of teaching. For F = 11.83, the p-value is .00, which means that the educational qualifications of the lecturers affect the effectiveness of their teaching. For F = 24,67, the p-value is .00, which means that the age of the lecturer also affects the effectiveness of teaching. This means that the three variables (the type of LMS platform used, educational qualifications, and the age of the lecturers affect the effectiveness of lecturers' teaching.

Table 8 also shows the effect of A*B, A*C, B*C, and A*B*C interactions. FAB = .15 with a p-value = .70, which means that there is no interaction effect between the types of LMS platforms used by lecturers and the educational qualifications of lecturers on teaching effectiveness. FAC = 5.26 with a p-value = .03, which means that there is an interaction effect between the types of LMS platforms used by the lecturers and the age of the lecturers on the effectiveness of teaching. In another sense, the type of LMS platform used by the lecturer affects

the effectiveness of teaching, depending on the age of the lecturer and vice versa. FBC = 1.31 with a p-value = .26, which means that there is no interaction effect between the educational qualifications of the lecturers and the age of the lecturers on the effectiveness of teaching. FABC = 10,58 with a p-value = .02, which means an interaction effect between the type of LMS platform used by the lecturer, the lecturer's educational qualification, and the lecturer's age on the effectiveness of teaching. The magnitude of the influence of the LMS platform type used, the lecturers' educational qualifications, the lecturers' age, and the interaction between the three variables are equal to the R Squared value in Table 8, which is .74.

The findings from the results of the analysis in Table 8 are all group variables of these factors, namely: the type of LMS platform used by the lecturer, the educational qualification of the lecturer, and the age of the lecturer, all three of which affect the effectiveness of the lecturer's teaching. This first finding can be called the primary influence. The subsequent finding in the results of the analysis of Table 8 is the so-called interaction effect. The result is that the type of LMS platform used by the lecturers and the educational qualifications of the lecturers have no interaction effect on the effectiveness of teaching. The same thing with educational qualifications and age of lecturers do not have an interaction effect on teaching effectiveness. However, the relationship between the type of lecturer's LMS platform and the age of the lecturer turned out to have an interaction effect on teaching effectiveness. The three factors also turned out to affect the teaching effectiveness by 74%.

In the Corrected Model row in Table 8, F = 16.35 with p-value = .00 means that H0 is rejected because p-value < .05. Thus, there is an average difference between the eight groups. Because testing the interaction effect hypothesis is significant, it must be continued with a simple effect test.

Tabel 7. Tests of between-subjects effects

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	6533.33a	7	933.33	16.35	.00
Intercept	229633.33	1	229633.33	4022.77	.00
A	4033.33	1	4033.33	70.66	.00
B	675.00	1	675.00	11.83	.00
C	1408.33	1	1408.33	24.67	.00
A * B	8.33	1	8.33	.15	.70
A * C	300.00	1	300.00	5.26	.03
B * C	75.00	1	75.00	1.31	.26
A * B * C	33.33	1	33.33	10.58	.02
a. *R Squared* = .74 (*Adjusted R Squared* = .70)					

Tabel 8. Contrast tests

Contrast		*Value of Contrast*	*Std. Error*	*t*	*df*	*Sig. (2-tailed)*
	$A_1B_1C_1$ x $A_2B_1C_1$	22.50	4.36	5.16	40	.00
	$A_1B_1C_2$ x $A_2B_1C_2$	15.83	4.36	3.63	40	.00
	$A_1B_2C_1$ x $A_2B_2C_1$	24.17	4.36	5.54	40	.00

