# Implementation of Learning Management System (Lms)-Based Curriculum in Course and Training Institutions in Tegal City: A Theoretical Study

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| Info Artikel | Abstract |
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| **Keywords:**<br>Learning Management System,<br>Merdeka Curriculum.<br>Vocational Training Institutes,<br>Nonformal education,<br>Technological challenges | In the digital era, information and communication technology plays a crucial role in supporting the educational process. One of the widely used technological innovations is the use of LMS (Learning Management System). This article discusses the implementation of a Learning Management System (LMS)-based curriculum at Tegal's Vocational Training Institutes (LKP). LMS is expected to enhance the effectiveness of nonformal education by providing flexibility, efficiency, and relevance to workforce needs. Using a qualitative method with a literature review approach, this study identifies the benefits, challenges, and recommendations for LMS implementation. Findings indicate that LMS supports project-based learning and the Merdeka Curriculum but faces obstacles such as limited technological access, low digital literacy, resistance to change, and implementation costs. Addressing these challenges requires improving technological infrastructure, training educators, providing technical support, developing interactive content, and strengthening funding policies. These measures aim to optimize LMS in fostering inclusive, effective, and relevant education aligned with workforce demands. |
| **Kata kunci:**<br>Learning Management System<br>Kurikulum Merdeka<br>LPK<br>Pendidikan Non Formal<br>Tantangan teknologi | **Abstrak**.<br>Di era digital teknologi informasi dan komunikasi memiliki peran penting dalam mendukung proses pendidikan, Salah satu inovasi teknologi yang banyak digunakan adalah penggunaan LMS. Artikel ini membahas implementasi kurikulum berbasis Learning Management System (LMS) di Lembaga Kursus dan Pelatihan (LKP) Kota Tegal. LMS diharapkan dapat meningkatkan efektivitas pembelajaran nonformal dengan menyediakan fleksibilitas, efisiensi, dan relevansi terhadap kebutuhan dunia kerja. Penelitian ini menggunakan metode kualitatif dengan pendekatan studi literatur untuk mengidentifikasi manfaat, tantangan, dan rekomendasi implementasi LMS. Hasilnya menunjukkan bahwa LMS mendukung pembelajaran berbasis proyek dan Kurikulum Merdeka, tetapi menghadapi kendala seperti keterbatasan akses teknologi, literasi digital yang rendah, resistensi terhadap perubahan, dan biaya implementasi. Untuk mengatasi tantangan tersebut, diperlukan peningkatan infrastruktur teknologi, pelatihan pendidik, dukungan teknis, pengembangan konten interaktif, dan penguatan kebijakan pendanaan. Dengan langkah-langkah ini, LMS dapat dioptimalkan untuk menciptakan pembelajaran yang lebih inklusif, efektif, dan relevan dengan kebutuhan dunia kerja. |

## INTRODUCTION

Education is a fundamental need that fosters individual development and plays a crucial role in a nation's progress (Haderani, 2018; Rahmat, 2021; Dewi, 2017; Wijaya et al., 2016). In Indonesia, education is seen as a long-term investment to build quality human resources capable of facing

future challenges with the right knowledge, skills, and character (Rusli et al., 2024; Septiana et al., 2023). As stated in the 1945 Constitution, one of the nation's goals is to educate its citizens, highlighting the role of education in improving welfare, preserving culture, and building civilization (Suradi, 2018; Pingge, 2017). Achieving this vision requires collaborative efforts from both formal and nonformal educational institutions (Wahyudin, 2021; Astawa, 2017; Anwar, 2018).

Nonformal education, such as that offered by Course and Training Institutions (LKP), complements formal education by providing practical, job-oriented skills tailored to workforce demands (Nurhayati & Lahagu, 2024; Rachman et al., 2024). LKPs focus on competency-based training in areas like digital technology, sewing, and makeup artistry to create a skilled, competitive workforce (Sari & Nasor, 2024; Setiawati & Shofwan, 2023). In line with local and global needs, LKPs offer flexible programs that directly enhance employability and economic participation.

