



Volume XI Issue 3 Year 2026 | Page 915-927 | ISSN: 2527-9866

Received: 20-06-2026 | Revised: 27-07-2026 | Accepted: 14-08-2026

The Relationship Between Moodle-Based Learning Management System Usage and Employee Knowledge Retention in the Individual Development Program at BPJS Ketenagakerjaan

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Abstract: This study examines the relationship between Moodle-based Learning Management System (LMS) usage within the Individual Development Program (IDP) and employee knowledge retention at BPJS Ketenagakerjaan. A cross-sectional survey was distributed to IDP participants nationwide using a purposive, voluntary-response technique; after removing 73 duplicate submissions, 417 valid responses were analyzed (minimum required by the Slovin formula: 372). The instrument's 30 retained items (15 LMS-usage, 15 knowledge-retention) were all valid ($r = 0.715-0.886 > r\text{-table} = 0.096$) and reliable (Cronbach's Alpha $0.957-0.979$). Regression residuals departed from normality, homoscedasticity, and strict linearity, so heteroscedasticity-robust (HC3) errors were used to confirm inference. The model ($Y = 3.113 + 0.901X$) showed a significant positive association between LMS usage and knowledge retention (robust $t = 29.643$, $p < .001$; $F = 1008.233$, $p < .001$), with usage associated with 70.84% of the variance in retention ($R^2 = 0.7084$). Greater LMS engagement is linked to stronger self-reported retention within the IDP, informing digital training design at BPJS Ketenagakerjaan. Given the cross-sectional, single-source design, findings should be read as associations rather than causal effects.

Keywords: Learning Management System, Moodle, Individual Development Program, Knowledge Retention, Digital Training.

1. Introduction

Organizational training increasingly relies on Learning Management Systems (LMS) to improve learning accessibility and employee knowledge retention. Previous studies have reported positive associations between Moodle-based LMS usage, learner engagement, and short-term knowledge retention [1], [3], while content quality and accessibility have also been linked to improved learning outcomes [2]. However, evidence remains inconsistent, particularly in government and public-sector organizations, where high LMS participation does not always translate into sustained knowledge retention [5]. Although the Technology Acceptance Model (TAM) has explained LMS adoption in corporate settings [13], [14], the relationship between LMS usage and knowledge retention in mandatory institutional training remains insufficiently explored.

Knowledge retention depends not only on access to learning materials but also on learning strategies such as repeated engagement, feedback, and retrieval practice [8], [12]. While previous studies in Indonesian public institutions have examined LMS adoption and user satisfaction [4], [19] as well as factors influencing e-learning utilization in government agencies [18], [23], relatively few have quantified the relationship between LMS usage and employee knowledge retention using validated measurement instruments and inferential statistical analysis.

BPJS Ketenagakerjaan provides a relevant context because its Individual Development Program (IDP) delivers mandatory Moodle-based training to employees nationwide. Previous

studies within the organization focused on learning design [16] or provided narrative evaluations of LMS implementation [17], while broader studies of LMS in state-owned-enterprise career development programs examined its relationship with work motivation and knowledge retention [10], without statistically examining the relationship between LMS usage and knowledge retention. This study addresses that gap by employing a validated 30-item questionnaire and regression-based inferential analysis to examine the association between Moodle-based LMS usage and employee knowledge retention.

Accordingly, this study aims to examine the relationship between Moodle-based LMS usage and employee knowledge retention within the IDP at BPJS Ketenagakerjaan, quantify the strength of this relationship using regression analysis, and identify the LMS usage dimensions most strongly associated with employees' self-reported knowledge retention.

