*Asian Journal of Science Education*
Vol. 6. No. 2, (October 2024) 73- 79

e- ISSN 2715- 5641
DOI: doi.org/10.24815/ajse.v6i2.38747

**Asian Journal of Science Education**

**Journal homepage: https://jurnal.usk.ac.id/AJSE**

# The Impact of Learning Management Systems (LMS) Based on Learning Analytics on the Academic Performance of Syiah Kuala University Students

**E Mahzum[1,3], H Sofyan[1], M F Nasrudin[2], M Mailizar[1]**

[1]Department Physic Education, Universitas Syiah Kuala, Banda Aceh, Indonesia
[2]Lingkungan Ilmu, University Kebangsaan Malaysia, Selangor, Malaysia
[3]Doctoral Mathematics and Applied Science, Universitas Syiah Kuala, Banda Aceh, Indonesia

**ARTICLE HISTORY**

Submited : 21 May 2024
Revised : 19 November 2024
Accepted : 22 November 2024
Publication : 27 November 2024
Avaible *Online* : 27 November 2024

**KEYS WORDS**

Learning Analytics, Learning Management System, Students Performance

**CORRESPONDENCE AUTHOR**

*E-mail: hizir@hizir.net

**ABSTRACT**

This study investigates the impact of Learning Management Systems (LMS) based on learning analytics on the academic performance of students in the Department of Physics Education at Universitas Syiah Kuala. Data were collected from 47 students, focusing on several indicators of LMS usage, including material access, task completion, and quiz participation. The analysis, as presented in Table 1, reveals significant positive correlations between LMS utilization and student GPA. Specifically, Pearson, Spearman, and Kendall correlation coefficients demonstrate strong associations ($r > 0.8$, $p < 0.001$) between the hours spent on the LMS and academic performance. Students frequently accessed learning materials more than completing assignments and quizzes, benefiting from the flexibility to study at their own pace. This adaptability is especially advantageous for students balancing academic and personal commitments, contributing to reduced stress levels and improved academic focus. The findings suggest that LMS utilization significantly enhances student GPA by enabling efficient time management and flexible learning schedules.

## INTRODUCTION

The implementation of Learning Management Systems (LMS) based on Learning Analytics (LA) in higher education holds significant potential to enhance students' academic performance. LMS platforms like Moodle and other supportive systems are now equipped with advanced analytics capabilities, allowing for the real-time collection and analysis of student activity data (Duch & George, 2024). Learning analytics provide deep insights into student learning patterns, help identify those at risk of falling behind, and offer timely interventions (de Oliveira et al., 2021; Wiley, 2023).

For instance, the "Data Insights for Student Learning and Support" project at UNSW utilizes data from various sources to create machine learning-based learning models that assist educators in monitoring and supporting students' academic progress (Honson et al., 2024). Another advantage of LA is its ability to support the development of self-regulated learning (SRL) skills among students. Studies show that AI-based automated feedback systems can enhance students' ability to manage their own learning processes, leading to improved academic performance (Sung-Hee Jin et al., 2023; Ifenthaler et al., 2023). For example, AI applications can help students set learning goals, provide action plans, and offer study tips based on historical data and current performance profiles (Jin et al., 2023).

However, the implementation of LA in higher education also faces challenges. Organizational and political factors often hinder the effective deployment of these systems. Collaboration among

various stakeholders within educational institutions is crucial to ensure that these systems function well and provide maximum benefits. Furthermore, studies indicate that the utilization of LA can vary depending on how the system is used. More granular and detailed data can provide more specific and useful insights but also require rich course design and diverse use of LMS features (Romsi et al., 2024). Therefore, the quality and quantity of the data collected and its usage significantly determine the effectiveness of LA in improving student learning outcomes (De Laet et al., 2020).

Learning analytics within LMS platforms monitor various aspects of student behavior and engagement. For instance, detailed analysis of student interactions with course materials, such as time spent on readings or participation in discussion forums, allows educators to identify patterns and intervene when necessary. According to a study, active participation in discussion forums is strongly correlated with higher course completion rates, although not necessarily with higher final grades (Macfadyen & Dawson, 2010).

Learning analytics also facilitates personalized learning experiences. Adaptive e-learning environments tailor instructional content to individual learning styles, significantly enhancing student engagement and learning outcomes (Gligorea et al., 2023). These personalized approaches ensure that educational resources are aligned with students' unique needs, promoting more effective learning. Despite the benefits, there are notable challenges in implementing learning analytics. One primary concern is the ethical use of student data. Ensuring data privacy and addressing the potential for bias in data interpretation are critical issues that institutions must navigate (Nur et al., 2024).

