

THE EFFECTIVENESS OF LEARNING MANAGEMENT SYSTEM IN IMPROVING LEARNING OUTCOMES AMONG ALTERNATIVE LEARNING SYSTEM (ALS) LEARNERS

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ABSTRACT

The Alternative Learning System of the Schools Division of Gingoog City conducted a new Learning Management System using Raspberry Pi that aimed to increase the academic performance of ALS Learners. Raspberry Pi is a small device, a single-board computer, sometimes called a small PC, in which all the data can be stored. The study was administered at a selected community learning center in the West III district in Barangay San Luis, Gingoog City. This Static-group Comparison research was conducted on 75 learner-respondents, comprising 40 students in the experimental group who used the learning management system and 35 in the control group who used the traditional printed learning activity sheets. The mean score for ALS students using the conventional printed LAS was 80.79, whereas the mean score for students utilizing the LMS was noticeably higher at 86.60. The disparity in mean scores between the two groups, which was statistically significant, points to a considerable variation in academic achievement between the two learning styles. Thus, the Learning Management System through Raspberry Pi substantially contributed to increasing the academic performance of ALS learners. The researchers recommend to the Division official that this innovation be supported to strengthen its implementation.

Keywords: *Alternative Learning System, Learning Management System, Learning Activity sheets, Raspberry Pi, Academic Performance*

INTRODUCTION

The Alternative Learning System (ALS) is a crucial educational initiative designed to provide learning opportunities for individuals who have not completed

formal education or those seeking to continue their education outside the conventional school system. ALS plays a significant role in addressing the need for inclusive and accessible education in the Philippines. This country recognizes the importance of education as a fundamental right and a key driver of social and economic development (DepEd Order No. 55, s. 2016).

There is a strong global trend toward utilizing Learning Management Systems (LMS) in academic institutions as a part of their educational management system to improve the teaching and learning experience. All LMS systems entirely depend on the current information and communication technology (ICT) infrastructure and use computer technology to use the system (Aldiab, 2018).

A learning management system (LMS) is essential for knowledge acquisition and management in the digital era (Nguyen, 2021). Following global practices, most countries adopted Web-Based Learning Management Systems (WLMS) to supplement classroom courses; it is primarily seen that these WLMSs fail in their objectives, leading to little or no return on investments (Mehroliya, 2021).

Despite the undeniable importance of ALS, it faces several challenges. One of the prominent issues is accessibility and flexibility for learners, many of whom have work or family responsibilities that make it challenging to attend traditional classes. This constraint often hinders their ability to access learning materials and assessments, impacting their learning outcomes.

Learning Management Systems (LMSs) offer a potential solution to this problem. LMSs are digital platforms that enable learners to access educational content and assessments from anywhere, at any time, and their own pace. These systems not only offer a flexible and convenient learning experience but also have the potential to enhance the effectiveness of ALS programs significantly. Moreover, technology-based assessments and tracking systems integrated into LMSs can provide timely feedback to ALS learners, helping them identify areas for improvement (DepEd Order No. 16, s. 2017).

In the context of this research, we will focus on implementing the Raspberry Pi LMS within ALS programs. Raspberry Pi is chosen for its user-friendly interface, customizable features, and compatibility with the unique needs of ALS learners.

This study sought to address the critical need for research in this area. The effectiveness of LMSs in improving learning outcomes among ALS learners is a question that demands a comprehensive examination. By evaluating the integration of an LMS, we aim to assess the potential benefits of this technology-driven approach for ALS programs. Our research will investigate how Raspberry Pi can offer a more flexible, convenient, and cost-effective solution, ultimately leading to improved outcomes for ALS learners.

In light of the challenges and opportunities above, this study's primary aim was to determine Raspberry Pi's effectiveness in enhancing learning outcomes among ALS learners and provide valuable insights for policymakers, educators, and stakeholders involved in the ALS program.

METHODOLOGY

The respondents of this static group comparison quasi-experimental study were the 75 learners of the combined community learning centers of West III district divided into control and experimental groups determined through purposive sampling. Only the experimental group received the Raspberry Pi and underwent FGDs upon submitting the performance tasks before and after the treatment. Interview guides were also provided to the learners during the treatment phase. All the learners were present for the duration of the action research.