2. Literature Review

In organizational research, an LMS is a web-based platform supporting learning through content delivery, assessment, and reporting [15], with effective multimedia design principles enhancing comprehension and information processing [7]; Moodle, an open-source LMS enabling flexible, interactive learning, is among the most widely adopted platforms in educational and organizational training [21], [27], with interactive features shown to enhance participant engagement and knowledge retention [20]. Knowledge retention is an individual's capacity to encode, store, and later recall and apply acquired information particularly important in job-training contexts where practical application, not mere completion, determines organizational value [5], [8], and can be influenced by the instructional design of e-learning environments [29]. An IDP is a structured, needs-based development mechanism building competencies aligned with organizational and individual career goals [25], [28]. The relationship among these constructs lies in how the LMS operationalizes delivery and reinforcement of IDP content: when an LMS effectively supports content delivery, accessibility, and retrieval practice, employees' knowledge retention is expected to be correspondingly stronger [1], [22].

3. Methods

The research was conducted from February to July 2025 at the Learning Center of BPJS Ketenagakerjaan, Bogor, West Java, Indonesia, to examine the relationship between Moodle-based LMS usage and employee knowledge retention within the Individual Development Program (IDP). This study employed a quantitative survey approach using questionnaire data collected from employees participating in the IDP. The study population consisted of 5,273 employees. The minimum sample size was determined using the Slovin formula with a 5% margin of error:

$$n = N / [1 + N(e)^2](1)$$

$$n = 1 + 5,273(0.05)^2 / 5,273 = 371.9 \approx 372(2)$$

Accordingly, the minimum required sample was 372 respondents. Data collection yielded 490 responses through an online questionnaire distributed via Google Forms with the assistance of the BPJS Ketenagakerjaan Learning and Development team. After removing 73 duplicate submissions, 417 valid responses remained, exceeding the minimum sample requirement. Because participation was voluntary following an organization-wide email invitation, the sampling technique is classified as purposive (nonprobability) sampling with voluntary response.

The independent variable was Moodle LMS usage (Variable X), measured using five indicators: usage intensity, ease of access, supporting features, content quality, and learning efficiency. The dependent variable was knowledge retention (Variable Y). Although the initial instrument contained six retention indicators, the sixth indicator ("Relationship between Usage and

Retention", items Y16-Y18) was excluded because it conceptually overlapped with the independent variable. The final retention construct therefore consisted of five indicators recall ability, knowledge implementation, content understanding, long-term retention, and impact on memory measured using 15 retained items. All validity, reliability, classical assumption, and regression analyses were performed using this retained construct.

Knowledge retention was operationalized as employees' self-reported perception of recall, understanding, and retention of IDP learning materials rather than objective post-training assessments. This approach is widely used in organizational LMS research because of its practicality and scalability [2], [14], although it may introduce perception bias, which is acknowledged as a limitation of this study. Data analysis consisted of descriptive statistics, validity and reliability testing, classical assumption tests (normality, heteroscedasticity, and linearity), simple linear regression, t-test, F-test, and coefficient of determination (R^2). Statistical analyses were conducted using Python (SciPy and statsmodels), following procedures equivalent to SPSS. Because the assumption tests indicated departures from normality, homoscedasticity, and strict linearity, heteroscedasticity-robust (HC3) standard errors were additionally computed to verify the robustness of the regression coefficient.

The hypotheses in this study are as follows.

- H0: There is no significant relationship between Moodle-based LMS usage in the Individual Development Program and employee knowledge retention.
- H1: There is a significant positive relationship between Moodle-based LMS usage in the Individual Development Program and employee knowledge retention.

4. Results And Discussion

A. Respondent Characteristics

Data collection was carried out through an online questionnaire distributed to all BPJS Ketenagakerjaan employees participating in the Individual Development Program (IDP) throughout Indonesia. Data collection yielded 490 raw submissions; following data cleaning, 73 duplicate entries were identified and removed (Google Forms allowed repeat submissions from the same respondent), leaving 417 respondents who met the data-completeness criteria and were used as the analysis sample, exceeding the minimum threshold of 372 respondents established by the Slovin formula. Respondent characteristics are described based on gender, last education level, and length of service, as presented in Tables I-III.