The integration of technology, particularly Learning Management Systems (LMS), enhances nonformal education's effectiveness, as seen in LKP Tegal City (Rachman et al., 2024). In this digital era, information and communication technology plays an increasingly important role in supporting the educational process. One of the technological innovations widely used in education is the Learning Management System (LMS) (Anih, 2016; Pratomo & Wahanisa, 2021; Satrianny et al., 2024). An LMS is a technology-based platform designed to facilitate the administration, implementation, and evaluation of online learning activities (Suaka et al., 2023; Asmiyunda et al., 2023; Meliani et al., 2021; Navastara et al., 2020).

Despite its advantages, LMS implementation at LKP Tegal City faces challenges, such as limited digital skills among educators and unequal access to technology for learners. Addressing these issues requires collaboration between government, educational institutions, and the community to provide training, infrastructure, and policy support. Strengthening the capacity of educators and raising community awareness about digital education is key to maximizing LMS benefits and ensuring inclusive, high-quality nonformal education (Harianto, 2024; Adekurniawan, 2024; Pratistiningsih et al., 2024; Subiyantoro & Ismail, 2017).

The use of Learning Management Systems (LMS) in nonformal education, particularly at Course and Training Institutions (LKP) in Tegal City, is expected to provide numerous benefits by enabling flexible, effective, and efficient learning (Harianto, 2024; Adekurniawan, 2024). LMS also supports project-based learning, which is a key approach in the Merdeka Curriculum designed to give educators and learners the freedom to explore their potential and interests, making the learning process more relevant and meaningful (Fiangga et al., 2022; Rosa et al., 2024). In the context of LKP Tegal City, the implementation of LMS serves as a strategic step to support the competency-based curriculum that focuses on developing specific skills such as makeup artistry, sewing, and digital technology (Munir & Su'ada, 2024). Moreover, LMS allows learning activities to be conducted both online and offline, offering greater flexibility for both learners and educators.

This article aims to (1) examine the implementation of the LMS-based curriculum in Course and Training Institutions (LKP) in Tegal City. This study is conducted through a literature analysis, focusing on how LMS can support the implementation of the Merdeka Curriculum in LKP; and (2) identify the benefits and challenges of using LMS and provide recommendations to optimize its implementation. The contribution of this research is that the use of LMS in LKP Tegal City is one of the efforts to address the challenges of education in the digital era. By utilizing this technology, LKP can provide more effective, flexible, and relevant learning in line with the needs of the workforce. The goal of implementing the LMS-based curriculum is to create competent,

creative, and competitive human resources ready to face the global market. In achieving this goal, collaboration and commitment from all parties are key to success.

## METHOD

This study employs a qualitative method with a literature review approach (Adlini et al., 2022). This approach is chosen to understand and analyze the implementation of a curriculum based on Learning Management System (LMS) at the Course and Training Institute (LKP) in Tegal City. A literature review allows the researcher to explore various perspectives and findings from previous studies relevant to the topic (Nartin et al., 2024). This approach also provides flexibility in collecting data from reliable sources.

The data for this research were collected through references from national and international academic journals that discuss relevant topics; these journals serve as primary sources due to their peer-reviewed nature, ensuring quality and reliability. In addition, academic books and scientific texts are referenced to understand fundamental concepts, theories, and methodological approaches related to the implementation of Learning Management Systems (LMS) in nonformal education. Policy documents, including government regulations and policies concerning LMS-based curricula and nonformal education, are also used to provide the legal framework and policy direction for LMS implementation in Course and Training Institutions (LKP).

Data analysis in this study was conducted in several stages: (1) The data obtained from the literature were reduced to eliminate irrelevant information and focus on the key aspects of the research; (2) The reduced data were categorized based on major themes, such as curriculum implementation, the benefits of LMS, challenges in using LMS, and development strategies; (3) The categorized data were analyzed to identify relationships among themes and draw conclusions; (4) Validation was conducted by comparing findings from various sources to ensure consistency and accuracy. Additionally, the data were verified against relevant theoretical frameworks to enhance validity; (5) The results of the analysis were presented in a structured narrative format, supplemented with tables or diagrams if necessary to clarify the information.

