Enhancing Digital Competence of Vocational School Teachers Through Website-Based Learning Management System (LMS)

Ana Latifah[1][✉], Noor Hudallah[2], Yeri Sutopo[2], Samsudin Anis[2]

[1]SMK Merdeka Ulujami, Indonesia
[2]Graduate School of Universitas Negeri Semarang, Indonesia

Article Info	Abstract
	The digital competence of teachers is a crucial aspect in supporting the success of technology-based learning implementation. However, at SMK Merdeka Ulujami, issues were found regarding the low use of effective digital media in the learning process, mainly due to limited training and the lack of integrated media. This study aims to develop a website-based Learning Management System (LMS) as a solution to improve the digital competence of teachers. This research is a type of R&D with the development model being ADDIE. The LMS was developed using the WordPress platform and the Tutor LMS plugin, designed to support blended learning. The research was conducted at SMK Merdeka Ulujami with a total of 20 teachers as participants. Normality testing was conducted using the Shapiro-Wilk method, which showed normal results. Data analysis used paired sample t-tests and Normalized Gain. The results showed a significant improvement in the digital competence of teachers after using the LMS, with a Normalized Gain score of 0.93 or 93%, which is categorized as effective. Observations and interviews indicated that the LMS helped teachers manage digital classrooms efficiently and in a structured manner. However, challenges remain, especially with older teachers who are less familiar with software, highlighting the need for continuous support.

[✉] Correspondence:
Jl. Desa 1, RT.01/RW.0, Dusun Dua, Ambowetan, Kec. Ulujami,
Kabupaten Pemalang, Jawa Tengah 52371, Indonesia
E-mail: analatifah916@students.unnes.ac.id

INTRODUCTION

Digital technology demands continuous adaptation from the education sector, especially in welcoming the era of Society 5.0, which places humans at the center of technology-based innovation (Handoko et al., 2024). In the educational process, teachers play a strategic role as agents of change, not only mastering teaching materials but also possessing digital competence to support a learning process relevant to the needs of the times. According to Wati & Nurhasannah (2024), digital competence of teachers includes the ability to use technology tools, manage digital information, and effectively utilize online learning platforms.

For vocational school teachers, mastering digital competence has become increasingly crucial, as they are tasked with preparing students to directly enter the workforce, which has also become digitized. Therefore, enhancing capacity of teachers in educational technology has become a priority in efforts to create innovative, collaborative, and adaptive learning (Fahrur Rahmanda et al., 2024). One of the main manifestations of this advancement is the utilization of Learning Management Systems (LMS), which are digital systems designed to design, manage, and evaluate online teaching and learning processes (Wiragunawan, 2022). LMS supports the blended learning model, which is a combination of face-to-face and online learning that is believed to improve flexibility, accessibility, and effectiveness of learning (Uswatun Khasanah et al., 2024).

In the midst of this digital transformation, the use of technologies like Learning Management Systems (LMS) has become a strategic step in supporting the continuous strengthening of digital competence of teachers. However, despite the global trend of LMS utilization in education, its implementation in vocational education in Indonesia still faces various obstacles. One example is SMK Merdeka Ulujami, which does not yet have a website-based LMS system that can integrate materials, assignments, assessments, and teacher-student interactions digitally. Based on interviews with the school principal and teachers in January 2025, it was found that learning is still conducted conventionally without adequate online platform support.

Another challenge is the low digital competence of teachers in managing technology-based learning. Teachers at this school are not accustomed to using digital tools to prepare materials, manage online classes, or conduct systematic learning evaluations. Additionally, resistance to using technology and the lack of training are also major barriers to digital transformation in the school (Picauly, 2024). Therefore, a website-based LMS has been developed that can have a significant impact on the quality of learning and the improvement of digital competence of teachers. According to Amelia & Suranto (2025), properly designed LMS can increase teacher and student engagement in the learning process. This is in line with Rahmi (2023), who stated that LMS can improve digital competence of teachers by up to 40% through integration into blended learning schemes. In the context of vocational education, the use of LMS also supports the separation between theory-based learning, which can be done online, and practical learning, which is still conducted at school (Pradnyana et al., 2024).