This study was conducted in the West III district, specifically in the two community learning centers of San Luis, Gingoog City, the San Luis Barangay Hall, and the Purok Aquino Community Learning Center. It offered a Blended Learning Modality, the Modular and the Face-to-Face learning Modality.

The controlled learners attended the ALS session weekly, received the Printed Learning Activity Sheets (PLAS), and submitted them the following week.

On the other hand, the experimental learners connected the Raspberry Pi to their mobile phones and accessed their Learning Management System (LMS) account. Then, they downloaded the Learning Activity Sheets intended to be answered on that specific week and answered it. It should be uploaded back to their LMS account for submission after a week and to be checked by the ALS implementer.

The ALS implementers utilized the Monthly Monitoring of Learners' Progress to check and record all respondents' scores. Data were analyzed using the Independent Samples T-test to determine the impact of the study.

RESULTS AND DISCUSSION

On the profile of the LMS Users, Considering Age, Gender, Occupational Status, and Frequency of LMS Usage

Table 1 shows the gender distribution of respondents at different community learning centers in two specific locations, Brgy. San Luis/Brgy. Hall And Brgy. San Luis/Purok Aquino.

As shown in Table 1, in Brgy. San Luis/Brgy. Hall CLC, Purok Aquino, there are 30 males and 6 females, totaling 36 individuals. In Brgy. San Luis/Purok

Aquino, there are 24 males and 15 females, summing up to 39 individuals. When we combine the data from both learning centers, there is a total of 54 males and 21 females, resulting in a total of 75 individuals across these two Community Learning Centers.

Table 1. *Frequency Distribution of Profile of ALS Learners in terms of Gender*

Community Learning Center	Male	Female	Percentage
Brgy. San Luis/Brgy. Hall	30	6	48%
Brgy. San Luis/Purok Aquino	24	15	52%
Total	54	21	100%

There is a notable difference in gender distribution between the two learning centers. Brgy. San Luis/Brgy. Hall CLC has a higher proportion of males (30 males, 6 females), while Brgy. San Luis/Purok Aquino has more females (24 males, 15 females).

Table 2 presents the frequency and percentage distribution of ALS learners' profiles in terms of age.

Table 2. *Frequency Distribution of Profile of ALS Learners in terms of Age*

AGE	Frequency	Percentage
12 - 15 yrs. old	4	5%
16 - 20 yrs. old	29	39%
21 - 25 yrs. old	24	32%
26 and above	18	24%
TOTAL	75	100%

The result reveals that 4 (5%) of respondents belong to the age bracket of 12-15 years old. This age group represents a small percentage of the ALS learners in the study, indicating that a few learners are in the early adolescent age range.

Most ALS learners (39%) fall within the age range of 16 to 20 years old. It suggests that a significant proportion of ALS participants are young adults. Another substantial portion (32%) of ALS learners is between the ages of 21 and 25, indicating a somewhat older segment of learners. Also, approximately a quarter (24%) of ALS learners are 26 years old and above, suggesting a presence of mature learners within the program.

Table 3 shows the frequency and percentage distribution of ALS learners' profiles in terms of employment status.

It can be revealed that the largest group among ALS learners is comprised of laborers, representing 40% of the total respondents. This indicates a substantial presence of students engaged in manual labor or related work. The second-largest

group comprises farmers, accounting for 17% of the ALS learners. This suggests that a significant number of learners are involved in agricultural activities. Factory workers comprise 23% of the ALS student population, indicating a notable presence in industrial or manufacturing employment. Approximately 20% of ALS learners identify as unemployed, signifying individuals not currently engaged in formal employment.

Table 3. *Frequency Distribution of Profile of ALS Learners in Terms of Employment*

Occupation	Frequency	Percentage
Laborer	30	40%
Farmer	13	17%
Factory Worker	17	23%
Unemployed	15	20%
TOTAL	75	100%

The result implies that a significant proportion of ALS learners are engaged in employment, such as labor, farming, and factory work. These occupations often come with irregular schedules and demands, making attending traditional classes challenging. Thus, considering the abovementioned instances, ALS teachers should develop solutions by allowing learners to access educational materials and resources at their convenience, making it easier for them to balance work and learning.

In Table 4, the data shows the Learning Management System (LMS) usage among Alternative Learning System (ALS) learners in two Community Learning Centers.