		$A_1B_2C_2$ x $A_2B_2C_2$	10.83	4.36	2.48	40	.02
		$A_1B_1C_1$ x $A_1B_2C_1$	-5.83	4.36	-1.34	40	.19
Learning Effectiveness	Assume equal variances	$A_1B_1C_2$ x $A_1B_2C_2$	-7.50	4.36	-1.72	40	.09
		$A_2B_1C_1$ x $A_2B_2C_1$	-4.17	4.36	-0.96	40	.35
		$A_2B_1C_2$ x $A_2B_2C_2$	-12.50	4.36	-2.87	40	.01
		$A_1B_1C_1$ x $A_1B_1C_2$	16.67	4.36	3.82	40	.00
		$A_1B_2C_1$ x $A_1B_2C_2$	15.00	4.36	3.44	40	.00
		$A_2B_1C_1$ x $A_2B_1C_2$	10.00	4.36	2.29	40	.03
		$A_2B_2C_1$ x $A_2B_2C_2$	1.67	4.36	.38	40	.70

The simple effect test analysis is divided into three parts, namely simple effect A (type of LMS platform used by lecturers, simple effect B (lecturer's education qualification), and simple effect C (lecturer's age). Each simple effect section has four different factors. So, the total factor, there are twelve differences (see Table 9).

Simple Effect A (Type of LMS Platform Used by Lecturers)

First the difference between A1 and A2 in B1C1. Contrast tests in Table 9, t = 5,16; df = 40; p-value = .00/2 = .00; then p-value < .05 so H0 is rejected. Thus, it was found that the teaching effectiveness of lecturers who used the Moodle LMS was higher than that of the lecturers who used the Google Classroom LMS for lecturers with master's education qualifications and aged less than 45 years. Second is the difference between A1 and A2 in B1C2. In Table 9, t = 3,63; df = 40; p-value = .00/2 = .00; then p-value < .05 so H0 is rejected. Thus, it was found that the teaching effectiveness of lecturers who used the Moodle LMS was higher than that of the lecturers who used the Google Classroom LMS for lecturers with master's education qualifications and over 45 years of age.

The third is the difference between A1 and A2 in B2C1. Contrast tests in Table 9, t = 5,54; df = 40; p-value = .00/2 = .00; then p-value < .05 so H0 is rejected. Thus, it was found that the teaching effectiveness of lecturers using Moodle LMS was higher than lecturers using Google Classroom LMS for lecturers with doctoral qualifications and aged less than 45 years. Fourth, the difference between A1 and A2 in B2C2. In Table 9, t = 2.48; df = 40; p-value = .02/2 = .01; then p-value < .05 so H0 is rejected. Thus, it was found that the teaching effectiveness of lecturers using Moodle LMS was higher than lecturers using Google Classroom LMS for lecturers with doctoral qualifications and aged over 45 years.

From the four simple effects A (the type of LMS platform used by lecturers), it was found that the teaching effectiveness of lecturers using Moodle was higher than lecturers using Google Classroom for both categories of lecturers' educational qualifications (master and doctoral) and all ages of lecturers. In this study, lecturers who used Moodle had better teaching effectiveness than lecturers who used Google Classroom.

Simple Effect B (Lecturer Education Qualification)

First the difference between B1 and B2 in A1C1. Contrast tests in Table 9, t =-1,34; df = 40; p-value = .19/2 = .095; then p-value > .05 so H0 is accepted. Thus, it was found that there was no difference in teaching effectiveness between lecturers with master's qualifications and

lecturers with doctoral qualifications for lecturers who used Moodle LMS and who were less than 45 years old. Second is the difference between B1 and B2 in A1C2. In Table 9, t = -1.72; df = 40; p-value = .09/2 = .045; then p-value < .05 so H0 is rejected. Thus, it was found that there were differences in teaching effectiveness between lecturers with doctoral qualifications and lecturers with master's qualifications. The teaching effectiveness of lecturers with doctoral qualifications is higher than lecturers with master's qualifications for lecturers who use Moodle LMS and are more than 45 years old.

The third is the difference between B1 and B2 in A2C1. Contrast tests in Table 9, t = -.96; df = 40; p-value = .35/2 = .175; then p-value > .05 so H0 is accepted. Thus, it was found that there is no difference in teaching effectiveness between lecturers with master's qualifications and lecturers with doctoral qualifications for lecturers who use the LMS Google Classroom and those who are less than 45 years old. Fourth, the difference between B1 and B2 in A2C2. In Table 9, t = -2.87; df = 40; p-value = .01/2 = .005; then p-value < .05 so H0 is rejected. Thus, it was found that there were differences in teaching effectiveness between lecturers with doctoral qualifications and lecturers with master's qualifications. The teaching effectiveness of lecturers with doctoral qualifications is higher than lecturers with master's qualifications for lecturers who use the Google Classroom LMS and are more than 45 years old.