In addition to pedagogical benefits, LMS also provides managerial advantages. This platform enables real-time monitoring of student activities, the storage of learning records, and ease of academic reporting (Harianto, 2024). Therefore, LMS development not only becomes a technological solution but also a strategy to strengthen the management system of vocational schools learning. For this reason, this research aims to develop a website-based LMS relevant to the needs of vocational school teachers and promote the improvement of their digital competence. This research also examines the factors that hinder and support the implementation of LMS from technical, pedagogical, and managerial perspectives. The results of this study are expected to contribute significantly to supporting the Merdeka Belajar policy and become a model for other vocational schools facing similar challenges in the digital transformation of education.

METHODOLOGY

This study is a quantitative research with a Research and Development (R&D) approach, using the ADDIE model, which consists of five main stages: Analysis, Design, Development, Implementation, and Evaluation (Sugiyono, 2021). The main purpose of this research is to develop a website-based Learning Management System (LMS) that can enhance the digital competence of teachers at SMK Merdeka Ulujami.

In the Analysis stage, the researcher identifies the needs of teachers for digital learning media and the actual learning conditions in the field through surveys and interviews. The findings from this stage form the basis for the Design stage, which involves designing the structure and features of the LMS based on user needs and indicators of digital competence for teachers. The Development stage involves creating the LMS system using the WordPress platform with the Tutor LMS plugin, which is then validated by media experts and tested for usability by users.

The Implementation stage is conducted through a limited trial with 20 teachers at SMK Merdeka Ulujami. Teachers are given brief training before using the LMS in actual learning activities. The final stage, Evaluation, focuses on measuring the effectiveness of the LMS in improving digital competence for teachers.

The instruments used in this study include a digital competence questionnaire for teachers, interview guidelines, and observation sheets. The aspects measured refer to the DigCompEdu framework for digital competence of educators, such as the use of technology in teaching, management of digital resources, and learner engagement (Redecker & Punie, 2017). Before testing effectiveness, pre-test and post-test data are first tested for analysis requirements using the Shapiro-Wilk normality test. The analysis is then continued using a paired sample t-test to determine the significance of the score differences before and after the use of the LMS. Additionally, to measure the relative improvement, normalized gain (N-Gain) analysis is used. The N-Gain results will show the improvement in digital competence for teachers in percentage form, allowing for the conclusion that the website-based LMS developed is effective in enhancing digital competence for teachers.

Below are the indicators of digital competence for teachers based on the DigCompEdu Framework (Redecker & Punie, 2017).

Table 1. Indicators of Digital Competence for Teachers

No	Competence	Indicator
1	Basic Technology Use	Teachers can operate basic software supporting learning activities, such as word processors, presentation tools, and online communication applications.
2	Digital Content Creation	Teachers have the ability to create, manage, and share learning materials in digital formats, such as learning videos, interactive modules, or multimedia-based teaching materials.
3	Online Learning Management	Teachers can effectively use Learning Management System (LMS) platforms to manage online classes, including uploading materials, scheduling, and monitoring activities of students.
4	Digital-Based Assessment	Teachers can design and implement learning assessments using digital media, such as online quizzes, digital rubrics, and automated feedback systems.
5	Digital Literacy & Security	Teachers understand the principles of digital literacy, including copyright, technology ethics, and ensuring the security of student personal data and information in a digital environment..

RESULTS AND DISCUSSION

Research results

Based on the analysis results, a website-based LMS was designed to match the characteristics and needs of the school. The design includes a navigation structure, a simple interface, and key features such as teaching materials, assignments, quizzes, and virtual classes. The LMS was developed using the WordPress platform with supporting plugins and a responsive design to ensure accessibility across various devices. The system was designed to be flexible so that content can be customized by teachers according to their respective subjects. This LMS aims to support the effectiveness of digital learning and ease of use for teachers with limited ICT competencies. The design of the LMS can be seen in Figures 1 and 2.
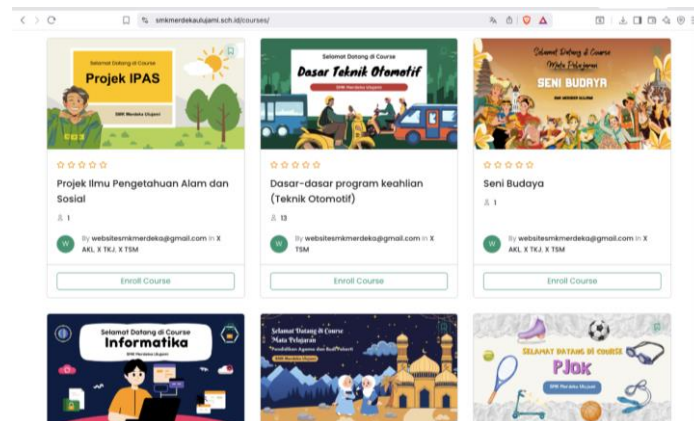