Table 4. *Frequency Distribution of Profile of ALS Learners in Terms LMS USAGE*

Treatment	Brgy. San Luis/Brgy. Hall CLC	Brgy. San Luis/Purok Aquino CLC	Percentage
Using LMS (Learning Management System)	19	21	53.33%
Printed LAS (Learning Activity Sheets)	17	18	46.67%
Total	36	39	100%

In Barangay Hall, Barangay San Luis, 19 learners use the LMS, while 17 rely on printed Learning Activity Sheets (LAS). In Purok Aquino, Barangay San Luis, 21 learners use the LMS, and 18 opt for printed LAS.

On the Academic Performance of the ALS Learners in the Control and Experimental Groups

In Table 5, we present the academic performance of Alternative Learning System (ALS) learners who utilized traditional printed Learning Activity Sheets (LAS) as their primary learning materials. The data is categorized into specific score ranges, along with their corresponding frequencies and percentages.

Table 5. *Academic Performance of ALS Learners Using Printed LAS (Learning Activity Sheets)*

Range	Frequency	Percentage	Interpretation	Mean: 80.79 SD: 1.22795
90-100	0	0%	Outstanding	Interpretation: Satisfactory
85-89	0	0%	Very Satisfactory	
80-84	26	74.3%	Satisfactory	
75-79	9	25.7%	Fairly Satisfactory	
74 below	0	0%	DNME	
Total	35	100%		

Notably, no learners achieved scores in the highest range of 90-100 or even in the range of 85-99, which signifies that none of the learners reached an exemplary level of performance. Most learners, representing 74.3%, fell within the range of 80-84, indicating that they achieved a satisfactory performance level. Furthermore, an additional 25.7% of learners scored in the range of 75-79, which achieved satisfactory performance.

The overall mean score for ALS learners using printed LAS was 80.79, with a standard deviation of 1.22795. This distribution suggests that many learners struggled to attain scores that would be considered satisfactory, highlighting the need for improvements in the learning materials or instructional strategies. These findings underscore the challenges ALS learners face in achieving their academic goals using traditional printed materials and emphasize the importance of exploring alternative methods, such as integrating technology-driven solutions like Learning Management Systems (LMS), to enhance their learning experiences and outcomes.

Several studies have emphasized the limitations of traditional education materials, especially for non-traditional learners like those in ALS programs. These learners often have diverse backgrounds, work commitments, and family responsibilities that can hinder their ability to attend regular classes and engage with conventional learning resources (Al-Fahad, 2010). This study's findings mirror

the concerns Bhuasiri et al. (2012) expressed regarding the critical success factors for e-learning in developing countries, where motivation and technology awareness play pivotal roles in the effectiveness of educational interventions. The lower mean score of 80.79 suggests that ALS learners may not be sufficiently motivated or engaged with the provided learning materials.

In Table 6, we present the academic performance of Alternative Learning System (ALS) learners who utilized a Learning Management System (LMS) as their primary learning mode. This data is categorized into specific score ranges, along with their corresponding frequencies and percentages.

Remarkably, none of the learners achieved scores in the highest range of 90-100, indicating that none reached an exemplary performance level. However, a notable performance improvement is evident when compared to the previous table. A significant 97.5% of learners achieved scores within the range of 85-89, signifying a very satisfactory level of performance. Only a minimal 2.5% of learners scored in the range of 75-79, which achieved a fairly satisfactory level of performance.

Table 6. *Academic Performance of ALS Learners Using LMS (Learning Management System)*

Range	Frequency	Percentage	Interpretation	Mean: 86.6 SD: 1.89
90-100	0	0%	Outstanding	Interpretation: Very Satisfactory
85-89	39	97.5%	Very Satisfactory	
80-84	0	0%	Satisfactory	
75-79	1	2.5%	Fairly Satisfactory	
74 below	0	0%	DNME	
Total	40	100		

The overall mean score for ALS learners using the LMS was 86.6, with a standard deviation of 1.89469. This distribution suggests that most learners achieved a very satisfactory level of performance when the LMS was integrated into their learning process. These findings underscore the positive impact of implementing technology-driven solutions like LMS in ALS programs. Learners demonstrated outstanding academic performance when using the LMS as their primary learning platform.

These results emphasize the effectiveness of integrating technology-based solutions such as LMS in ALS education, contributing to remarkable improvements in learning outcomes and experiences. While the learners did not reach the highest

score range, their performance within the "Outstanding" category (85-89) showcases the potential of LMS to enhance ALS students' academic achievements significantly.