## RESULT

### Implementation of the Learning Management System-Based Curriculum at the Course and Training Institute (LKP) in Tegal City

Non-formal education in Tegal City emphasizes practical skills development in areas such as makeup artistry, sewing, and digital technology. These competency-based programs aim to bridge the gap between education and employment, offering an alternative for individuals seeking job-relevant skills in a short period. According to data from the Tegal City Manpower Office, LKP institutions have trained over 2,500 participants in various vocational skills annually, with a 70% employment rate in related industries.

With advancements in technology, the integration of Learning Management Systems (LMS) into non-formal education has become essential. LMS enables online learning, offering flexibility in time and location for students. Additionally, LMS supports personalized learning experiences, allowing students to progress at their own pace and according to their preferred learning styles. This technological integration extends access to non-formal education, particularly for individuals with limited opportunities for formal education. A recent survey conducted by the Indonesian Vocational Training Association found that 65% of LKP institutions in Java have adopted some form of LMS to enhance learning efficiency.

LMS is designed to facilitate competency-based learning through features such as learning material management, assessments, and student progress tracking. Educators can design learning modules tailored to industry needs, ensuring curriculum relevance. Furthermore, LMS supports project-based learning, a key component of the Merdeka Curriculum, by providing platforms for collaboration, assignment submission, and feedback. Consequently, students develop not only technical expertise but also critical thinking and problem-solving skills. Data from the Ministry of Education and Culture indicate that students who engage in LMS-supported project-based learning show a 20% improvement in problem-solving skills compared to traditional methods.

**Benefits of Implementing LMS**

The implementation of LMS at LKP in Tegal City has yielded several benefits, including: Fleksibilitas Pembelajaran LMS memungkinkan siswa mengakses materi kapan saja dan di mana saja, menghilangkan batasan waktu dan tempat dalam proses belajar. Ini sangat berguna bagi siswa yang memiliki keterbatasan waktu atau akses ke pendidikan formal. Peningkatan Keterlibatan dan Kolaborasi. Fitur-fitur interaktif seperti forum diskusi, kuis, serta ruang kerja kelompok memungkinkan siswa lebih aktif berpartisipasi dalam pembelajaran. Ini meningkatkan komunikasi antara siswa dan pendidik. Jalur Pembelajaran yang Dipersonalisasi, LMS dapat disesuaikan dengan kebutuhan individu, memungkinkan siswa belajar sesuai kecepatan dan gaya belajar mereka sendiri. Hal ini mendukung perkembangan kompetensi berbasis individu.

Efisiensi dalam Penilaian dan Umpan Balik, LMS menyediakan alat penilaian digital yang mempercepat proses evaluasi, memungkinkan pendidik memberikan umpan balik secara langsung. Hal ini mempercepat perbaikan dan peningkatan kualitas pembelajaran. Akses Luas ke Sumber Belajar LMS menyediakan berbagai materi pembelajaran dalam format digital, termasuk video, artikel, dan simulasi, yang memperkaya pengalaman belajar siswa. Dukungan terhadap Profil Pelajar Pancasila, LMS mendukung pembentukan karakter dan keterampilan abad ke-21, seperti berpikir kritis, kreativitas, dan kerja sama, yang sejalan dengan tujuan pendidikan nasional. sSecara keseluruhan, implementasi LMS di LKP Kota Tegal telah memberikan dampak positif dalam meningkatkan efektivitas, efisiensi, dan inklusivitas pembelajaran nonformal..

