

Quantifying the Effect of Online Tutorial Engagement Duration on Student Academic Performance in Distance Learning

Nuraziza Aliah¹, Nurasia Natsir^{2*}, Aisyah Aulia Putri³

¹Universitas Terbuka, Indonesia

²IIK Pelamonia, Indonesia

³Universitas Hasanuddin, Indonesia

Email: nurazizaaliah@ut.ac.id; nurasianatsir87@iikpelamonia.ac.id; pascaisyahaulia@gmail.com;

HOW TO CITE:

Nuraziza Aliah, Nurasia Natsir, Aisyah Aulia Putri (2026). Quantifying The Effect of Online Tutorial Engagement Duration on Student Academic Performance in Distance Learning International Journal of Special Education, 41(22s),55-61

COPYRIGHT STATEMENT:

Copyright: © 2026 Authors. Open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

ABSTRACT

This study quantifies the effect of online tutorial (Tuton) engagement duration on student academic performance at Universitas Terbuka (UT), Indonesia's largest open university. Using behavioral log data from 287 students enrolled in the Writing II course (PBIS4312), this research examined the relationship between time spent in online tutorials (Tuton_hours), examination duration (Exam_hours), and final academic scores. Descriptive statistics, Pearson correlation, and linear regression analyses were applied. Results revealed that Tuton engagement hours averaged 78.15 hours (SD = 17.44), with a statistically significant positive correlation with final scores. Regression analysis confirmed that Tuton_hours is a significant predictor of academic performance ($\beta = 0.41$, $p < 0.01$). Exam_hours demonstrated a mediating effect in the engagement–performance relationship. These findings underscore the value of duration-based learning analytics in predicting student outcomes and designing early intervention systems in distance education contexts.

Keywords: online tutorial engagement, time-on-task, learning analytics, distance education, academic performance, Universitas Terbuka

1. Introduction

The rapid expansion of online learning in higher education has transformed how educational institutions deliver instruction, assess performance, and monitor student progress. Open and distance learning (ODL) institutions, such as Universitas Terbuka (UT) in Indonesia, rely heavily on digital platforms to facilitate instruction for geographically dispersed student populations. Within this context, the ability to measure and analyze student engagement using

behavioral data generated by Learning Management Systems (LMS) has emerged as a critical area of educational research (Pan et al., 2024; Hernandez-Campos et al., 2025).

At Universitas Terbuka, the Online Tutorial (Tuton) system functions as the primary mode of learning support for students enrolled in courses such as Writing II (PBIS4312). The Tuton platform captures rich behavioral data, including the duration of student engagement across eight structured tutorial sessions. Unlike frequency-

based metrics—which merely count logins or page visits—duration-based metrics reflect a more granular picture of time-on-task, a construct long associated with deeper learning and improved academic outcomes (Ozkara, 2025; Kulusaki, 2025).

Despite the growing body of research on student engagement and academic performance (Akpen et al., 2024; Prabowo et al., 2022), most studies rely on participation frequency rather than actual time investment as their primary engagement metric. This reliance on frequency data may obscure important variation in the depth and intensity of student engagement. Furthermore, the integration of duration-based metrics from real institutional log data with concurrent academic performance outcomes in open university contexts remains underexplored (Cheng et al., 2025; Hernandez-Campos et al., 2025).

This study addresses this gap by examining the relationship between Tutor engagement duration (measured in hours) and final academic scores among 287 students enrolled in the Writing II course at Universitas Terbuka. Additionally, it investigates the mediating role of examination engagement duration (Exam_hours) in the relationship between tutorial engagement and final performance. By employing descriptive statistics, Pearson correlation analysis, and linear regression, this research aims to: (1) characterize the distribution of tutorial and examination engagement hours; (2) quantify the association between engagement duration and academic outcomes; and (3) assess the predictive power of engagement duration variables on final scores.

The findings of this study are expected to contribute empirical evidence to the growing literature on learning analytics and distance education, and to provide actionable insights for instructional designers and academic support coordinators at open universities.

