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Implementation of Electronic Technology Using a Learning Management System as a Medium for ICT-Based Digital Communication Science Learning at the Amari Community Learning Center

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Abstract

PKBM Amari, located in South Meruya, West Jakarta, is a non-formal educational institution offering Package A to Package C programs. Despite having qualified educators and active students, the institution faced challenges in digital integration, particularly the absence of a Learning Management System (LMS) and limited digital literacy among teachers and learners. To address these issues, a community empowerment program applies electrical and information technology to develop and implement an LMS-based website as a digital communication learning medium through several key initiatives, namely: (a) developing an LMS-based website, (b) conducting training for teachers and administrative staff, (c) integrating ICT in the learning process, (d) strengthening digital management capacity, (e) establishing sustainable partnerships and networks, and (f) implementing continuous monitoring and evaluation. This program, which supports SDGs 4 (Quality Education) and 8 (Decent Work and Economic Growth), aims to enhance the general quality of education at PKBM Amari through the development of digital skills and the encouragement of responsible technology use. This program generates social and economic benefits in addition to its implementation process. Educators have shown significant improvement in digital literacy, administrative tasks have become more efficient with LMS automation, and students can access learning materials more flexibly. These results show that LMS integration provides real improvements that have a positive impact on social and economic aspects at PKBM Amari.

Keywords: *community empowerment, digital literacy, electrical technology, ICT-based education, Learning Management System*

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Introduction

A Learning Management System (LMS) is essentially a digital platform that helps organize, deliver, monitor, and assess learning activities in an educational environment. It allows tutors to arrange course materials, monitor student participation, and access learning progress in a more organized and user-friendly way. At the same time, an LMS gives students the flexibility to access lessons, assignments, and feedback from anywhere, as everything is stored in one centralized platform (Novita et al., 2025).

However, the role of LMS is not limited to providing users with access to educational materials. This system also serves as a means of communication between students and tutors. LMS facilitates easy information sharing and maintains active engagement throughout the learning process through features such as discussion forums, announcements, and built-in messaging tools. LMS is also equipped with assessment tools that allow tutors to create exams, collect assignments, automate some assessment procedures, and monitor student academic progress more effectively. For educational institutions, a learning management system offers administrative efficiency through data management, user tracking, and customizable reporting features. Overall, these functions enhance the learning experience, improve teaching quality, and enable community-based educational centers (*pusat kegiatan belajar masyarakat* in Indonesian language, shortened to PKBM) such as PKBM Amari to adopt more flexible and transparent digital learning practices (Sardjono & Perdana, 2024).

A key component of the proposed strategy to address PKBM Amari digital issues is the provision of a learning management system. As mentioned earlier, PKBM Amari currently lacks an integrated learning management system sufficient to facilitate online collaboration and distance learning. This limitation directly hinders the ability to provide educational services that can adapt to the demands of the digital age (Novita et al., 2025).

The basis for improving the operations and teaching quality of a community-based educational centers is to implement a learning management system. The creation of a website that is integrated with a learning management system and functions as a centralized learning center and promotional platform is one of the main initiatives of this program. By implementing a learning management system, PKBM Amari will be able to:

1. Overcoming access and communication: By organizing information in one easily accessible location, a learning management system will provide a unified communication hub through discussion forums, announcements, and messages that will increase student engagement and reduce difficulties associated with low digital literacy among staff.
2. Improving administrative and teaching efficiency: With the implementation of a learning management system, student data management, progress tracking, and the assessment of assignments and quizzes can be handled automatically. This greatly reduces the administrative workload, which was once felt overwhelming, especially because the digital infrastructure previously available was insufficient. With these tasks becoming more efficient, educators are now able to devote more of their time and attention to the actual teaching process.
3. Learn anytime, anywhere: PKBM Amari can now provide learning programs that are far more accessible and flexible, particularly for communities that were previously difficult to reach. With a centralized learning management system, learners can access materials based on their own schedules and personal needs, making the overall learning experience more convenient, adaptable, and aligned with their daily routines.