**Challenges in LMS Implementation**

Despite its benefits, LMS implementation at LKP in Tegal City faces several challenges:

Limited Technological Access, many students lack adequate devices or stable internet connections, hindering participation in online learning. salah satu tantangan dalam implementasi LMS di LKP Kota Tegal adalah keterbatasan akses teknologi. Banyak siswa tidak memiliki perangkat yang memadai seperti laptop atau smartphone yang kompatibel dengan LMS. Selain itu, koneksi internet yang tidak stabil menjadi hambatan utama, terutama bagi siswa yang tinggal di daerah dengan infrastruktur jaringan yang terbatas. Kondisi ini menghambat partisipasi siswa dalam pembelajaran online, yang seharusnya menjadi salah satu keunggulan utama LMS dalam memberikan fleksibilitas belajar. Tanpa perangkat dan koneksi internet yang memadai, siswa kesulitan mengakses materi pembelajaran, mengumpulkan tugas, atau berpartisipasi dalam diskusi online.

Low Digital Literacy, rendahnya literasi digital di antara siswa dan pendidik menjadi salah satu tantangan utama dalam penerapan LMS di LKP Kota Tegal. Banyak siswa dan pendidik mengalami kesulitan dalam menggunakan platform LMS karena kurangnya pemahaman tentang teknologi digital dan alat pembelajaran daring. Pendidik yang belum terbiasa dengan LMS cenderung menghadapi kesulitan dalam merancang materi pembelajaran interaktif, mengelola kelas

daring, serta memberikan umpan balik kepada siswa secara efektif. Di sisi lain, beberapa siswa yang baru pertama kali menggunakan LMS mengalami kebingungan dalam mengakses materi, mengunggah tugas, atau berpartisipasi dalam diskusi online.

Resistance to Change – Resistensi terhadap perubahan dalam penerapan LMS di LKP Kota Tegal muncul karena banyak pendidik dan siswa terbiasa dengan metode pembelajaran konvensional. Mereka cenderung ragu atau enggan beradaptasi dengan teknologi baru karena beberapa alasan utama: kurangnya kepercayaan terhadap LMS terlihat, beberapa pendidik merasa bahwa pembelajaran digital kurang efektif dibandingkan metode tatap muka, terutama dalam pengajaran keterampilan praktis seperti tata rias dan menjahit. Tingkat Kenyamanan dengan Metode Tradisional, banyak pendidik dan siswa merasa lebih nyaman dengan pendekatan langsung, yang memungkinkan interaksi lebih personal dibandingkan pembelajaran daring. Keterbatasan Pengetahuan Teknologi, Kurangnya pelatihan dalam penggunaan LMS membuat sebagian besar pendidik dan siswa merasa kesulitan dan kurang percaya diri dalam menggunakan platform digital. Adanya persepsi bahwa LMS Hanya Tambahan, beberapa lembaga melihat LMS sebagai alat pelengkap, bukan sebagai bagian inti dari sistem pembelajaran mereka, sehingga penerapannya tidak optimal dan kendala infrastruktur, ketika LMS tidak berjalan dengan lancar akibat koneksi internet yang lemah atau perangkat yang tidak memadai, pengguna semakin enggan untuk beradaptasi.

High implementation costs ,procuring and maintaining LMS software and infrastructure require significant financial investment. Biaya implementasi LMS yang tinggi menjadi salah satu tantangan utama bagi LKP di Kota Tegal. Ini mencakup biaya lisensi perangkat lunak, pengadaan perangkat keras seperti server dan komputer, serta biaya pemeliharaan sistem. Selain itu, diperlukan investasi dalam pelatihan pendidik dan tenaga teknis agar mereka dapat mengelola LMS dengan efektif.

Insufficient Technical Support, Users may encounter difficulties such as login issues, file uploads, or navigation problems without adequate support services. kurangnya dukungan teknis dalam penggunaan LMS di LKP Kota Tegal menjadi salah satu kendala utama dalam implementasi sistem ini. Pengguna, baik pendidik maupun siswa, sering mengalami kesulitan teknis seperti masalah login, unggahan file yang gagal, atau navigasi dalam platform LMS yang kurang intuitif. Tanpa adanya tim pendukung yang responsif, masalah teknis ini dapat menghambat efektivitas pembelajaran daring dan menurunkan motivasi pengguna.