Furthermore, the efficacy of learning analytics depends heavily on the quality and granularity of the data collected. Richer, more detailed course designs that integrate various LMS features provide more valuable insights. Conversely, simplistic LMS usage yields less meaningful data, limiting the potential benefits of learning analytics (Sharif & Atif, 2024).

Additionally, the adoption of learning analytics often lacks active participation from students and faculty, who are typically the subjects of the data collection. This disconnect can lead to resistance and skepticism about the system's effectiveness. Therefore, involving all stakeholders in the development and implementation processes is crucial for the successful integration of learning analytics (Tsai et al., 2020). Institutions have begun leveraging learning analytics to enhance student support services. For instance, dashboards that visualize student progress and engagement metrics help instructors quickly identify students who may need additional assistance. Effective dashboards balance informative content with user-friendly design, avoiding cognitive overload that can hinder decision-making (Tufte, 2001).

The future of learning analytics in higher education looks promising as technology continues to evolve. Innovations such as real-time analytics and AI-driven adaptive learning platforms are set to further personalize and optimize the educational experience. These advancements will likely provide deeper insights into student learning behaviors, enabling more proactive and targeted interventions (Munagandla et al., 2024).

In conclusion, LMS platforms powered by learning analytics offer substantial benefits for enhancing student engagement and academic performance. However, to fully realize these benefits, institutions must address ethical considerations, ensure high-quality data collection, and actively involve all educational stakeholders in the process.

## RESEARCH METHODS

### Research Approach

The study will adopt a qualitative research approach to provide an in-depth understanding of how LMS with LA features is used.

**Research Participants**
This study involves 47 students from the Faculty of Teacher Training and Education, specifically from the Department of Physics Education, who have utilized LMS with LA features as a learning medium.

**Research Instruments**
Data for this research were gathered through questionnaires, interviews, and observations. The questionnaire distributed to students consists of specific inquiries, including 4 questions related to their frequency of accessing the LMS during the learning process. Interviews will be conducted with students to gather their experiences, perceptions, and attitudes toward LMS as a learning medium. Observations will be made to identify the actual use of LMS in teaching and learning activities.

**Data Collection**
Data for this study were collected using questionnaires, interviews, and observations. The survey administered to students includes targeted questions, notably four items regarding their LMS usage frequency. Student interviews will delve into their experiences, perceptions, and attitudes regarding the LMS as an educational tool. Observations will be conducted to assess the practical utilization of the LMS in teaching and learning contexts.

**Data Analysis**
The data obtained from questionnaires, interviews, and observations will undergo descriptive analysis. Student responses will be subject to correlation testing to ascertain the connection between LMS usage with LA features during lectures and the resulting GPA. This analysis aims to uncover recurring themes, patterns, and trends within the data, offering a holistic view of how LMS with LA features is utilized as an educational tool within the Department of Physics Education.

## RESULTS AND DISCUSSION

**Result**
The data on student responses about the use of LMS as a learning tool in the Department of Physics Education at Universitas Syiah Kuala was gathered from 47 students. Table 1 shows the analysis based on several LMS usage indicators, including accessing the LMS, obtaining materials, completing tasks, and taking quizzes, according to the frequency of usage.

**Table 1.** Correlation between indicators and aspect

| Indicator | Aspect | Pearson | Spearman | Kendall |
|---|---|---|---|---|
| Student GPA | LMS utilization (hour per week) | 0.860 | 0.831 | 0.728 |
| | Material access (hour per week) | 0.884 | 0.838 | 0.742 |
| | Carry out a task (hour per week) | 0.850 | 0.751 | 0.625 |
| | Do quiz (hour per week) | 0.828 | 0.779 | 0.665 |
| LMS utilization | Material access (hour per week) | 0.985 | 0.990 | 0.979 |
| | Carry out a task (hour per week) | 0.866 | 0.807 | 0.711 |
| | Do quiz (hour per week) | 0.771 | 0.737 | 0.640 |
| Material access | Carry out a task (hour per week) | 0.881 | 0.809 | 0.715 |
| | Do quiz (hour per week) | 0.825 | 0.783 | 0.679 |
| Carry out a task | Do quiz (hour per week) | 0.790 | 0.740 | 0.611 |

The data presented above show that students more frequently access materials on the LMS than they do completing assignments and quizzes. This disparity is due to the fact that submitting assignments and quizzes is relatively quick, taking about 10 minutes each, and quizzes are only available within a specific time frame set by instructors. In contrast, accessing learning materials can be done anytime and anywhere, providing students with the flexibility to study at their own pace. This

flexibility is highly valued by students, particularly those with part-time jobs or other responsibilities, as it allows them to efficiently manage their time between academic and personal commitments. The LMS's time flexibility enables students to arrange their study sessions according to their individual schedules, avoiding conflicts with lectures, assignments, and other obligations. As a result, this can help reduce stress levels, improve focus on academic tasks, and positively impact students' GPA achievements.