This community service program aims to ensure that PKBM Amari can fully utilize the learning management system to achieve Sustainable Development Goals (SDGs) particularly the SDG 4 (Quality Education) by implementing more transparent, structure, and digital educational practices, as well as SDG 8 (Decent Work and Economics Growth) by providing the necessary digital skills to staff and students to improve their job search skill and increase community productivity in West Jakarta (Sardjono & Perdana, 2024).

The rapid development of Information and Communication Technology (ICT) in the era of digital transformation has reshaped the landscape of education, industry, and community empowerment (Budiyanto & Silalahi, 2023; Ma et al., 2022; Tiwari, 2021). Technological advances have opened up various opportunities while presenting new challenges in integrating digital systems into community-based educational environments. This is particularly felt by nonformal educational institutions that serve underprivileged communities. As part of the community service grant program organized by the Ministry of Education, Culture, Research, and Technology, this initiative focuses on the application of electrical and information technology to strengthen educational infrastructure and improve digital literacy in various

community learning centers. A key partner in the initiative is the PKBM Amari located in South Meruya, West Jakarta. The learning center offers a variety of nonformal education programs, ranging from Package A (equivalent to elementary school) to Package C (equivalent to high school). At present, PKBM Amari is supported by eight educators and serves a total of 144 students, consisting of 101 male and 43 female learners.

Despite its accredited status and longstanding contribution to community education, PKBM Amari still faces several challenges in its efforts to undergo digital transformation. First, the institution does not yet have an integrated learning management system to support distance learning and online communication. Second, limited digital literacy among teachers and staff makes the process of disseminating information and engaging students less than optimal. Third, the lack of digital infrastructure, such as a website and stable internet access, also limits the institution's ability to promote educational programs and manage administrative data efficiently (Silalahi et al., 2023).

To overcome these challenges, the Community Partnership Empowerment (CPE) Program focuses on applying multidisciplinary expertise from Mercu Buana University's Department of Electrical Engineering and Department of Communication Sciences to promote the strengthening of digital-based education at PKBM Amari.

Through this program, a number of initiatives have been designed to support the institution's digital transformation, including:

1. Development of a website integrated with a learning management system as a learning tool and a medium for promoting the institution.
2. Training for teachers and administrative staff to become more skilled in using information and communication technology for teaching and learning activities.
3. Integration of technology into daily teaching activities to create a more interactive and engaging learning experience.
4. Improvement of digital management capacity and system maintenance capabilities so that the institution can manage technology independently.
5. Strengthening partnerships and collaborative networks to ensure the sustainability of long-term programs..

6. Continuous monitoring and evaluation to assess program effectiveness and identify areas for improvement.

In line with the Sustainable Development Goals, specifically SDGs 4 on Quality Education and SDGs 8 on Decent Work and Economic Growth, this program also aligns with the *Merdeka Belajar Kampus Merdeka* (MBKM) framework, including KPI-2 and KPI-5. Through this collaboration, students have the opportunity to apply ICT skills directly in the field, lecturers are able to contribute to community-focused innovation, and the partner institution benefits from noticeable improvements in service quality and educational accessibility. At its core, this initiative is designed to boost digital empowerment, promote the responsible use of technology, and ICT-based learning systems at PKBM Amari.

To ensure that this program generates meaningful and sustainable impacts, a clear and community-oriented methodological approach is essential. Therefore, this study applies a Participatory Action Research (PAR) framework, which focuses on collaborative problem identification, iterative planning, action, observation, and reflection involving both the university team and stakeholders at PKBM Amari. This method allows the development of solutions that truly respond to the community's needs while providing room for continuous refinement during the implementation phase (Samsinas & Haekal, 2023).