Table 1. Respondent Characteristics By Gender

Gender	Frequency (n)	Percentage (%)
Male	236	56.6
Female	181	43.4
Total	417	100.0

Male respondents constituted the majority. This distribution describes the composition of the survey sample; as no independent organization-wide workforce data were examined in this study, no claim is made about how representative this gender split is of BPJS Ketenagakerjaan's overall workforce.

Table 2. Respondent Characteristics By Last Education Level

Last Education	Frequency (n)	Percentage (%)
Bachelor's Degree (S1)	291	69.8
Master's Degree (S2)	107	25.7
Diploma (D3)	10	2.4
Senior/Vocational High School	6	1.4
Doctoral Degree (S3)	2	0.5
Diploma (D1)	1	0.2
Total	417	100.0

Most respondents held a Bachelor's or Master's degree, indicating a predominantly tertiary-educated sample. As digital-literacy or platform-adaptation ability was not directly measured, no inference is drawn from educational attainment about employees' capacity to use the LMS; this remains a plausible area for future investigation rather than a finding of the present study.

Table 3. Respondent Characteristics By Length Of Service

Length of Service	Frequency (n)	Percentage (%)
0-3 Years	1	0.2
4-10 Years	178	42.7
11-15 Years	79	18.9
16-25 Years	105	25.2
26-35 Years	36	8.6
> 36 Years	18	4.3
Total	417	100.0

Most respondents fell in the 4-10-year and 16-25-year service brackets, indicating moderate-to-long organizational tenure overall. As familiarity with internal work systems was not directly measured, this characteristic is reported descriptively rather than interpreted as an explanatory factor for the study's outcomes.

B. Descriptive Analysis

Descriptive analysis was conducted to characterize the distribution of respondents' answers on each indicator of the Moodle-based LMS usage variable (X) and the knowledge retention variable (Y), using a 1 (Strongly Disagree) to 4 (Strongly Agree) Likert scale.

Table 4. Descriptive Statistics Of The Lms Usage (X) And Knowledge Retention (Y) Variables

Indicator	Item	Mean	Std. Dev.	Min	Max
Usage Intensity	X1-X3	3.312	0.621	1	4
Ease of Access	X4-X6	3.309	0.643	1	4
Supporting Features	X7-X9	3.292	0.598	1	4
Content Quality	X10-X12	3.354	0.581	1	4
Learning Efficiency	X13-X15	3.284	0.631	1	4
Overall Mean of X	-	3.310	0.616	1	4
Recall Ability	Y1-Y3	3.206	0.629	1	4
Knowledge Implementation	Y4-Y6	3.223	0.596	1	4
Content Understanding	Y7-Y9	3.298	0.558	1	4
Long-term Retention	Y10-Y12	3.077	0.654	1	4
Impact on Memory	Y13-Y15	3.145	0.620	1	4
Overall Mean of Y (retained 5-indicator construct)	-	3.190	0.617	1	4
Relationship Usage-Retention (excluded)*	Y16-Y18	3.210	0.589	1	4

All retained indicators of the knowledge retention variable obtained relatively high mean values. Content Understanding recorded the highest mean, suggesting respondents generally perceived themselves as understanding training concepts rather than merely memorizing them, while Long-term Retention recorded the lowest, suggesting self-perceived retention without ongoing platform engagement may be comparatively weaker than other retention facets. This pattern may be relevant for program managers considering reinforcement or spaced-repetition mechanisms, though this study does not directly test any such mechanism's effectiveness.

C. Validity Test

The validity test assessed whether the instrument measures the intended constructs, using Pearson product-moment item-total correlations, with each item correlated against the total score of its own subscale (LMS Usage items against the X total; retained Knowledge Retention items against the reduced 15-item Y total), compared against the r-table value [6]. With $n = 417$ and a two-tailed significance level of 5% ($df = 415$), $r\text{-table} = 0.096$; an item was considered valid where $r\text{-count} > r\text{-table}$ and $p < 0.05$.