There are two simple effects B (lecturer's educational qualifications), which found no difference in teaching effectiveness between lecturers with master's and doctoral education qualifications, and those aged less than 45 years. This is found in lecturers who use the Moodle LMS or Google Classroom LMS. For all lecturers who are more than 45 years old, it was found in this study that lecturers with doctoral qualifications had higher teaching effectiveness than lecturers with master's qualifications. This is also found in lecturers who use the Moodle LMS or Google Classroom LMS.

Simple Effect C (Lecturer Age)

First the difference between C1 and C2 in A1B1. Contrast tests in Table 9, t = 3.82; df = 40; p-value =.00/2 = .00; then p-value < .05 so H0 is rejected. Thus, it was found that the teaching effectiveness of lecturers aged less than 45 years was higher than lecturers aged more than 45 years for lecturers who used Moodle LMS and who had master's education qualifications. Second is the difference between C1 and C2 in A1B2. In Table 9, t = 3.44; df = 40; p-value = .00/2 = .00; then p-value < .05 so H0 is rejected. Thus, it was found that the teaching effectiveness of lecturers aged less than 45 years was higher than lecturers aged more than 45 years for lecturers who used Moodle LMS and who had doctoral qualifications.

The third is the difference between C1 and C2 in A2B1. Contrast tests in Table 9, t = 2,29; df = 40; p-value = .03/2 = .015; then p-value < .05 so H0 is rejected. Thus, it was found that the teaching effectiveness of lecturers aged less than 45 years was higher than lecturers aged more than 45 years for lecturers who used the LMS Google Classroom and who had master's education qualifications. Fourth, the difference between C1 and C2 in A2B2. In Table 9, t = 0.38; df = 40; p-value = .70/2 = .35; then p-value > .05 so H0 is accepted. Thus, it was found that there was no difference in teaching effectiveness between lecturers aged less than 45 years and lecturers aged more than 45 years for lecturers who used the Google Classroom LMS and those with doctoral qualifications.

From the results obtained on the simple effect of C (age of lecturers), for lecturers with doctoral qualifications and using the LMS Google

Classroom, at all ages of lecturers, it was found that there was no difference in terms of teaching effectiveness. In addition, it was found that the teaching effectiveness of lecturers aged less than 45 years was higher than lecturers aged more than 45 years.

Interpretations

From the findings of the interpretation of the descriptive analysis, the mean value in Table 7 shows that the average value of teaching effectiveness for lecturers who use Moodle LMS is higher than for lecturers who use Google Classroom LMS. This is also seen in finding a simple effect A (data interpretation Table 9). Based on these findings, the researcher sees that the Moodle LMS is more effective in teaching than the Google Classroom LMS. Moodle LMS does have many advantages over other LMS. Moodle is accessible for lecturers to manage, organize, and be safe because it is easy to back up and restore, has complete resources to support learning activities, and, most importantly, can be reported (Ghosh et al., 2019). Unlike Google Classroom, which cannot store all learning activities in one document, Moodle's LMS has been proven to have been developed and capable of doing this. This is undoubtedly very helpful for lecturers in administering learning documents that will later be reported as evidence of performance.

This study proves that the Moodle LMS is indeed the best choice in an effective learning process regarding planning, implementation, and learning management activities (Kerimbayev et al., 2020). Learning planning involves making semester learning plans (abbreviated in Indonesian as RPS) and lecture program units (in Indonesian abbreviated as SAP), and lecture contracts. RPS, SAP, and lecture contracts can be uploaded as Moodle LMS content so that students can read them repeatedly. All synchronous and asynchronous learning activities can be held through the Moodle LMS (Ghosh et al., 2019). All learning content (documents, presentations, audio videos, internet links) can be presented on Moodle LMS. Interactive in the form of comments, questions, and discussions in full are presented in the Moodle LMS. Resources for complete assignments, surveys, quizzes, and assessment activities can be made in the Moodle LMS (Willermark & Islind, 2022).