The research approach in this program uses PAR, which is an empowerment method that emphasizes the active participation of partners in every stage of decision-making. Through PAR, the process of problem identification, planning, action, observation, and reflection is carried out collaboratively between the university team and PKBM Amari so that the solutions developed are truly in line with the needs of the community. The use of PAR is highly relevant because the process of education digitalization in nonformal settings requires social adjustments, increased digital capacity, and changes in work patterns, things that can only be achieved through the direct involvement of PKBM Amari tutors and managers.

The implementation of LMS at PKBM Amari also has a significant social and economic impact. From a social perspective, the use of LMS can improve digital literacy, encourage student engagement in the learning process, and open up opportunities in the learning process, and open up opportunities for them to learn independently without being constrained by space

and time. Economically, the LMS helps improve operational efficiency by reducing paper usage, simplifying administrative processes, and increasing educator productivity. Thus, the integration of this technology is not only a form of innovation in world education but also has a real impact on improving service quality and organizational efficiency in a sustainable manner (Riyanti., et al 2024).

Methods

Management and social aspects in improving the quality of community services are the two main focuses of this community partnership empowerment grant program. To address these needs, the program offers integrated solutions by utilizing information systems and digital technology, particularly through the implementation of a learning management system at PKBM Amari.

1. Participatory Action Research (PAR)

   PAR is a research approach that emphasizes close collaboration between researchers and communities to encourage meaningful social change. In PAR, community members are not positioned as mere research objects, but are actively involved in every stage of the process. Kemmis and McTaggart (2005) explain that PAR proceeds through a cycle of repeated actions-from planning, implementation, observation, to reflection-which allows the solutions produced to be truly appropriate to the local context and needs. This approach is widely used in community empowerment programs, particularly in the fields of education and digital capacity building. Through PAR, communities have the opportunity to participate in the technological transformation process they are experiencing, so that the changes that emerge are more relevant, more easily accepted, and more in line with actual conditions on the ground (Rizal et al., 2025).

2. Methodological Framework

   The program adopts a PAR approach, which emphasizes active collaboration between the university and PKBM Amari at every stage of the process. The PAR cycle, which includes planning, acting, observing, and reflecting, was applied to ensure that the implementation of LMS is based on the actual needs of the partner, continuously refined through feedback, and gradually improved. This approach ensured that the program outcomes are measurable, contextually relevant, and directly aligned with the challenges faced by PKBM Amari. The methodological flow is defined as: Needs Assessment - System Design - LMS Development

- Training of Tutors and Staff - Implementation - Monitoring - Evaluating and Reflection (Siswadi & Syaifuddin, 2024).

3. Management Aspect (Organizational and Administrative Structure)
   a. Currently, there is still uncertainty in the division of roles and responsibilities within the management of PKBM Amari, which has an impact on limited operational efficiency and accountability.
   b. In addition, the management team still has limitations in digital management knowledge and skills, so they are not yet able to manage the education and administration processes optimally.

   To overcome this, the programs developed and implemented a learning management system platform that functions as both a learning system and a digital administration system. Through this LMS, each user can have access control according to their role, equipped with scheduling, digital document management, and reporting features. The presence of this system is expected to help better organize organizational tasks and improve coordination between staff, teachers, and students.

4. Social Aspect (Improvement of Learning Service Quality)
   a. The quality of learning service at PKBM Amari is not yet fully able to meet the needs of students, especially those who require flexible or remote learning access.
   b. On the other hand, limited technological knowledge and digital literacy among teachers and students remain obstacles to the implementation of online learning methods.

   To improve the quality of learning service, LMS is designed to facilitate more effective online classroom management. These systems allow teachers to upload learning materials, facilitate discussion forums, and carry out digital assessments. In doing so, the learning management system helps create a learning environment that is more interactive and adaptable, aligning with the direction of educational transformation in the digital era.

5. Training of Teaching and Administrative Staff
   a. The Electrical Engineering team is responsible for preparing and conducting technical training for teachers and staff at PKBM Amari. This training covers the use of the learning management system server operations and digital network configuration, ensuring that participants can operate the system correctly and confidently.
   b. Meanwhile the Communication Science team provides training on online communication strategies, digital literacy, and classroom management within the LMS. This training also emphasized the importance of technical use of technology.