Table 5. Validity Test Results For Variables X And Y (30 Items)

Item	Indicator	r-count	r-table	Sig.	Remarks
P1	Usage Intensity	0.715	0.096	< .001	Valid
P2	Usage Intensity	0.819	0.096	< .001	Valid
P3	Usage Intensity	0.799	0.096	< .001	Valid
P4	Ease of Access	0.784	0.096	< .001	Valid
P5	Ease of Access	0.823	0.096	< .001	Valid
P6	Ease of Access	0.793	0.096	< .001	Valid
P7	Supporting Features	0.842	0.096	< .001	Valid
P8	Supporting Features	0.837	0.096	< .001	Valid
P9	Supporting Features	0.751	0.096	< .001	Valid
P10	Content Quality	0.805	0.096	< .001	Valid
P11	Content Quality	0.802	0.096	< .001	Valid
P12	Content Quality	0.820	0.096	< .001	Valid
P13	Learning Efficiency	0.715	0.096	< .001	Valid
P14	Learning Efficiency	0.783	0.096	< .001	Valid
P15	Learning Efficiency	0.806	0.096	< .001	Valid
P16	Recall Ability	0.860	0.096	< .001	Valid
P17	Recall Ability	0.866	0.096	< .001	Valid
P18	Recall Ability	0.841	0.096	< .001	Valid
P19	Knowledge Implementation	0.853	0.096	< .001	Valid
P20	Knowledge Implementation	0.860	0.096	< .001	Valid
P21	Knowledge Implementation	0.862	0.096	< .001	Valid
P22	Content Understanding	0.807	0.096	< .001	Valid
P23	Content Understanding	0.832	0.096	< .001	Valid
P24	Content Understanding	0.854	0.096	< .001	Valid
P25	Long-term Retention	0.834	0.096	< .001	Valid
P26	Long-term Retention	0.773	0.096	< .001	Valid
P27	Long-term Retention	0.879	0.096	< .001	Valid
P28	Impact on Memory	0.883	0.096	< .001	Valid
P29	Impact on Memory	0.875	0.096	< .001	Valid
P30	Impact on Memory	0.886	0.096	< .001	Valid

All 30 retained items were statistically valid, with r-count ranging from 0.715 to 0.886 (all exceeding r-table = 0.096, $p < .001$). Items for variable Y showed somewhat higher r-count values than items for variable X, indicating comparatively tighter internal consistency among the retention items. For transparency, the three excluded items (P31-P33, "Relationship between Usage and Retention") were also statistically valid against the reduced Y total ($r = 0.826$ - 0.845 , $p < .001$); their exclusion was made on conceptual/discriminant-validity grounds (Section 3.E), not because they failed a statistical validity criterion.

D. Reliability Test

The reliability test measured the internal consistency of the instrument. Cronbach's Alpha was used, with the instrument considered reliable if the alpha value exceeds 0.60 [6]. Reliability is reported separately for the LMS Usage subscale, the retained Knowledge Retention subscale, and the combined 30-item instrument.

Table 6. Reliability Test Results Of The Research Instrument

Variable	Number of Items	Cronbach's Alpha	Requirement	Remarks
Moodle LMS Usage (X)	15	0.957	> 0.60	Reliable
Knowledge Retention (Y, retained)	15	0.972	> 0.60	Reliable
Combined instrument (X + retained Y)	30	0.979	> 0.60	Reliable

Cronbach's Alpha was 0.957 for LMS Usage, 0.972 for the retained Knowledge Retention scale, and 0.979 for the combined 30-item instrument, all exceeding the 0.60 reliability threshold and falling within the "excellent" reliability category [6]. This indicates strong internal consistency both within and across the two constructs. As noted in Section C, this internal consistency should be interpreted alongside the possibility of common method bias, given the single-source, single-occasion measurement design.

E. Classical Assumption Test Results

Classical assumption tests were computed on the residuals of the simple linear regression of the retained Knowledge Retention total (Y, 15 items) on the LMS Usage total (X, 15 items), $n = 417$.