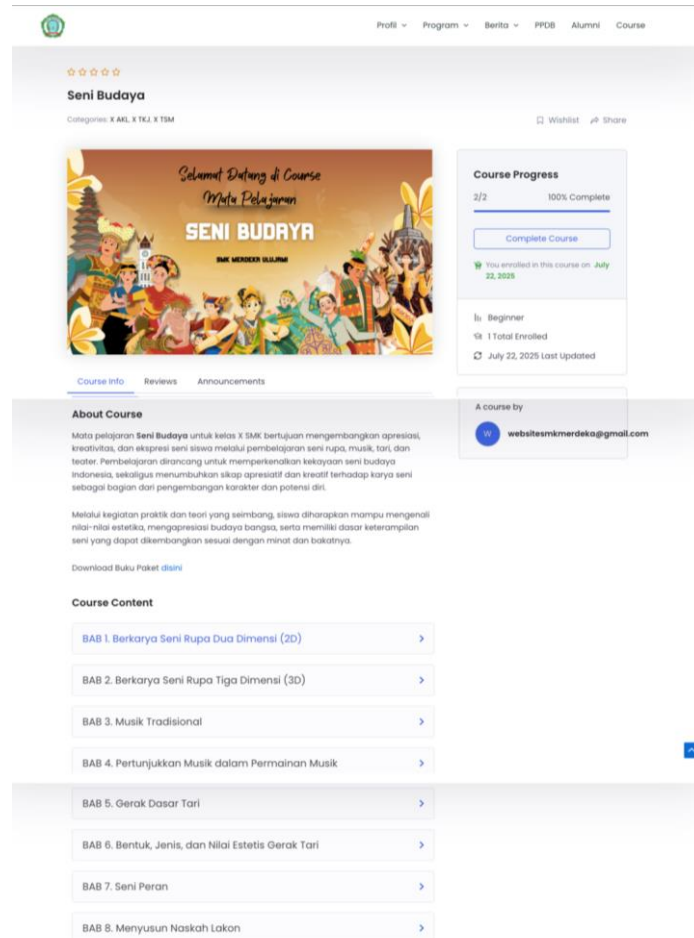**Figure 1.** LMS Material Catalog (Website-based)

Figure 2. LMS Course Display (Website-based)

The LMS platform was developed using WordPress because it is considered easy to use, flexible, and supported by online learning plugins like Tutor LMS. The development included creating simple navigation, customizing the visual design, and integrating learning features such as teaching materials, assignments, and quizzes.

The data from the implementation by teachers was then tested for analysis requirements. Normality testing was performed using the Shapiro-Wilk method, showing significance values of 0.117 for the pre-test and 0.143 for the post-test, both above 0.05.

Therefore, the data met the normality assumption and could proceed with the paired sample t-test and normalized gain tests. The results of the paired sample t-test analysis can be seen in Tables 1 and 2.

From Table 2, it can be seen that the average post-test score reached 76.30 with a standard deviation of 2.716, while the average pre-test score was only 24.10 with a standard deviation of 1.210. This shows an increase of 52.20 points after teachers used the LMS that was developed. A t-test was then performed to examine whether this difference was statistically significant. The results can be seen in Table 3.

Table 2. Paired Sample T-Test Output 1

Paired Samples Statistics		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post test	76.30	20	2.716	.607
	Pretest	24.10	20	1.210	.270

Table 3. Paired Sample T-Test Output 2

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Postest - Pretest	52.200	2.441	.546	51.058	53.342	95.640	19	.000

The significance value (Sig. 2-tailed) of 0.000 is far below the significance threshold of 0.05, meaning there is a significant difference between the pre-test and post-test scores. Therefore, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. This indicates that the use of the website-based LMS significantly improves digital competence for vocational school teachers. The calculated t-value of 95.640 shows that the difference between the two averages is very strong. Additionally, the small standard error value of 0.546 indicates that the variability among individuals is low, thus the data has high reliability. The analysis continued with the normalized gain test to determine the extent of its effectiveness. The results of the Normalized Gain analysis can be seen in Tables 4 and 5 below.