Through these capacity-building activities, educators and staff at PKBM Amari are expected to be able to operate the LMS independently while implementing responsible and sustainable digital practices, ultimately contributing to a more modern, adaptive, and future-oriented approach to education.

6. Strengthening Partnerships and Networks

   The Department of Electrical Engineering and the Department of Communication Science are working to establish partnerships with various stakeholders, such as academic institutions, governmental organizations, and business sectors, in order to improve the long-term sustainability of the program. These partnerships aimed to increase the use of digital technology at PKBM Amari and support the sustainable development of the LMS. By strengthening digital-based learning management, boosting teacher competencies, and boosting organizational efficiency within PKBM Amari, the program helps achieve SDGs 4 (Quality Education) and 8 (Decent Work and Economic Growth).

7. Partner Roles and Contributions

   Throughout the program, PKBM Amari, as the partner institution, played a crucial role and was actively involved at every stage. They prepared tutors and administrative staff for the training sessions, supplied baseline data on learner characteristics and digital literacy levels, granted access to computer labs and documentation resources, and took part in a variety of assessment activities. The involvement of PKBM Amari's staff during the planning, implementation, and monitoring phases ensured that the LMS design and implementation genuinely matched the institution's real needs and operational limitations. The application of the PAR approach, combined with strong engagement from the partner institution, ensured that each stage of the LMS implementation directly informed the outcomes presented in the results and discussion section. This methodological coherence also allowed the program's social and economic impacts to be assessed more clearly and accurately.

Results and Discussions

Activity Result

Community service activities were carried out on Monday, September 22, 2025, starting from 19.00 to 21.00 WIB as shown in Figure 1. This community service activity was divided into several activities, including information dissemination, a handover ceremony, and training in the use of LMS. This event was attended by 31 participants, consisting of educators and

Fig. 1. Community service activities documentation

students. This activity was filled with presentations from lecturers proposing community service activities, consisting of Setiyo Budiyanto, Irmulansati Tomohardjo, and Fauzi Nur

Iman. The activity also involved students from Mercu Buana University, including Rio Ivan Geraldio, Muhammad Yasierli Qadafi, Emil Rahmata Janil, Fahreza Oktavian, and Rezawien Fakhri.

Measured Social and Economic Impact

The implementation of the LMS at PKBM Amari has brought clear social and economic advantages for the institution. On the social side, the digital skills of tutors improved noticeably, with more than 80% of them demonstrating stronger abilities in navigating and operating the LMS compared to their initial baseline. Learners also became more engaged as they could access digital learning material more freely and study at times that fit their personal routines and responsibilities.

The institution's administrative operations also become more cost-efficient. By reducing several manual tasks, especially those related to printing and photocopying, the overall operational expenses, including electricity use, were noticeably lower. Additionally, the LMS made tracking student progress more feasible and streamlined reporting, which eventually helped the institution run more smoothly on a daily basis.

It should be emphasized that this program does not focus on developing new technology, but rather on adapting and optimizing the Moodle platform to suit the needs of nonformal education. Although it does not directly produce technological innovation, the main contribution of this research can be seen in the social and economic changes that have emerged after the LMS was implemented in PKBM Amari environments that previously had limited digital access. Thus, the novelty of this research lies in the empowerment approach used and the successful implementation impact achieved in the community context.

Website Improvement

To strengthen its digital services, PKBM Amari also upgraded and connected its main website with the online learning platform. The official website, pkbmamari.sch.id, now includes an “LMS” menu that directs users to the online learning portal at *lms.pkbmamari.sch.id*. Improving this integration has made it easier for tutors and learners to move between general institutional information and the learning system. This improvement is intended to help students and tutors access the learning platform more easily, provide a clearer navigation flow

between the information site and the LMS, and reinforce the overall digital ecosystem within PKBM Amari.