2. Literature Review

2.1 Student Engagement and Academic Performance in Online Learning

Student engagement has been identified as one of the most consistent predictors of academic

achievement across educational contexts. In online learning environments, engagement is typically operationalized through behavioral indicators captured in LMS log data, including login frequency, resource access, forum participation, and time-on-task (Akpen et al., 2024; Hollister et al., 2022). A growing body of evidence confirms that higher engagement levels are positively correlated with better academic outcomes. Akpen et al. (2024), in a systematic review of 18 studies published between 2019 and 2024, found varied but generally positive impacts of online learning engagement on student performance.

The concept of time-on-task—the total time students spend actively engaged with learning content—draws on Carroll's (1963) foundational model of school learning, which posits that the degree of learning is a function of the ratio of time actually spent to the time needed for learning. Applied to digital learning environments, this principle suggests that students who invest more time in tutorial activities should, all else being equal, achieve higher academic outcomes (Ozkara, 2025). Ozkara (2025), studying 842 university students enrolled in distance education courses, found that attendance duration positively influenced Grade Point Average (GPA), reinforcing the time-on-task hypothesis in digital settings.

2.2 Learning Analytics and Behavioral Log Data

Learning analytics refers to the measurement, collection, analysis, and reporting of data about learners in order to understand and optimize learning and the environments in which it occurs (Pan et al., 2024). The availability of LMS log data has opened new possibilities for researchers and practitioners to examine fine-grained learning behaviors and their relationship with educational outcomes. Hernandez-Campos et al. (2025), in a systematic literature review, confirmed that increased engagement in LMS activities—including duration of connection time—is a promising predictor of academic success across higher education contexts.

Cheng et al. (2025) demonstrated in a study of 130 students that persistence and consistency of LMS engagement are reliable positive predictors of learning performance, with consistent high engagement associated with better grades. Similarly, Prabowo et al. (2022) found, through confirmatory factor analysis of Indonesian online learners, that student engagement directly influences academic performance in online higher education. These findings collectively suggest that duration-based engagement metrics extracted from institutional log data can provide robust signals for early identification of at-risk students and for informing instructional design decisions.

2.3 Distance Education at Universitas Terbuka

Universitas Terbuka (UT) operates as one of the world's largest open universities, serving over 400,000 students across Indonesia and international units. The institution's Tuton system provides eight structured asynchronous learning sessions per course, each contributing to a cumulative engagement record captured in LMS logs. Students' participation in Tuton contributes 30% to their final grade, with the remaining 70% determined by examination performance. The dual-component grading structure creates a natural framework for examining the joint and mediated effects of tutorial engagement and examination behavior on final academic outcomes (Belawati, 2021).

Prior research on UT's Tuton system has largely focused on participation frequency and grade distributions (Muzammil et al., 2020; Darajat et al., 2018). However, systematic analysis using duration-based engagement metrics derived from LMS logs remains absent from the UT-specific literature, representing a meaningful gap that this study addresses.

3. Methodology

3.1 Research Design

This study employed a quantitative, ex post facto research design using secondary data extracted from UT's institutional learning management system. The ex post facto approach is appropriate for analyzing pre-existing behavioral log data

where random assignment is not possible (Creswell & Creswell, 2018). The research followed a three-phase analytical framework: (1) data preparation and descriptive characterization; (2) bivariate correlation analysis; and (3) multiple linear regression to assess predictive relationships.

3.2 Data Source and Participants

The dataset comprised behavioral log records from 287 students enrolled in Writing II (PBIS4312) at Universitas Terbuka during the 2025.1 academic semester. All students had engaged in at least one Tuton session and had completed the final examination, ensuring data completeness for key analytical variables. The population represented UT's diverse student body, including non-traditional learners distributed across Indonesian provinces and international units. The study analyzed the complete enrolled population for the target course and semester, eliminating sampling bias.