Table 4. Normalized Gain Test Results

Data SPSS Analisis Normalized Gain		
Rata-Rata	0.93	93.42
Minimal	0.82	82.46
Maksimal	1	100
Presentase	93%	
Kategori	Efektif	

The results of the normalized gain analysis show an average N-Gain value of 93.42%, which is categorized as effective. This analysis shows a significant improvement in understanding after the intervention or treatment. Based on the effectiveness category range, this result indicates that the learning intervention conducted was very effective in improving the digital competence of teachers. The statistical results of the Normalized Gain are displayed in Table 5.

Table 5. Descriptive Statistical Analysis

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Ngain_Score	20	.82	1.00	.9342	.04767
Ngain_Percent	20	82.46	100.00	93.4225	4.76743
Valid N (listwise)	20				

The results show that the majority of teachers experienced a significant increase in their scores, with a homogeneous distribution of N-Gain values. All N-Gain scores were above 0.7, indicating that the LMS developed not only improved learning outcomes but did so optimally and uniformly across all participants. Therefore, based on the N-Gain analysis, the use of the website-based LMS in teacher training for vocational schools is highly effective in improving digital competence both individually and collectively. This strengthens the previous test results that the LMS developed meets the effectiveness criteria both pedagogically and technologically.

These results provide strong evidence that the LMS developed in this study is not only feasible to use but also significantly effective in enhancing the digital skills of teachers.The significant improvement reinforces the argument that LMS can be the right training medium to support digital transformation in vocational education environments.

Discussion

The development of the website-based Learning Management System (LMS) in this study aims to enhance the digital competence of vocational school teachers through learning media that supports the blended learning model. The LMS was designed with consideration for the characteristics of users, namely teachers with varying levels of digital literacy. Key features such as class management, material uploading, assessment systems, and online attendance were developed with a simple, responsive, and easy-to-understand interface. This aligns with Wibowo (2023) statement that an effective LMS must be adaptive to user's competencies and provide an accessible and intuitive learning experience.

The effectiveness of the LMS was measured through a comparison of pre-test and post-test scores for the digital competence of teachers. The analysis using N-Gain calculations showed an average score of 93.42%, which is categorized as high. According to Hake (1998), an N-Gain value above 0.7 indicates high learning effectiveness. This effectiveness is supported by the results of observations and interviews. During the training and LMS implementation, the researcher observed increased enthusiasm and confidence from teachers in accessing and managing LMS features. Teachers started to explore the system independently, such as creating digital materials, making quizzes, and grading assignments online. Interviews with several teachers also showed that they found the LMS very helpful in organizing learning more neatly and efficiently. The LMS was also seen as relevant to current learning needs, which require mastery of information technology.

This opinion is in line with Sugiarto & Musyafa (2024), who stated that LMS not only supports online learning processes but also enhances the readiness of teachers to adapt to the digital era. Additionally, Tarumingkeng (2025) emphasized that the use of LMS in learning can foster the independence of teachers and accelerate digital transformation in educational practices. However, during the implementation process, this study also found significant challenges that still need improvement, particularly with the adaptation skills of older teachers. This group of teachers tends to face obstacles in operating the LMS software, especially in the early stages of use. Some teachers mentioned that they needed more time and practice to understand the workflow of the LMS, even for basic features such as uploading materials or creating assessments. These limitations affect the speed of technology adoption in daily learning.

This condition is supported by findings from Eti Tamsiyati et al. (2024), who stated that age is a significant factor in determining the speed at which teachers adopt digital technology in learning. Older teachers tend to resist new technologies and require a different approach to support. Therefore, a more intensive and

continuous mentoring strategy is needed for this group, such as step-by-step training, individual technical guidance, and periodic joint learning sessions. These efforts are crucial to ensure that all teachers can experience the optimal benefits of using the website-based LMS in blended learning.

Thus, while the website-based LMS has been proven effective in improving the digital competence of teachers in general, its overall implementation success still requires continuous support, especially in addressing the needs of teachers with limited digital literacy due to age or experience factors. The integration of technology in education is not only about providing media but also about empowering human resources inclusively.

CONCLUSION

This study shows that the development of a website-based Learning Management System (LMS) has proven effective in improving the digital competence of vocational school teachers. Teachers feel assisted in managing digital learning more systematically, efficiently, and according to their needs. However, the implementation of the LMS still faces challenges, especially for teachers who are older and experience difficulties in operating the software. Therefore, more intensive and continuous mentoring strategies are needed so that all teachers can optimize the use of the LMS equally. The website-based LMS developed has great potential to support digital transformation in vocational education and needs to be complemented with adaptive and inclusive training.

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