Fig. 2. Main website *pkbmamari.sch.id*

The PKBM Amari LMS is built using Moodle as its primary framework. Moodle was selected because it is a flexible, open-source learning platform that can be easily adapted to meet the institution's specific needs. This platform offers a variety of modern features that support the teaching and learning process, such as course and participant management, automatic assessment, and interactive discussion forums that facilitate communication between tutors and students. In addition, Moodle also allows the integration of various types of learning content, from videos and documents to quizzes. Through this development, PKBM Amari can provide more flexible learning access for students, facilitate effective distance learning, and strengthen the digital administration and documentation of teaching and learning activities.

Moving forward, the development team will continue to maintain and enhance the LMS by optimizing its interface for responsiveness across devices, conducting training sessions for tutors and students, and integrating academic data between the main website and the LMS system.

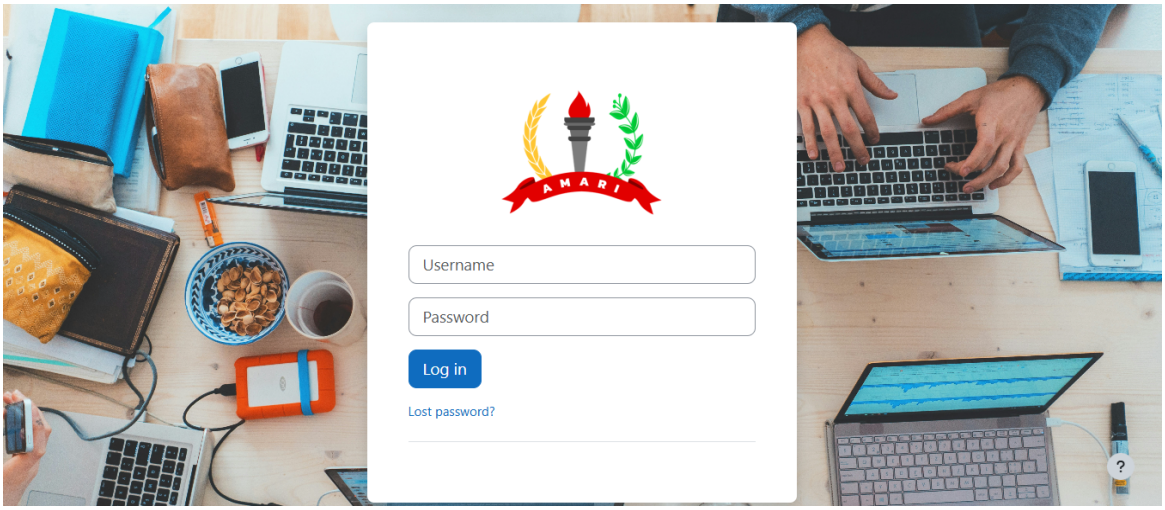


Fig. 3. PKBM Amari LMS login page

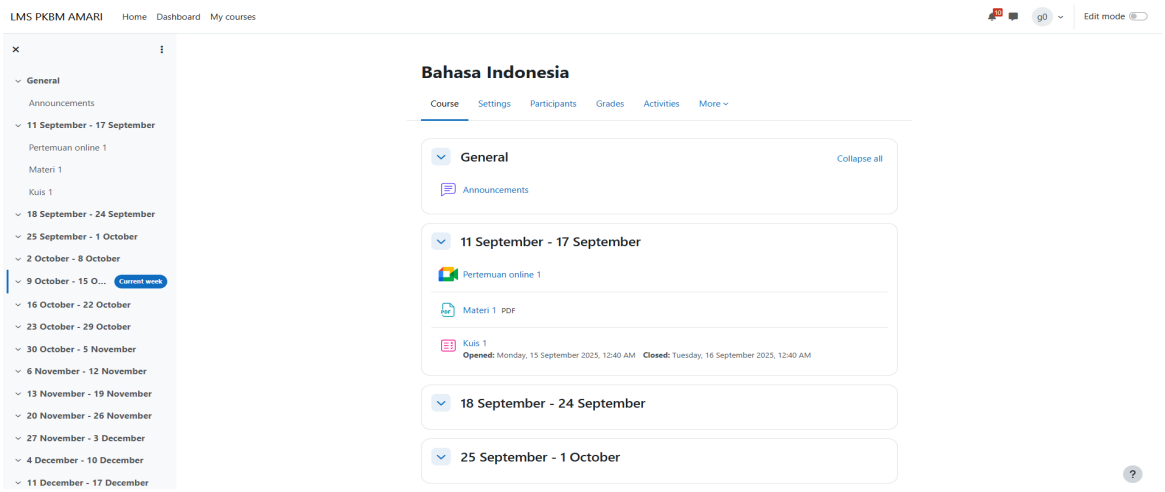


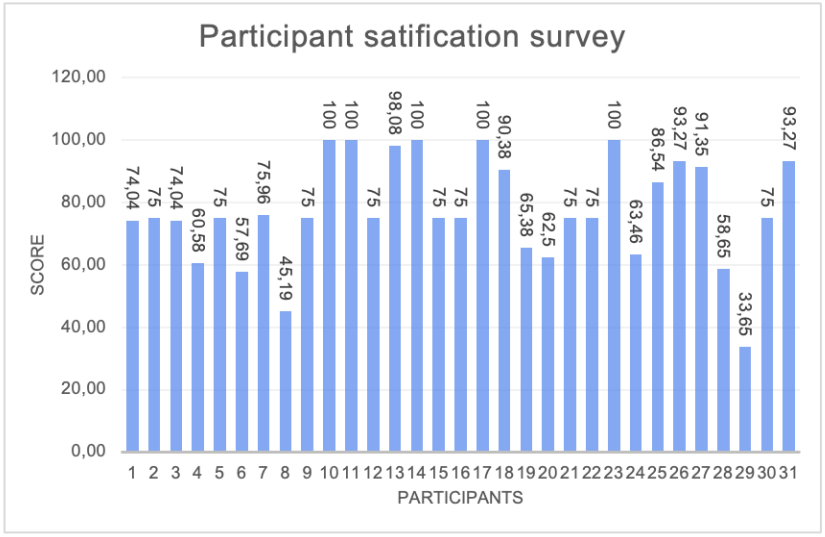
Fig. 4. The teaching and learning activities within the PKBM Amari LMS

Analysis

The activity ran very smoothly and was appreciated very well by the partners, as noted in Figure 4. The results of filling out the questionnaire conducted by the PKBM Amari participants were based on questions given on a scale of 1 (bad) to 4 (very good). The results of this activity were carried out using a survey consisting of several questions shown in Figure 5. The analysis showed that 79.33% of the participants showed enthusiasm and expressed seriousness in participating in CS program activities, 20.77% of them showed beyond expectations and satisfaction.