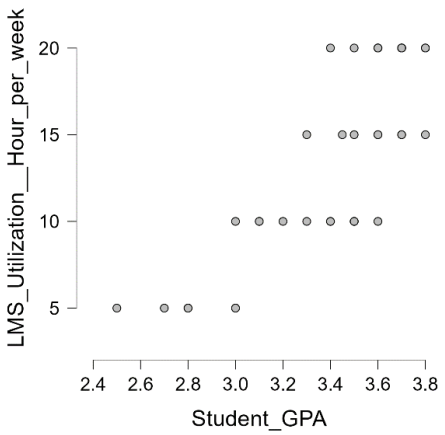


**Figure 1.** Illustrates the students' GPA and Utilization

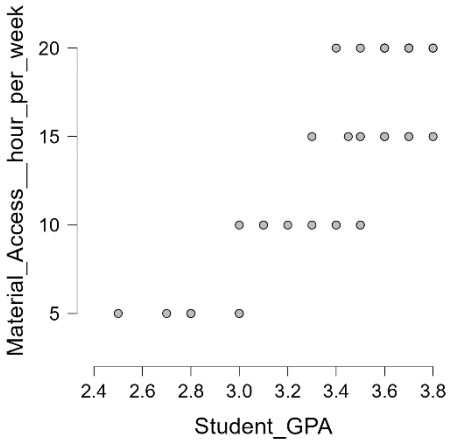


**Figure 2.** Illustrates the students' GPA and Material Access

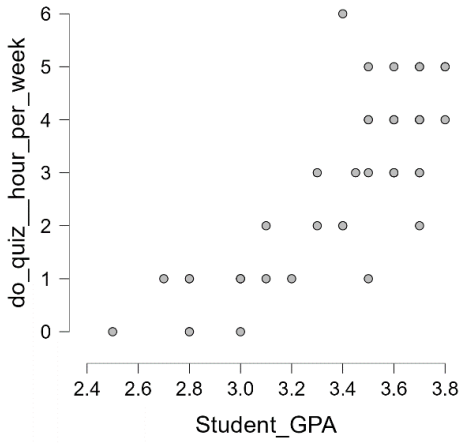


**Figure 3.** Illustrates the students' GPA and Do_Quiz

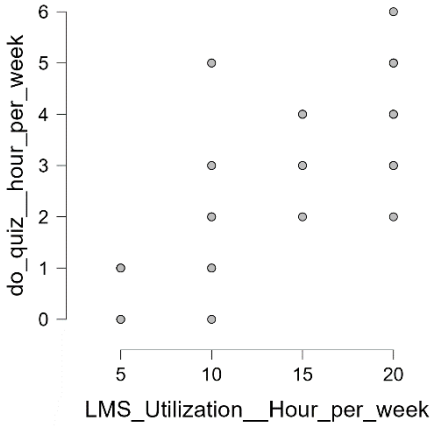


**Figure 4.** Illustrates the Utilization and Do_Quiz

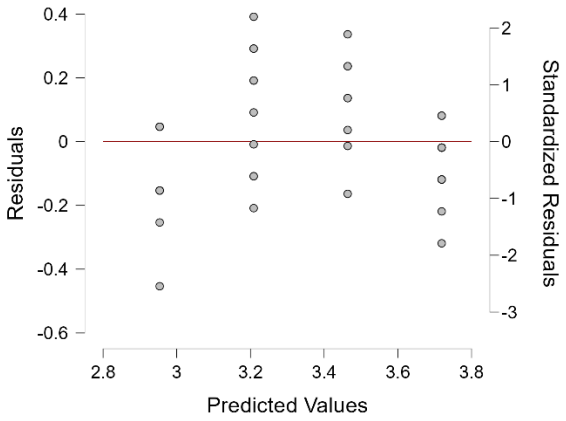


**Figure 5.** Illustrates the Predicted Values and Residuals

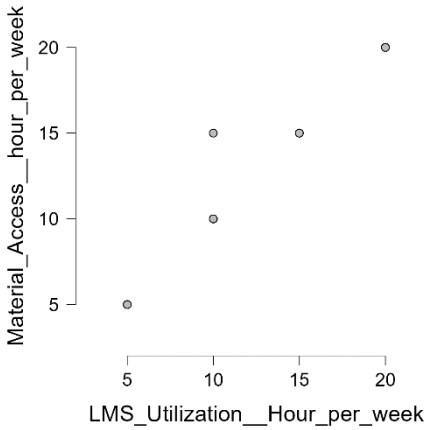


**Figure 6.** Illustrates Utilizations and Material Access

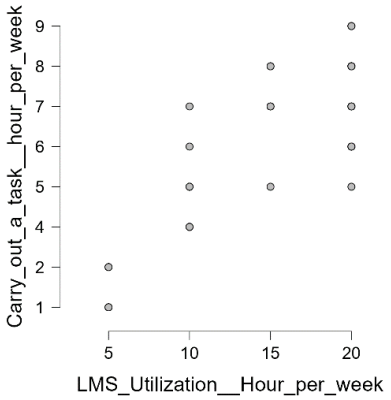


**Figure 7.** Illustrates the Utilization and Carry Out Task

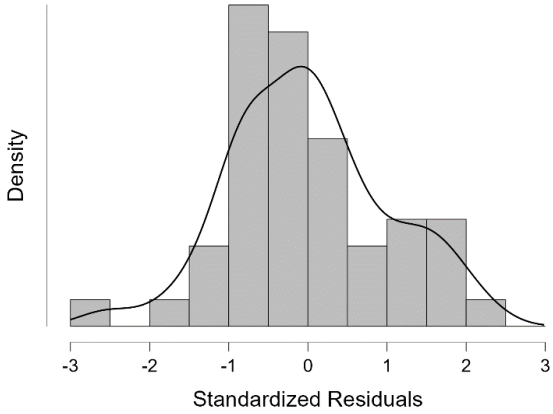


**Figure 8.** Grafik of Stnadradized Residual and Density

## Discussion

The results of the study indicate that the use of a Learning Management System (LMS) based on learning analytics has a significant and positive relationship with students' academic achievement. This is reflected in the high correlation coefficient values in various aspects of LMS use, including total time spent, access to materials, completion of assignments, and participation in quizzes. Specifically, access to learning materials has the highest correlation with students' GPA ($r = 0.884$, $p < 0.001$), indicating that students who access materials more frequently have a greater chance of achieving better academic achievement. This can be explained by the flexibility of the LMS, which allows students to organize their study time according to their needs so that they can understand the material more deeply and repeat it when needed.

In addition, completion of assignments and participation in quizzes also have a significant correlation with GPA, although with slightly lower correlation values. This shows that although access to materials is a dominant component, active involvement in evaluation activities such as assignments and quizzes still makes an important contribution to academic achievement. These results support the idea that the LMS functions not only as a platform for delivering materials but also as a tool to encourage engagement and understanding through interactive activities. The flexibility and ease of use of LMS are key factors that enable students to balance academic commitments with personal responsibilities.