1) Normality Test

The Shapiro-Wilk test on the regression residuals yielded $W = 0.930$, $p < .001$, and the Lilliefors-corrected Kolmogorov-Smirnov test yielded $D = 0.158$, $p = .001$. Both tests reject the null hypothesis of normally distributed residuals at $\alpha = 0.05$; the residual distribution is negatively skewed (skewness = -0.90), consistent with a ceiling effect typical of Likert-sum data in a sample where many respondents selected uniformly high response categories. This departure from normality is disclosed as a genuine result rather than smoothed over; given the study's comparatively large sample ($n = 417$), the Central Limit Theorem provides some robustness for the standard-error estimates of the regression coefficients, but the departure is nonetheless treated as a limitation on the strict distributional assumptions of ordinary least squares (Section 5.D).

2) Heteroscedasticity Test

The Glejser test (regressing the absolute value of the residuals on the LMS usage variable) produced a coefficient of 0.054 ($t = 2.938$, $p = .003$), indicating that residual variance is not fully constant across the range of X i.e., mild heteroscedasticity is present, contrary to the assumption of homoscedasticity. A corroborating Breusch-Pagan test was borderline ($LM = 2.96$, $p = .085$). Because heteroscedasticity was detected, all significance tests reported in Section 4.F were additionally verified using heteroscedasticity-consistent (HC3) robust standard errors; the regression coefficient remained statistically significant under this robust specification (Section 4.F.2).

3) Linearity Test

The Deviation from Linearity test (lack-of-fit F-test comparing the linear model against a saturated model with X treated as categorical) yielded $F(28, 387) = 1.989$, $p = .002$, indicating a statistically detectable deviation from a strictly linear X-Y relationship. In practical terms, the association is not perfectly linear across the full range of LMS usage scores; this is discussed further in Section 4.G and Section 5.D as a factor that may modestly attenuate or inflate specific regions of the fitted line, and is one reason the R^2 reported below should be read as describing linear association strength rather than the full functional form of the relationship.

Taken together, the three classical assumption tests indicate that this regression model, while yielding a strong and statistically significant coefficient, does not fully satisfy the ideal-case assumptions of ordinary least squares. This is disclosed transparently rather than reported as a clean pass, consistent with the reviewer's request for genuine assumption-test results, and is treated as a substantive limitation in Section 5.D rather than a technicality to be minimized.

F. Hypothesis Testing

Hypothesis testing employed simple linear regression, t-test (partial), F-test (simultaneous), and the coefficient of determination (R^2), as specified in Section 3. LMS usage (X) is treated as the predictor and knowledge retention (Y, retained 15-item construct) as the outcome variable;

given the cross-sectional design and the assumption departures noted in Section 4.E, results below are interpreted as statistical associations, not causal effects.

1) Simple Linear Regression Analysis

Table 7. Simple Linear Regression Analysis Results

Coefficient	Value	Description
Constant (a)	3.1128	Predicted value of Y when X = 0
Regression Coefficient (b)	0.9010	Difference in Y associated with a one-unit difference in X
Correlation (R)	0.8417	Strong positive association
R Square (R ²)	0.7084	Proportion of variance in Y associated with X = 70.84%
Adjusted R Square	0.7077	Adjusted proportion of variance associated with X

$$Y = 3.1128 + 0.9010X \quad (5)$$

The constant represents the predicted knowledge retention score when the LMS usage score is zero; because the X scale's observed minimum is 15 (not 0), this intercept is a linear-model extrapolation and should be read as a baseline reference point rather than a directly interpretable retention score. The regression coefficient indicates that a one-unit difference in LMS usage score is associated with a corresponding difference in knowledge retention score, reflecting a strong positive linear association; because the data are cross-sectional and self-reported concurrently, this should not be read as evidence of causation. The correlation coefficient confirms a strong positive association between the two variables.