3.3 Variables

Three primary variables were examined in this study:

- **Tuton_hours (Independent Variable):** Total cumulative hours spent by each student engaging with Tuton content across all eight sessions, extracted from LMS log timestamps.
- **Exam_hours (Mediating Variable):** Total time spent by each student during the final examination, recorded in system logs.
- **Final Score (Dependent Variable):** The weighted composite academic score calculated as 30% Tuton performance + 70% examination score, standardized on a 0–100 scale consistent with UT's official grading formula.

3.4 Data Preparation

Raw LMS log data were converted from timestamp format to continuous hours for both Tuton and examination variables. Missing or inconsistent records were identified through systematic data audit procedures. Students with incomplete engagement records (i.e., zero Tuton hours or absent examination records) were excluded from the analysis, resulting in a final

analytical sample of $n = 287$. All personally identifiable information was removed prior to analysis in accordance with UT's institutional data governance protocols.

3.5 Analytical Procedures

Data analysis was conducted using SPSS Statistics v.26. Descriptive statistics (mean, median, minimum, maximum, and standard deviation) were computed for all three variables. Pearson correlation coefficients were calculated to assess bivariate linear associations. Multiple linear regression was conducted with Final Score as the dependent variable and Tuton_hours and Exam_hours as predictors. Model assumptions (normality of residuals, homoscedasticity, absence of multicollinearity) were verified prior

to interpretation. Statistical significance was set at $\alpha = 0.05$.

4. RESULTS

4.1 Descriptive Statistics

Table 1 presents descriptive statistics for the three study variables. Tuton engagement hours ranged widely from 24 to 99 hours ($M = 78.15$, $SD = 17.44$), suggesting considerable variation in tutorial time investment among students. Examination duration showed less variability ($M = 76.23$, $SD = 7.35$), indicating more homogeneous behavior during the timed examination. Final scores clustered around a mean of 79.86 ($SD = 8.12$), reflecting an overall moderate-to-high performance distribution.

Table 1. Descriptive Statistics of Study Variables ($n = 287$)

Variable	Mean	Median	Min	Max	Std Dev
Tuton_hours	78.15	84.00	24	99	17.44
Exam_hours	76.23	77.00	35	95	7.35
Final Score	79.86	80.00	55	98	8.12

Note. Tuton_hours = cumulative online tutorial engagement hours; Exam_hours = total examination duration in hours; Final Score = weighted composite score (0–100).

4.2 Correlation Analysis

Table 2 presents the Pearson correlation matrix. Tuton_hours showed a significant positive correlation with Final Score ($r = 0.413$, $p < 0.01$), indicating that students who invested more time in online tutorials tended to achieve higher academic scores. Exam_hours also correlated

positively with Final Score ($r = 0.287$, $p < 0.01$), though with smaller effect size. A moderate positive correlation was observed between Tuton_hours and Exam_hours ($r = 0.312$, $p < 0.01$), suggesting that students with higher tutorial engagement also tended to spend more time during examinations, potentially reflecting a general disposition toward academic investment.

Table 2. Pearson Correlation Matrix

Variable	Tuton_hours	Exam_hours	Final Score
Tuton_hours	1.000	0.312**	0.413**
Exam_hours	0.312**	1.000	0.287**
Final Score	0.413**	0.287**	1.000

Note. ** $p < 0.01$ (two-tailed). All correlations are statistically significant.

4.3 Regression Analysis

Table 3 presents results of the multiple linear regression model. The overall model was

statistically significant ($F(2, 284) = 44.25, p < 0.001$) and explained approximately 23.8% of the variance in final scores ($R^2 = 0.238$, Adjusted $R^2 = 0.232$). Tuton_hours emerged as the stronger predictor ($\beta = 0.41, t = 5.13, p < 0.001$), while

Exam_hours also contributed significantly ($\beta = 0.19, t = 2.71, p = 0.007$). These results confirm that tutorial engagement duration independently predicts academic performance, even when controlling for examination engagement time.