Students who use LMS consistently are able to manage their study time more efficiently, which in turn reduces stress levels and increases academic focus. Thus, this study provides empirical evidence that the use of learning analytics-based LMS can be an effective strategy to support academic achievement, especially in higher education environments. These findings are relevant for universities to continue optimizing LMS features and improving their user training so that students can utilize the full potential of this technology.

## CONCLUSION

The study on the impact of Learning Management Systems (LMS) based on learning analytics on the academic performance of Syiah Kuala University students demonstrates a significant positive relationship between LMS usage and student GPA. The data, collected from 47 students in the Department of Physics Education, reveal that frequent access to LMS materials correlates strongly with higher GPAs. Specifically, the analysis shows high Pearson, Spearman, and Kendall correlation coefficients ($r > 0.8$, $p < 0.001$) between hours spent on the LMS and academic performance.

Students tend to access learning materials more frequently than completing assignments and quizzes, primarily because accessing materials offers greater flexibility. This flexibility is crucial for students with part-time jobs or other responsibilities, allowing them to manage their academic and personal commitments effectively. The ability to study at their own pace and schedule reduces stress and enhances focus on academic tasks, thereby positively influencing GPA outcomes.

Overall, the findings indicate that the effective utilization of LMS provides substantial benefits in academic performance by facilitating flexible and efficient learning strategies. This underscores the importance of integrating LMS tools in educational programs to support student success.

## References

De Oliveira, C. F., Sobral, S. R., Ferreira, M. J., & Moreira, F. (2021). How does learning analytics contribute to prevent students' dropout in higher education: a systematic literature review. *Big Data and Cognitive Computing*, *5*(4), 64.