The findings in Table 6 align with existing literature on the effectiveness of Learning Management Systems (LMS) in educational settings. Numerous studies have demonstrated that when properly implemented, LMS platforms can lead to outstanding student performance and engagement (Bhuasiri et al., 2012). The remarkable shift in performance, with a significant percentage of learners achieving scores in the "Outstanding" range (85-89), corroborates the notion that LMS can positively impact learning outcomes.

Additionally, research by Al-Fahad (2010) has emphasized the importance of technology-driven solutions like LMS in modern education, particularly in promoting flexibility and accessibility in learning. The high percentage of ALS learners achieving outstanding scores in the presence of LMS aligns with Al-Fahad's findings, underscoring the potential of technology to enhance educational experiences.

Furthermore, research on the impact of Learning Management Systems (LMS) in various educational contexts has consistently shown positive outcomes. Díaz et al. (2014) highlighted how personal portable devices, including LMS, were used effectively as learning tools, increasing students' productivity and interest. Similarly, Frand (2000) emphasized the importance of transforming educational experiences to make them meaningful for information-age learners and using an LMS aligns with this goal.

The data in Table 6 highlights the transformative impact of LMS in ALS education, showcasing its potential to elevate learner performance to an outstanding level. These findings provide valuable insights into the effectiveness of technology-driven solutions in enhancing the learning outcomes of ALS students and advocate for the continued integration of LMS in ALS programs.

On the Significant Difference in the Academic Performance among ALS Learners Who Used and Did not Use LMS?

Table 7 compares learners' academic performance when using traditional printed Learning Activity Sheets (LAS) versus a Learning Management System (LMS) as their primary mode of learning. This table includes essential statistical information, including the means, T-value, and P-value, which are crucial for understanding the significance of the differences observed.

Table 7. *Difference in the Academic Performance of Learners between Using LAS and Using LMS*

Comparison	Mean	T-value	P-Value
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Using LAS	80.79		
Using LMS	86.60	-15.936	.000 S

The mean score for ALS learners using traditional printed LAS was 80.79, while for those using the LMS, it was notably higher at 86.60. The difference in mean scores between the two groups is evident, suggesting a substantial variance in academic performance between the two learning modes.

The T-value, which measures the significance of the difference in means, was calculated to be -15.936. This T-value, in conjunction with the P-value, provides insights into the statistical significance of the difference. The P-value is reported as .000 in this case, denoting a highly significant difference. The negative T-value indicates that learners' academic performance using the LMS was significantly better than those using printed LAS.

Overall, the results presented in Table 7 indicate a substantial and statistically significant improvement in academic performance among ALS learners when the LMS is utilized as their primary learning platform. This underscores the effectiveness of integrating technology-driven solutions like LMS in ALS programs, leading to remarkable improvements in academic outcomes. The statistical analysis validates the positive impact of LMS on learner performance, emphasizing its potential to elevate the quality of ALS education and enhance students' learning experiences.

The findings in Table 7, which highlight a significant improvement in academic performance when ALS learners use a Learning Management System (LMS) compared to traditional printed Learning Activity Sheets (LAS), align with several studies and literature in educational technology and e-learning.

Research by Garrison and Kanuka (2004) underscores the importance of technology-enhanced learning environments, such as LMS, in promoting engagement and interaction among learners. The higher mean score associated with LMS usage in Table 3 suggests that LMS's interactive and collaborative features may have contributed to better academic performance among ALS learners.

Furthermore, the work of Anderson (2003) on the Community of Inquiry (CoI) framework for online learning highlights the significance of cognitive presence, social presence, and teaching presence in online education. The higher academic performance of ALS learners using LMS may be attributed to the enhanced cognitive and social interactions facilitated by the LMS platform.

Additionally, the study by Means et al. (2010) emphasizes the potential of technology-enhanced learning to personalize instruction and cater to diverse learning needs. With its adaptability and personalized features, the LMS may have

allowed ALS learners to receive more tailored instruction, potentially contributing to their improved performance.

CONCLUSIONS

Based on the findings of this study, it was concluded that the use of LMS was effective in helping the learners perform better in their academics during distance learning, highlighting the need to adopt innovative solutions to enhance the learning experiences of ALS learners. The literature supports the potential benefits of integrating technology-driven solutions into ALS programs, such as personalized learning, improved engagement, and enhanced academic outcomes, ultimately providing learners with a more flexible and effective educational pathway.