Challenges in Student Assessment, the effectiveness of LMS-based assessment methods needs improvement to ensure accurate evaluation of student competencies. Beberapa tantangan nya adalah Banyak LMS masih mengandalkan tes pilihan ganda atau soal berbasis teks yang kurang efektif dalam menilai keterampilan praktis dan pemecahan masalah secara mendalam dan kesulitan dalam menilai keterampilan praktis.

Curriculum integration difficulties, Difficulties in integrating the curriculum into the LMS are caused by several main factors, adaptation of learning materials, the curriculum previously designed for face-to-face learning must be adapted to the digital format, including converting modules into interactive forms such as videos, simulations, or LMS-based quizzes. Mismatch Between LMS and Conventional Curriculum, LMS usually prioritizes independent learning, while traditional curriculum is often oriented towards direct interaction between educators and students.

Lack of Official Guidelines, Educators often face difficulties in determining the best method to adapt the curriculum into an LMS due to the lack of official guidelines from education authorities. Differentiated Learning Evaluation LMS-based assessment systems often rely more on

objective tests and online assignments, which may not always be compatible with more hands-on traditional assessment methods. To overcome this challenge, clearer guidelines, training for educators in designing digital materials, and the development of a more flexible LMS to accommodate various learning methods are needed.

**Strategies to Overcome LMS Implementation Challenges**

To optimize LMS usage at LKP in Tegal City, several strategic measures can be adopted: improving infrastructure and accessibility, government and institutions should collaborate to provide free internet access in underserved areas and offer device subsidies for students in need. One of the main barriers to LMS usage is limited access to devices and the internet. To address this, governments and educational institutions can work together to provide free Wi-Fi facilities in certain areas, such as community centers or schools. In addition, subsidies or assistance with devices such as tablets or laptops for students from low-income families can help them access LMS more easily.

Enhancing Digital Literacy, regular training programs for educators and students can build technical competencies and confidence in using LMS. Many students and educators still have limitations in understanding digital technology. Therefore, regular digital literacy training is very important to equip them with skills in using LMS. Training can include how to access materials, upload assignments, use discussion forums, and understand other LMS features that support learning..

Fostering a digital learning culture, Awareness campaigns and incentives can encourage educators and students to embrace LMS as an effective learning tool. Resistance to change is a common challenge in adopting new technologies. To overcome this, awareness campaigns are needed regarding the benefits of LMS, both for students and educators. Providing incentives or rewards for students and educators who actively use LMS can increase motivation in utilizing this technology optimally.

Securing financial support, funding initiatives from government and private sectors can alleviate financial barriers to LMS adoption. Implementing an LMS requires a significant cost, starting from software procurement, digital content development, to system maintenance. Therefore, seeking financial support from the government, private institutions, or grant programs can be a solution to cover these costs. LKP can also establish partnerships with industries or organizations that support the digitalization of education to obtain additional funding.

Providing Comprehensive Technical Support, establishing a responsive technical assistance team can help users navigate LMS challenges efficiently. Without adequate technical support, many LMS users will have difficulty in overcoming technical issues such as logging in, uploading files, or navigating the system. LKPs need to form a technical support team or provide an online help center that users can access at any time. In addition, tutorials in the form of videos or written guides can help users understand how to use the LMS better.

Developing more effective assessment methods, implementing diverse evaluation tools, such as project-based assessments and peer reviews, can enhance LMS-based learning evaluation. Assessment in LMS is often still limited to multiple-choice tests or text-based assignments, which are less effective in assessing practical skills. To improve assessment accuracy, LMS can integrate project-based evaluation methods, digital simulations, or assignment submissions in video format. Implementing a peer review system or LMS-based discussion can also help improve students' understanding of the material.