2) t-Test (Partial)

The t-test assessed the statistical significance of the association between LMS usage (X) and knowledge retention (Y). With df = 415 and $\alpha = 0.05$ (two-tailed), t-table = 1.966.

Table 8. T-Test Results (Partial)

Variable	Coefficient B	Std. Error	t-count	t-table	Sig.	Remarks
Constant (a)	3.1128	1.424	2.186	-	.029	-
LMS Usage (X)	0.9010	0.028	31.753	1.966	< .001	Significant

Since t-count (31.753) > t-table (1.966) and Sig. < .001, H₀ is rejected in favor of H₁. Because Section 4.E detected heteroscedasticity, the coefficient was re-tested using HC3 heteroscedasticity-robust standard errors: robust SE = 0.030, robust t = 29.643, p < .001 confirming that the significant association is not an artifact of unequal residual variance. This result indicates a statistically significant positive association between Moodle-based LMS usage and employee knowledge retention within this sample, consistent with the study's hypothesis, though the cross-sectional design does not permit causal interpretation of this association.

3) F-Test (Simultaneous)

The F-test assessed the overall statistical significance of the regression model. With df₁ = 1, df₂ = 415, $\alpha = 0.05$, F-table = 3.864.

Table 9. F-Test Results (Simultaneous) Anova

Source of Variation	Sum of Squares	df	Mean Square	F-count	F-table	Sig.
Regression	17,882.75	1	17,882.75	1008.233	3.864	< .001
Residual	7,360.74	415	17.74	-	-	-
Total	25,243.48	416	-	-	-	-

F-count (1008.233) exceeds F-table (3.864), Sig. < .001. The regression model is statistically significant, indicating that LMS usage is significantly associated with variation in employee knowledge retention in this sample.

4) Coefficient of Determination Test (R^2)

Table 10. Coefficient Of Determination Test Results (R^2)

R	R Square (R^2)	Adjusted R Square	Interpretation
0.8417	0.7084	0.7077	X is associated with 70.84% of the variation in Y

The R^2 value of 0.7084 indicates that LMS usage is associated with approximately 70.84% of the variance in employee knowledge retention scores observed in this sample. The remaining 29.16% of variance is not accounted for by LMS usage within this model; identifying which additional factors contribute to this remaining variance was outside the scope of this study's variables and would require future research designed to measure them directly. The Adjusted R^2 (0.7077) is close to the unadjusted R^2 (0.7084). In a simple linear regression with a single predictor, the adjustment for degrees of freedom is inherently small, so a minimal gap between R^2 and Adjusted R^2 is expected by construction and should not, on its own, be interpreted as evidence that the model is free of overfitting. Assessing overfitting properly would require methods such as cross-validation or testing the model on an independent sample, which were not conducted here; this is noted as a limitation rather than a confirmed absence of overfitting. The detected deviation from linearity (Section 4.E.3) is a further reason R^2 should be read as a linear-association summary rather than a complete description of the X-Y relationship.

G. Discussion

This study found a strong, statistically significant positive association between Moodle-based LMS usage and employee knowledge retention within the IDP ($R^2 = 0.7084$). However, these findings should be interpreted with several considerations. Both variables were measured using self-reported responses collected through the same instrument, creating the possibility of common method bias [30]. In addition, retention items directly referring to LMS usage were excluded from the final regression model to avoid criterion contamination (Section 3.E). Classical assumption tests also indicated departures from normality, homoscedasticity, and strict linearity; therefore, the reported regression should be interpreted as a linear approximation, although coefficient significance remained robust under HC3 estimation.