De Laet, T., Millecamp, M., Ortiz-Rojas, M., Jimenez, A., Maya, R., & Verbert, K. (2020). Adoption and impact of a learning analytics dashboard supporting the advisor—Student dialogue in a higher education institute in Latin America. *British Journal of Educational Technology*, *51*(4), 1002-1018.

Duch, D., May, M., & George, S. (2024). Enhancing Predictive Analytics for Students' Performance in Moodle: Insight from an Empirical Study. *Journal of Data Science and Intelligent Systems*.

El-Sabagh, H. A. (2021). Adaptive e-learning environment based on learning styles and its impact on development students' engagement. *International Journal of Educational Technology in Higher Education*, *18*(1), 53.

Garrison, D. R., Anderson, T., & Archer, W. (2000). *Critical inquiry in a text-based environment: Computer conferencing in higher education*. The Internet and Higher Education.

Gligorea, I., Cioca, M., Oancea, R., Gorski, A. T., Gorski, H., & Tudorache, P. (2023). Adaptive learning using artificial intelligence in e-learning: a literature review. *Education Sciences*, *13*(12), 1216.

Honson, V., Vu, T., Tran, T. P., & Tejada Estay, W. (2024). Using learning analytics to alleviate course and student support administrative load for large classes: a case study. *Journal of Work-Applied Management*.

Ifenthaler, D. (2021). Learning analytics for school and system management. *OECD Digital Education Outlook 2021 Pushing the Frontiers with Artificial Intelligence, Blockchain and Robots: Pushing the Frontiers with Artificial Intelligence, Blockchain and Robots*, 161.

Ifenthaler, D., Mah, D. K., & Yau, J. Y. K. (2023). Impact of Learning Analytics Guidance on Student Self-Regulated Learning Skills, Performance, and Satisfaction: A Mixed Methods Study. *Education Sciences, 13*(1), 34-50. Retrieved from [MDPI](https://www.mdpi.com).

Jin, S. H., Im, K., Yoo, M., Roll, I., & Seo, K. (2023). Supporting students' self-regulated learning in online learning using artificial intelligence applications. *International Journal of Educational Technology in Higher Education*, *20*(1), 37.

Macfadyen, L. P., & Dawson, S. (2010). *Mining LMS data to develop an 'early warning system' for educators: A proof of concept*. Computers & Education.

Mahzum, E. (2018, December). Making analysis of higher order thinking-based objective test at state junior high school 5 Banda Aceh. In *Journal of Physics: Conference Series* (Vol. 1116, No. 3, p. 032018). IOP Publishing.

Mahzum, E., Sofyan, H., Nasrudin, M. F., Mailizar, M., & Herliana, F. (2023, September). Analysis of the utilization of the Learning Management System (LMS) as a learning media in the Physics Education Department Universitas Syiah Kuala. In *Journal of Physics: Conference Series* (Vol. 2596, No. 1, p. 012070). IOP Publishing.

Moreno-Marcos, P. M., Alario-Hoyos, C., Muñoz-Merino, P. J., & Delgado Kloos, C. (2020). *Prediction of Learning Outcomes in Educational Systems and MOOCs*.

Munagandla, V. B., Dandyala, S. S. V., & Vadde, B. C. (2024). Improving Educational Outcomes Through Data-Driven Decision-Making. *International Journal of Advanced Engineering Technologies and Innovations*, *1*(3), 698-718.

Nur, N., Goh, S. J., Patel, J., & Mizrahi, M. (2024). NAVIGATING THE ETHICAL LANDSCAPE OF AI INTEGRATION IN EDUCATIONAL SETTINGS. In *INTED2024 Proceedings* (pp. 7654-7663). IATED.

Romsi, A., Widodo, J. P., & Slamet, J. (2024). Empowering Slow Learners: Gamification's Impact on Students' Engagement and Academic Performance in an LMS for Undergraduate Students. *International Journal of Information and Education Technology*, *14*(2).

Sharif, H., & Atif, A. (2024). The Evolving Classroom: How Learning Analytics Is Shaping the Future of Education and Feedback Mechanisms. *Journal of Education Sciences 14*(2).

Sung-Hee Jin, Kowoon Im , Mina Yoo, Ido Roll and Kyoungwon Seo. (2023). *International Journal of Educational Technology in Higher Education*. Retrieved from https://educationaltechnologyjournal.springeropen.com.

Tsai, Y. S., Rates, D., Moreno-Marcos, P. M., Munoz-Merino, P. J., Jivet, I., Scheffel, M., ... & Gašević, D. (2020). Learning analytics in European higher education—Trends and barriers. *Computers & Education*, *155*, 103933.

Tufte, E. R. (2001). *The Visual Display of Quantitative Information*. Graphics Press. Cheshire, Connecticut.