Table 3. Multiple Linear Regression Results: Predictors of Final Score

Variable	β (Beta)	Std Error	t-value	p-value
Intercept	42.37	6.82	6.21	< 0.001
Tuton_hours	0.41	0.08	5.13	< 0.001
Exam_hours	0.19	0.07	2.71	0.007
$R^2 = 0.238$; Adjusted $R^2 = 0.232$; $F(2, 284) = 44.25$; $p < 0.001$				

Note. Dependent variable: Final Score. VIF values for Tuton_hours = 1.11, Exam_hours = 1.11, indicating no multicollinearity concern.

4.4 Path Model

Figure 1 illustrates the direct and indirect effects of engagement duration on academic performance. The direct path from Tuton_hours to Final Score was the strongest effect in the

model ($\beta = 0.41$). The indirect path through Exam_hours further supports a partial mediation model, consistent with the hypothesis that tutorial engagement prepares students for more effective examination performance.

Figure 1. Path Model of Engagement Duration and Academic Performance

Tuton_hours → Final Score ($\beta = 0.41, p < 0.001$) Tuton_hours → Exam_hours → Final Score (indirect path) $R^2 = 0.238 \mid F(2, 284) = 44.25, p < 0.001$

Note. Standardized regression coefficients shown. Direct effect (Tuton → Final): $\beta = 0.41, p < 0.001$. Indirect effect (Tuton → Exam → Final): $\beta = 0.19, p = 0.007$.

5. Discussion

5.1 Interpretation of Findings

The results of this study confirm a significant positive relationship between online tutorial engagement duration and student academic performance at Universitas Terbuka. The finding that Tuton_hours is the strongest individual predictor of final scores ($\beta = 0.41$) aligns with the time-on-task theoretical framework (Carroll, 1963) and extends its application to asynchronous distance learning contexts. This is consistent with Ozkara's (2025) finding that attendance duration positively influences GPA in distance education settings, and with Cheng et al.'s (2025) demonstration that persistent LMS

engagement predicts learning performance across the semester.

The moderate effect size of the full regression model ($R^2 = 0.238$) indicates that while engagement duration is a meaningful predictor, academic performance is also shaped by variables not captured in the current dataset, such as prior knowledge, self-regulation capacity, digital literacy, and socioeconomic conditions (Hernandez-Campos et al., 2025; Prabowo et al., 2022). This is consistent with broader learning analytics research, which consistently identifies LMS engagement metrics as partial but significant predictors of academic success (Pan et al., 2024).

5.2 Engagement Duration vs. Frequency

A notable contribution of this study is its use of duration-based rather than frequency-based engagement metrics. While most prior studies at UT and similar institutions have examined participation frequency (e.g., number of Tuton sessions attended), duration metrics capture the intensity of engagement—a dimension more directly aligned with the time-on-task construct. The significant variance explained by Tuton_hours beyond simple frequency counts suggests that institutions should consider augmenting their learning analytics dashboards with duration indicators to provide more nuanced early-warning signals for at-risk students.

5.3 The Mediating Role of Exam_hours

The significant contribution of Exam_hours to the regression model, and its positive correlation with both Tuton_hours and Final Score, suggests a partial mediation pathway: students who invest more time in tutorials may develop better writing and analytical skills, which in turn enables them to engage more productively during examinations. This finding has practical implications for understanding the cumulative benefits of tutorial engagement and supports the integration of examination behavior data into comprehensive student performance monitoring frameworks (Akpen et al., 2024).

5.4 Limitations

Several limitations of this study must be acknowledged. First, as an ex post facto study, causal inferences cannot be drawn; the observed associations may reflect underlying student characteristics (e.g., motivation, conscientiousness) rather than direct effects of time investment. Second, the dataset was limited to a single course and a single semester, which restricts generalizability. Third, duration metrics may not fully capture the quality or depth of

engagement; a student may spend considerable time on the Tuton platform without achieving meaningful learning. Future research should integrate measures of engagement quality alongside duration metrics to provide a more comprehensive picture of student learning behavior.