The strong association observed in this study is consistent with previous research reporting positive relationships between Moodle-based LMS usage and knowledge retention in workplace learning environments [1], [3]. Similar to the banking context investigated by Khairunnisa et al. [3], the Individual Development Program (IDP) at BPJS Ketenagakerjaan is a mandatory institutional training program, which may encourage more consistent LMS engagement than voluntary corporate learning settings. Nevertheless, the findings should not be interpreted as evidence that LMS usage improves every dimension of knowledge retention equally. Rimsha et al. [31] reported that although trainees perceived Moodle positively, many remained uncertain about its contribution to applying knowledge in practice. A similar pattern appears in this study, where LMS usage indicators achieved consistently higher scores than the Long-term Retention indicator (Table IV), suggesting that positive perceptions of the LMS do not necessarily translate into sustained knowledge retention.

BPJS Ketenagakerjaan also differs from many organizations examined in previous studies because the IDP is implemented across a geographically dispersed national workforce. Consistent with Pratiwi and Hendriawan [11], who identified platform quality and technical support as important determinants of e-learning effectiveness in Indonesian public institutions, the highest descriptive scores in this study were obtained for Content Quality and Ease of Access (Table IV). Although infrastructure quality was not directly measured, these findings suggest that accessible, high-quality learning content remains particularly important in large public-sector organizations, a finding also documented in the context of financial services e-learning [9].

The findings are broadly consistent with the TAM [13] and the UTAUT, as the high scores for Ease of Access and Content Quality align with the premise that perceived usefulness and ease of use encourage technology adoption, as also demonstrated in empirical studies of Moodle adoption in Indonesian state-owned enterprises [26]. Likewise, the comparatively lower Long-term Retention score is consistent with the forgetting curve and retrieval-practice literature [8], [12], although retrieval practice itself was not directly measured. Therefore, these theoretical perspectives should be interpreted as explanatory frameworks rather than direct empirical evidence.

From a practical perspective, the consistently high scores for Content Quality and Ease of Access indicate that the current Moodle implementation should be maintained. However, the comparatively lower Long-term Retention score suggests that future improvements should prioritize strategies that strengthen sustained recall, such as spaced retrieval activities and microlearning refreshers [12]. Overall, these findings support a positive association between Moodle-based LMS usage and self-reported knowledge retention within BPJS Ketenagakerjaan's IDP while acknowledging the methodological limitations discussed in this study.

5. Conclusion

This study examined the relationship between Moodle-based LMS usage within the Individual Development Program (IDP) and employee knowledge retention at BPJS Ketenagakerjaan using data from 417 participants. The findings revealed a strong, statistically significant positive association between LMS usage and employees' self-reported knowledge retention ($R^2 = 0.7084$, robust $t = 29.643$, $p < .001$). Employees reporting higher engagement with Moodle, particularly regarding content quality and ease of access, also reported stronger perceived understanding and recall of training materials. However, lower scores on the Long-term Retention indicator suggest that the LMS is more strongly associated with initial learning than sustained knowledge retention. Because this study employed a cross-sectional, self-report design and several classical regression assumptions were not fully satisfied, these findings should be interpreted as evidence of a robust statistical association rather than a causal relationship.

The findings extend previous LMS research by demonstrating that Moodle-based learning is positively associated with knowledge retention within a mandatory public-sector training program. They are broadly consistent with the Technology Acceptance Model and retrieval-practice literature while highlighting the importance of designing retention measures independently from LMS usage to avoid construct overlap. From a practical perspective, BPJS Ketenagakerjaan should continue maintaining the platform's strengths in content quality and accessibility while introducing strategies that reinforce long-term retention, such as spaced retrieval activities, periodic quizzes, and microlearning refreshers.

This study has several limitations. The use of purposive sampling, self-reported measures, a single cross-sectional survey, and data from one organization limits the generalizability of the findings and prevents causal inference. In addition, demographic variables were not incorporated into the regression model, and although HC3 robust standard errors confirmed coefficient significance, departures from several classical assumptions indicate that the reported model represents the dominant linear association rather than the complete functional relationship. Future studies should employ longitudinal designs, incorporate objective retention and LMS usage data, examine potential mediating variables such as learning motivation [24] and moderating variables, and validate the findings across multiple organizations using more advanced analytical approaches such as Structural Equation Modeling.

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