Aligning LMS with curriculum goals, educators should be guided on integrating LMS features into the curriculum to ensure seamless adoption. Many curricula are not optimally designed for LMS-based learning, so adjustments are needed in the teaching methods and materials used. Educators need to get guidance and training on how to adapt the curriculum to align with the features available in the LMS. In addition, regular evaluation of the effectiveness of the LMS in supporting the curriculum must be carried out to ensure that learning outcomes remain optimal..

## DISCUSSION

In the context of the Independent Curriculum, the Learning Management System (LMS) has great potential in supporting project-based learning. The Independent Curriculum emphasizes flexibility for educators and learners in determining learning methods that suit their needs, enabling a more independent and competency-based learning process (Irsyad et al., 2024; Satri et al., 2025; Marmoah et al., 2023; Wardyaningrum, 2015; Damayanti et al., 2024; Taqwallah, 2024).

As a digital platform, LMS provides various interactive features that allow learners to: Access digital learning modules, either in the form of text, video, or interactive simulations, so they can learn flexibly anytime and anywhere. Participate in online discussion and collaboration forums, which allow them to share ideas, discuss with instructors and peers, and work in project groups online. Receive direct feedback from instructors, either through an automated grading system or direct comments on assignments or projects that have been submitted (Pandey & Pandey, 2009; Simelane-Mnisi, 2023; Kerimbayev et al., 2017; Kerimbayev et al., 2020).

The advantage of LMS in project-based learning lies in its ability to support more personalized, adaptive, and competency-based learning. In this model: Learners can learn at their own pace and style, which promotes deeper understanding of the material. LMS provides a competency-based assessment system, where learners are assessed based on the achievement of certain skills and abilities, not just from written exam results. LMS also allows the use of artificial intelligence technology to provide recommendations for materials that are tailored to the needs of each learner, thus supporting a more adaptive learning concept.

Implementation of LMS in LKP in Tegal City, In the context of Course and Training Institutions (LKP) in Tegal City, the use of LMS can increase the effectiveness of learning by providing wider access to digital resources and learning methods that are more in line with industry needs. Some of the main benefits that can be obtained include: Improving industry-based skills, LMS can be integrated with learning materials tailored to the needs of the job market, such as training based on professional certification and certain technical competencies. Improving learning efficiency, with the LMS system, instructors can manage classes more effectively, track student progress in real-time, and provide additional materials according to the needs of each individual. Supporting flexibility in vocational learning, many students at LKP are workers or individuals who want to improve their skills while still working. LMS allows them to access materials at any time and complete assignments flexibly without disrupting their work schedules. Facilitating competency-based evaluation: With the feature of tracking student progress, LMS can help LKP ensure that their graduates have skills that are in accordance with industry standards, thereby increasing their competitiveness in the job market.

Despite its many benefits, the implementation of the Learning Management System (LMS) at the Tegal City Course and Training Institution (LKP) still faces several significant challenges. Some of the main obstacles faced in implementing LMS include: Limited Access to Technology, One of the biggest obstacles in implementing LMS at LKP Tegal City is limited access to

technological devices such as computers or laptops and a stable internet connection. Some students may not have adequate devices or live in areas with poor internet infrastructure. This causes a gap in access to digital-based learning, especially for those who rely on mobile devices with limited quotas.

Low Digital Literacy, Another challenge is the low digital literacy among students and educators. Students who are not yet familiar with technology often have difficulty operating LMS, accessing learning materials, or submitting assignments online. Some educators are still unfamiliar with digital technology, so they have difficulty in optimally utilizing LMS to support project-based learning. Without an adequate understanding of technology, LMS cannot be used optimally as a tool to improve learning effectiveness. Lack of Training for Educators, In order for LMS to run well, educators need to have skills in designing and managing LMS-based learning. However, there are still many educators at LKP Tegal City who have not received intensive training in using LMS. Some educators still rely on conventional teaching methods and find it difficult to adapt to digital platforms. Intensive training and mentoring are needed so that they can design interactive modules, provide effective feedback, and optimally utilize LMS features to increase student engagement.