LMS Moodle was developed with algorithms for learning feedback techniques and student self-assessment with the help of lecturers (Dimiæ et al., 2018). With the help of information and communication technology (ICT), Moodle LMS continues to be developed. The association analysis technique was developed in the Moodle e-test. The testing technique in Moodle already supports all types of learning tests, so it is instrumental in getting learning feedback for lecturers and students. Feedback can be obtained from direct feedback or comments, assignment results, exam results, and surveys. All the feedback is available and ready to be designed by the lecturer. With feedback, lecturers can measure the effectiveness of teaching, and students can measure themselves and correct any failures in learning.

The teaching effectiveness of using the Moodle LMS can be compared with students' perceptions of this LMS. Student satisfaction with the use of the Moodle LMS is dependent on the quality of the content provided by the lecturer through this LMS (Horvat et al., 2015). Generally, students find it helpful to have an LMS, including Moodle. Students are satisfied that all traditional learning activities in the classroom can be transferred to the LMS. Especially during the Covid 19 pandemic, where distance learning can reduce its quality and effectiveness if it is held without using good management. Moodle LMS helps students follow learning well and effectively, both synchronously and asynchronously. It all depends on the motivation and participation of students, and some students are good at

traditional face-to-face learning and learning in LMS and do not have any concern for learning (Carpenter et al., 2020). This is the task of the lecturer in learning, so feedback is always essential in interactive relationships with students. Lecturers must understand and think to find solutions for each student's obstacles in learning.

This proven effective Moodle LMS can be increased in reach with international learning because Moodle has become a distance learning platform well known by many users in the world of education (Kerimbayev et al., 2017). To improve the global learning program, an LMS-based distance learning platform is urgently needed. Moodle LMS is well known because almost all universities now have Moodle-based LMS. It is possible for international learning to use Moodle LMS. This means that lecturers can participate in international learning. This can improve the competence of lecturers and help universities achieve international accreditation. International accreditation is an indicator of the effectiveness of teaching lecturers and campuses or vice versa (Rahardja et al., 2020).

Mastery of information and communication technology (ICT) is an essential differentiator in the success of teaching with an LMS, especially Moodle. Mastery of technology is mandatory for all lecturers, both those who teach in science, technology, engineering, and mathematics (STEM) and non-STEM ones, to produce high teaching effectiveness using LMS (Sáiz-Manzanares et al., 2021). The indicators are as described by the author, including being able to find and create content using multimedia applications and graphic design (Reyna et al., 2018), using Office applications fluently, using online applications for tests and evaluations, and accessing and downloading learning references from internet sources, with a high reputation, using online meeting applications, using the cloud, and using database applications both online and offline (Asamoah, 2020).

The descriptive analysis of the mean for the educational qualifications of lecturers (Table 7) shows that lecturers with doctoral qualifications are more effective in teaching using LMS. Then the simple effect test B (Table 9) shows no difference between lecturers' effectiveness with master's and doctoral qualifications using LMS Moodle or Google Classroom. This finding supports previous research that high teacher qualifications do not significantly affect teaching quality in terms of teaching success (Darling-Hammond, 2000). However, for specific age categories of lecturers, it turns out that there are differences between lecturers with doctoral qualifications and those with master's qualifications. In this study, it was found that for lecturers aged over 45 years, lecturers with doctoral qualifications were more effective in teaching than lecturers with master's qualifications. The older a lecturer is, the longer he teaches, so the experience in terms of learning and teaching also increases. Lecturers with more profound practical experience certainly have better teaching effectiveness (Böckelmann et al., 2021). Lecturers with higher educational qualifications also produce more pedagogical thinking (Akbari & Dadvand, 2011). These pedagogical thoughts produce planned and practical learning in their implementation. Of course, this can increase teaching effectiveness with LMS from lecturers with doctoral qualifications.