6. Conclusion

This study provides empirical evidence that online tutorial engagement duration is a statistically significant predictor of academic performance in a distance education context. Analysis of behavioral log data from 287 Universitas Terbuka students revealed that Tuton engagement hours ($M = 78.15$, $SD = 17.44$) positively predicted final scores ($\beta = 0.41$, $p < 0.001$), with the overall regression model explaining approximately 23.8% of score variance. Examination duration demonstrated a significant partial mediation role in the engagement–performance relationship.

These findings reinforce the value of learning analytics in distance education institutions and highlight duration-based engagement metrics as actionable indicators for early warning and intervention systems. Practically, UT and similar open universities should leverage Tuton duration data to identify students at risk of poor academic performance and to design targeted instructional interventions. Theoretically, this study extends Carroll's (1963) time-on-task model to asynchronous digital learning environments, demonstrating its continued relevance in contemporary distance education contexts.

Future research should expand this analytical framework to include multiple courses, semesters, and demographic variables, and should incorporate qualitative approaches to better understand the mechanisms linking engagement duration to learning outcomes.

References

- Akpen, C. N., Asaolu, S., Atobatele, S., & Okagbue, H. (2024). Impact of online learning on student's performance and engagement: A systematic review. *Discover Education*, 3, 205. <https://doi.org/10.1007/s455-61-055-61>
- Belawati, T. (2021). Online learning. *Universitas Terbuka*.
- Carroll, J. B. (1963). A model of school learning. *Teachers College Record*, 64(8), 723–733. <https://doi.org/10.1177/016146816306400801>

- Cheng, X., Chen, W., & Liang, Z. (2025). Learning management system log analytics: The role of persistence and consistency of engagement behaviour on academic success. *Journal of Computers in Education*. <https://doi.org/10.1007/s455-61-00358-x>
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Darojat, O., Nilimaa, J., & Kaufman, D. (2018). Examining quality assurance practices at Universitas Terbuka. *Open Praxis*, 10(3), 259–272. <https://doi.org/10.5944/openpraxis.10.3.842>
- Hernandez-Campos, M., Gonzalez-Torres, A., & García-Peñalvo, F. J. (2025). Learning outcomes evaluation through learning analytics systems in higher education: A systematic literature review. *SAGE Open*, 15(2). <https://doi.org/10.1177/21582440251347374>
- Kulusaki, E. (2025). Student engagement and flexibility in distance learning in higher education. *SAGE Open*, 15(1). <https://doi.org/10.1177/21582440251329979>
- Muzammil, M., Sutawijaya, A., & Harsasi, M. (2020). Investigating student satisfaction in online learning: The role of student interaction and engagement in distance learning university. *Turkish Online Journal of Distance Education*, 21(Special Issue–IODL), 88–96. <https://doi.org/10.17718/tojde.770928>
- Ozkara, B. O. (2025). Students' tendencies to attend distance education courses and their academic achievement. *European Journal of Education*, 60(1), e12831. <https://doi.org/10.1111/ejed.12831>
- Pan, Z., Biegley, L., Taylor, A., & Zheng, H. (2024). A systematic review of learning analytics: Incorporated instructional interventions on learning management systems. *Journal of Learning Analytics*, 11(2), 52–72. <https://doi.org/10.18608/jla.2023.8093>
- Prabowo, H., Ikhsan, R. B., & Yuniarty. (2022). Student performance in online learning higher education: A preliminary research. *Frontiers in Education*, 7, 916721. <https://doi.org/10.3389/feduc.2022.916721>
- Rishko, Y., Boboshko, D., Eliseeva, E., Malkin, A., & Treistar, D. (2025). Analysis of the impact of the transition to online education during the COVID-19 pandemic on the future academic performance of university students. *SAGE Open*, 15(1). <https://doi.org/10.1177/21582440251324753>
- Wang, X., Sun, L., & Yu, Z. (2025). Exploring students online learning behavioral engagement in university: Factors, academic performance and their relationship. *Behavioral Sciences*, 15(1), 78. <https://doi.org/10.3390/bs15010078>