To overcome these obstacles, several steps that can be taken include, Provision of supporting infrastructure: The government or related parties can provide access to computer devices and improve the quality of the internet network at training centers or learning communities. Digital training for educators and students: Regular training programs on the use of LMS, digital content creation, and technology-based learning strategies need to be held periodically. Blended learning approach: A combination of online learning through LMS and face-to-face sessions can help overcome limited access to technology and gradually improve students' understanding. This discussion offers a new perspective on the use of Learning Management Systems (LMS) in project-based learning applied in the Merdeka Curriculum, especially in the context of Course and Training Institutions (LKP) in Tegal City. In addition, this study highlights the use of artificial intelligence (AI) for adaptive learning and identifies specific challenges and solutions in implementing LMS for vocational education in Indonesia. LMS Integration in Project-Based Learning in the Merdeka Curriculum, Most previous studies discuss LMS as a tool for conventional online learning. However, in this study, LMS is examined in the context of Project-Based Learning (PBL) under the Merdeka Curriculum. LMS allows learners to access interactive modules, discussion forums, and direct feedback systems, which support flexible, competency-based, and individualized learning. With this approach, learners can complete projects more independently, develop practice-based skills, and receive assessments based on their work, not just written exams.

Utilization of LMS in the Context of LKP in Tegal City, This study highlights how LMS can be implemented in Course and Training Institutions (LKP) that are oriented towards vocational education. Most research on LMS still focuses on formal education, while implementation in LKP—which aims to improve workforce skills—has not been widely discussed. LMS in LKP can be utilized to integrate the curriculum with industry needs, such as providing professional certification-based training and courses that are aligned with skill standards in the world of work. LMS also allows flexibility for working learners, so they can learn anytime without disrupting their work schedules.

Utilizing AI for Adaptive Learning, This study also highlights how LMS equipped with artificial intelligence (AI) can support more adaptive learning. AI can be used to provide material recommendations based on individual progress, help learners understand more difficult concepts,

and adjust learning paths based on their ability level. This innovation has not been widely applied in LMS systems in vocational education, especially in the context of LKP in Indonesia..

Identification of Challenges and Solutions in Implementing LMS for Vocational Education, This discussion also highlights various specific challenges faced in implementing LMS in LKP Tegal City, such as limited access to technology, low digital literacy, and lack of training for educators. The solutions offered include providing supporting infrastructure, intensive training for educators and students, and implementing a blended learning model to overcome limited access to technology.

## CONCLUSION

The use of a Learning Management System (LMS) integrated with artificial intelligence (AI) in project-based learning at Course and Training Institutions (LKP) can improve the effectiveness of vocational learning in Indonesia. LMS not only functions as a learning management platform but is also able to provide an adaptive learning experience, where AI can adjust the material to individual needs, provide specific recommendations based on the learning progress of participants, and the system facilitates competency-based evaluations. This allows for more relevant skills development to industry needs, bridging the gap between education and the job market.

Theoretically, this study enriches the literature on project-based learning in the context of the Independent Curriculum, by highlighting how LMS can be optimized to improve the effectiveness of vocational learning. This study also provides a new perspective on the use of AI for adaptive learning, which is still rarely discussed in studies related to vocational education in Indonesia. Practically, this study provides insights for: Course and Training Institutions (LKP) in implementing LMS more effectively, by considering the challenges and solutions that have been identified. Educators, especially in vocational education, in utilizing LMS and AI to support project-based learning, provide more effective feedback, and adapt materials to learners' needs. Policy makers, in designing policies that support technology integration in vocational education, including the provision of digital infrastructure and training for educators to be better prepared to adopt LMS in the learning process.

Although this study offers new insights, several limitations, including geographical limitations, Limited access to technology, Level of readiness of educators and learners and Not yet spreading long-term impacts. Based on the limitations identified in this study, there are several recommendations that can be used as a focus in further research, Expansion of Geographic Coverage, In-depth Study of Access to Technology and Digital Infrastructure, Increasing Digital Literacy for Educators and Learners and Evaluation of the Long-Term Impact of Using LMS in Vocational Education.

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