From the results of the descriptive analysis of the average values in Table 7, it was also found that in the study it was found that younger lecturers, i.e., less than 45 years, had better LMS teaching effectiveness than older lecturers who were more than 45 years old. In the simple effect test C (Table 9), it was found that the effectiveness of teaching with LMS for younger lecturers (less than equal to 45 years) was higher than for older ones (more than 45 years), except for lecturers who used Google Classroom LMS and who have doctoral qualifications. In this study, lecturers less

than 45 years old are the generations x and y (millennials). These lecturers live in the era of information and communication technology (ICT) which has been widely applied. On the other hand, lecturers who are more than 45 years old have just used ICT in their old age, so it takes more effort to get used to the use of ICT (Kubiatko, 2013). This impacts teaching with LMS, which all use ICT in the use and management of teaching. However, unlike lecturers with doctoral qualifications, they can be said to be able to compete with younger lecturers. Lecturers with doctoral qualifications are accustomed to using ICT since they are studying again (doctoral studies). There is also no difference between lecturers who use Google Classroom regarding teaching effectiveness because Google Classroom has a simple interface, making it easy to use for young and old alike, especially for those with higher education qualifications. For lecturers who are old or young, in some instances, there is no difference in the effectiveness of their teaching in using LMS (Torff & Kimmons, 2021).

In the influence test between research subjects in Table 8, it was found that the three research subjects (type of LMS platform used, educational qualifications, and age of lecturers) each affected teaching effectiveness. The effectiveness of teaching lecturers is influenced by the type of LMS platform used, namely LMS Moodle or Google Classroom. Doctoral or master's educational qualifications also affect the effectiveness of teaching. Likewise, the age of younger lecturers (less than equal to 45 years) or older (more than 45 years) affects teaching effectiveness. The interaction effect is only found between the type of LMS platform used and the educational qualifications of the lecturers on the effectiveness of their learning, as well as on the three variables (type of the LMS platform used, educational qualifications, and the age of the lecturers) together on teaching effectiveness. The percentage of the interaction effect of the three s of variables on teaching effectiveness is 74%.

CONCLUSIONS

This study found that there was a difference in the average score between the use of the Moodle LMS (78.33), Google Classroom (60.00), doctoral qualification (72.92), master's qualification (65.42), age less than the same as 45 years (74.58), and over 45 years (63.75). The analysis results found that the type of LMS platform used affected teaching effectiveness, educational qualifications, and the age of the lecturers; also, each affected teaching effectiveness. The interaction effect occurs in the relationship between the type of LMS platform used and the age of the lecturer on teaching effectiveness. The effect of mutual interaction also occurs in the three of them, namely the type of LMS platform used, educational qualifications, and the age of the lecturers, on the effectiveness of their teaching. The percentage of the interaction effect of mutual interaction is 74%.

The teaching effectiveness of lecturers who use Moodle is higher than lecturers who use Google Classroom, depending on both categories of lecturers' educational qualifications (master and doctoral) and for all ages lecturers. Lecturers who use Moodle have better teaching effectiveness than lecturers who use Google Classroom. There is no difference in teaching effectiveness between lecturers in the category of master's and doctoral education qualifications and those less than 45 years old. For all lecturers who are more than 45 years old, it was found in this study that lecturers with doctoral qualifications had higher teaching effectiveness than lecturers with master's qualifications. For lecturers with doctoral qualifications and using the Google Classroom LMS at all ages of lecturers, it was found that there was no difference in teaching effectiveness.

It is hoped that with the results of this research, lecturers can improve the quality of teaching through LMS for more effective teaching. Lecturers must develop themselves by always following the development of information and communication technology (ICT). It is necessary to hold workshops or pieces of training on blended learning and LMS use in universities that are still less effective in LMS-based learning. In the future, the perceptions of lecturers and students can be studied in terms of the quality of teaching and learning using LMS Moodle or Google Classroom. It is also necessary to study quantitatively or qualitatively other types of LMS that have not been studied.

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