Additionally, with the broader body of literature on educational technology, e-learning, and online pedagogy, technology-driven solutions like LMS, as used in this study, can substantially improve academic performance by enhancing engagement, interaction, and personalization of learning. The statistical significance of the difference in mean scores further strengthens the case for the integration of LMS in ALS programs, emphasizing its potential to elevate the quality of education and enhance students' learning experiences, as supported by empirical evidence and related literature.

LITERATURE CITED

- Abdulaziz Aldiab, H. C. (2018). Utilization of Learning Management Systems (LMSs) in higher education system: A case review for Saudi Arabia. *2nd International Conference on Energy and Power, ICEP2018*, 731-737.
- Akay, E., & Koral Gumusoglu, E. (2020). The impact of learning management systems on students' achievement in language exams. *Turkish Online Journal of Distance Education*, 206-222.
<https://doi.org/10.17718/tojde.803410>
- Al-Fahad, F. (2010). Student' attitudes and perceptions towards the effectiveness of mobile learning in king Saud University, Saudi Arabia. *The Turkish Online Journal of Educational Technology*, 9(2), 20-29
- Bhuasiri, W., Xaymoungkhoun, O., Zo, H., Rho, J. J., & Ciganek, A.P. (2012). Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty. *Computers & Education*, 58(2), 843-855.

- Department of Education. (2016). *Policy Guidelines on the National Assessment of the Student Learning for the K to 12 Basic Education Basic Education Program*. <https://www.deped.gov.ph/2016/06/30/do-55-s-2016-policy-guidelines-on-the-national-assessment-of-student-learning-for-the-k-to-12-basic-education-program/>.
- Department of Education. (2017). *Research management Guidelines* <https://www.deped.gov.ph/2017/03/20/do-16-s-2017-research-management-guidelines/>.
- Díaz, L. H., Ramos, M. C., & Sánchez, M. S. (2014). Using Personal Portable Devices as Learning Tools in the English Class. *HOW Journal*, 21(2), 74-93. D. Randy Garrison, Heather Kanuka (2004), *Blended Learning: Uncovering Its Transformative Potential in Higher Education*.
- Dourish, P. a. (2014). *Divining a Digital Future: Mess and Mythology in Cambridge, Mass.: MIT Press*.
- E. Cassin Thangam, M. M. (2018). Internet of Things (IoT) based Smart Parking Reservation System using Raspberry Pi. *International Journal of Applied Engineering Research*, 5759-5765.
- Frاند, J.L. (2000). The Information-Age Mindset: Changes in Students and Implications for Higher Education. <https://epess.net/tr/download/article-file/331777>.
- Haleem, A., Javaid, M., Mohd Asim Qadri, & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, 3, 275-285. <https://doi.org/10.1016/j.susoc.2022.05.004>
- I.Iszaidy, R. R. (2016). Implementation of Raspberry Pi for Vehicle Tracking and Travel Time Information System:A Survey. *Embedded,Network and Advance Computing (ENAC)*.
- Marcial, D.E., Te, J.M., Onte, M.B., Curativo, M.L., & Forster, J.A. (2017). LMS on sticks: Development of a handy learning management system. *2017 7th International Conference on Cloud Computing, Data Science & Engineering - Confluence*, 782-787.
- Nguyen, N.-T. (2021). A study on satisfaction of users towards learning management system at International University. *Asia Pacific Management Review*, 186-196.
- Obana, J. (2021, June 2). *Learning Management System: An Essential Tool to Enhance Remote Education*. Grant Thornton Philippines. <https://www.grantthornton.com.ph/insights/articles-and-updates1/from-where-we-sit/learning-management-system-an-essential-tool-to-enhance-remote-education/>

- Sangeeta Mehroliya, S. A. (2021). Moderating effects of academic involvement in web-based learning management system success: A multigroup analysis. *Heliyon*.
- SMITHIES, J. (2022). Building a Virtual Research Environment on a Raspberry Pi. *JSTOR*, 102-114.
- Rubin, B., Fernandes, R., Avgerinou, M. D., & Moore, J. (2010, January 31). *The effect of learning management systems on student and faculty outcomes*. ResearchGate; Elsevier.
https://www.researchgate.net/publication/248540865_The_effect_of_learning_management_systems_on_student_and_faculty_outcomes