No	Nama	Questionnaire Questions																								SUM	SCORE
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26		
1	abdulloh azam	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	77	74,04
2	ahmad aziz afrizal	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	78	75
3	Ali	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	77	74,04
4	Allena Debby Saputri	3	2	2	2	4	4	2	2	2	2	3	3	2	2	3	3	2	2	2	2	2	2	2	2	3	3	63	60,58
5	Amelia putri Suryaningsih	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	78	75
6	Chikalfadhilaramadhan	4	2	1	1	2	2	2	1	3	2	4	2	2	2	4	4	2	2	2	2	2	2	2	4	2	2	60	57,69
7	Elizaa	2	3	2	3	2	2	3	2	3	3	3	3	3	3	3	4	3	4	4	3	4	3	3	3	4	4	79	75,96
8	Fadhilahramadhan	1	1	1	1	2	2	4	2	1	1	1	1	1	1	2	2	2	1	4	2	4	2	4	2	1	1	47	45,19
9	Gabriel Kristofer Theodore	3	3	3	2	2	3	4	4	3	3	3	3	3	3	3	2	4	3	2	3	3	3	4	4	3	2	78	75
10	Laura	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	104	100
11	Lillah	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	104	100
12	Lisna	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	78	75
13	Luthfia laura febriani	4	4	4	4	4	4	4	4	3	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	102	98,08
14	Muhamad Fadly	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	104	100
15	Muhamad ikbar	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	78	75
16	Muhammad Abubakar Shiddiq	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	78	75
17	Muhammad Arief	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	104	100
18	neyni hidayah	3	3	4	3	4	4	3	4	3	4	4	4	3	4	3	4	3	4	3	4	4	4	4	3	4	4	94	90,38
19	Nina	3	2	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	3	2	3	3	2	2	3	3	68	65,38
20	NURKOMALA SARI	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	65	62,5
21	Putri aisyah f	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	78	75
22	Rafi	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	78	75
23	SafaraZ akma fadil	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	104	100
24	Salwa Aliyatus Salsabila	3	2	3	2	3	2	3	2	2	3	2	3	2	3	3	2	2	3	3	2	3	2	2	3	3	3	66	63,46
25	Sarah Kamilia	3	4	3	4	3	4	3	4	3	4	3	4	4	3	4	3	3	4	4	3	3	3	4	4	3	3	90	86,54
26	SARMILIH	4	4	4	4	3	4	3	4	4	3	4	3	4	3	4	4	4	4	4	4	3	4	3	4	4	4	97	93,27
27	sefhira zalfa	4	3	4	4	3	3	4	4	4	4	3	3	4	4	4	4	3	3	4	4	4	4	4	4	3	3	95	91,35
28	SITI WINDIYANTI NINGRUM	3	2	2	2	1	1	2	3	2	3	3	3	2	4	1	3	3	1	2	3	2	1	4	2	2	4	61	58,65
29	syahrul dwi ramadan	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	3	1	1	1	1	1	1	1	1	1	1	35	33,65
30	Yeni Maryani	4	2	4	2	4	2	4	3	4	3	3	3	3	3	3	2	3	2	3	2	3	2	4	3	4	3	78	75
31	Zahra Khairunnisa	3	4	3	4	4	4	4	3	4	4	4	4	4	4	4	4	3	3	4	4	3	3	4	4	4	4	97	93,27
																									Average			82,5	79,33
																									Min			35	33,65
																									Max			104	100
																									STD			17,55	16,87
																									VAR			307,99	284,76

Fig 5. Participants responses



Average	82,5	79,33
Min	35	33,65
Max	104	100
STD	17,55	16,87
VAR	307,99	284,76

Fig 6. Questionnaire result

Figure 5 and Figure 6 provide insight into participant responses regarding the effectiveness of the program. The high satisfaction level, with 79.33% rating the activities positively, reflects the relevance of the implemented LMS and the success of the training process. These results also validate the PAR-based methodological approach, as continuous feedback allows iterative improvements throughout the implementation.

Although the program successfully implemented an LMS and strengthened digital literacy, it does not introduce a new technological innovation. Instead, it focuses on the contextual adaptation and optimization of existing technologies, specifically Moodle for use in a nonformal education setting. This distinction highlights that the primary contribution of this work lies in its practical application and measurable community impact rather than technological novelty.

Conclusion

Based on the results of the evaluation of the activities that have been carried out, it was concluded that 79.33% of the participants gave satisfactory and expected responses to the implementation of the grant program. Furthermore, participants were able to understand the definition, variety of applications, and simple training on the application of website management.

To ensure long-term sustainability, several follow-up actions are recommended. These include the establishment of a dedicated digital support team within PKBM Amari, periodic refresher training sessions for tutors and staff, routine LMS maintenance cycles, and the expansion of LMS features to support blended learning models. In addition, future collaboration may involve the development of advanced digital literacy modules for students, ensuring that PKBM Amari continues progressing toward a fully digital learning ecosystem.

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this program. It is envisaged that this collaboration will keep promoting creativity and long-term expansion in community-based ICT education.

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