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The Interactive LMS Application Based on the Litera-Tech Model to Enhance Students' Understanding of Basic Literacy Instruction in Elementary Schools

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Abstract

LMS emerged as a response to the development of information technology and the need to simplify and improve education management. Digital technology in learning refers to using digital tools and systems that facilitate a more interactive and dynamic learning process. The development model used in this study is the ADDIE model The Undergraduate Program in Elementary School Teacher Education (PGSD), Faculty of Education, Yogyakarta State University (FIP UNY), was the subject of this research. The determination of research subjects was carried out purposively. The product trials in this study were conducted in two stages: the main trial, involving 50 trial subjects from undergraduate PGSD students at FIP UNY, and the operational field trial, also involving 100 trial subjects from undergraduate PGSD students at FIP UNY. The developed product underwent validation by subject matter experts and design experts. The obtained data were processed using descriptive percentage techniques and then converted into quantitative descriptive data.. The results of the design expert validation of nine aspects of the interface, user media, navigation, interactivity, feedback, affective considerations, robustness, invisible features, and help and support showed an average score of 3.87 within the range of 3.41 - 4.00, which, according to the assessment criteria, is included in the "Very Good" category. The results of the material validation showed an average score of 4.75 (Very Good category). The lecturer's practicality test produced an average score of 3.9 (Very Good category), indicating that this application is suitable for lecture use. The main trial with 50 students produced an average score of 3.94 (Very Good), and the field trial with 100 students recorded an average score of 3.95 (Very Good), so that the interactive LMS application based on the Litera-tech lecture model can be used to support lectures.
Keywords: Digital learning; Litera-Tech; LMS

Introduction

Digital literacy involves using technological devices and understanding how to access, evaluate, and effectively and ethically utilize information (Nasution et al., 2024). The education system is growing (Sholeha et al. 2025). However, in this digital age, the challenges in education are increasingly complex (Tinofa et al. 2024). It is defined as the ability to create and share different types of information, integrate and communicate knowledge, and understand when and how to use information technology tools to achieve specific goals (Sulianta, 2020). As Ussarn et al., (2022) stated, digital literacy is key to enhancing the skills and knowledge of students preparing to enter the workforce. One

important aspect of this model is interactive technology that enables students to engage in learning actively. A digital literacy-based instructional model must also consider the needs and challenges students face (Abiltarova et al. 2022).

Interactive technology-based learning approaches have improved students' critical thinking skills. Chan et al. found that using digital storytelling in teaching can improve students' digital literacy regardless of their initial competence in digital skills (Lin et al., 2017). The digital literacy-based learning model, named LITERA-TECH in this study, is expected to bridge the gap between everyday use of technology and its application in academic settings. Through a systematic review, García-Martínez et al., (2020) found that integrating technology into lectures can improve student learning outcomes, especially in creativity and problem-solving. The digital literacy model also emphasizes the importance of critical thinking and evaluation (Feerrar, 2019; Alexander et al., 2017; Hall et al., 2014; Sparks et al., 2016).

The virtual learning environment is a fully customized way of studying at any time (Herrador-Alcaide, Hernández-Solís, and Sanguino Galván 2019). The use of virtual learning environments in universities has advantages over trad itional face-to-face teaching in a classroom. Every student can connect from anywhere to receive online training (Borba, Chiari, and de Almeida 2018). Online learning is cooperative in nature. It requires high levels of interaction and collaboration (Ammenwerth et al. 2019; Macfadyen and Dawson 2010; Naveh, Tubin, and Pliskin 2010; Rabiman, Nurtanto, and Kholifah 2020). Modern information technology has significantly influenced the transformation of basic approaches to education, and learning management systems (LMS) have become an important tool in this process (Aljad 2023).

According to Fahrezi et al. (2024), there are problems in applied learning, including difficulties in managing learning materials, limitations in monitoring student progress in a structured manner, and concerns about time and place in the learning process. This results in less-than-optimal learning effectiveness and efficiency, as well as interactions between instructors and participants that are not well facilitated. Research conducted by Al Hadiq et al. (2025) shows that the digital literacy of PGSD students is still at a basic to moderate level, particularly in the aspect of utilising technology for pedagogical purposes. The development of science and technology indirectly requires everyone to adapt to the progress of data that occurs. Student teachers are the front guard

who will hold the key to student success. This is because student teachers are future educators who will be tasked with educating students in educational institutions. Understanding learning media is an important component in the transfer of knowledge from teachers to students (Anggraeni & Pajaga, 2023).

According to Hidayat & Khotimah (2019), using digital technology in education refers to applying digital tools and systems that facilitate more interactive and dynamic learning processes. Technology is used to solve various real-life problems and is applicable in many fields, including education, where digital literacy plays a key role in e-learning (Warsito & Djuniadi, 2016). Syarifudin et al. (2003) argue that using e-learning platforms like LMS (Learning Management Systems) significantly influences the success of digital literacy learning processes. LMS platforms based on digital literacy also play an essential role in ensuring the smoothness and effectiveness of teaching and learning for teachers and students (Kaeophanuek et al., 2018). Koc (2024) states that LMS offers flexibility in learning modes to accommodate different learning speeds, preferences, and styles, resulting in a more personalized and practical learning experience for prospective teachers (Lyashenko and Frolova 2014). Moreover, LMS can enhance the learning experience by providing a structured environment that facilitates student engagement and collaboration (Fredin et al., 2023; Chauhan et al., 2025).

LMS is an application that electronically automates and virtualizes the teaching and learning process (Zulviana et al., 2025). It serves several essential functions in learning and training activities, including centralizing and automating administration, offering self-guided services and usage instructions, and systematically organizing and delivering learning content. Additionally, LMS supports flexibility, improved standardization, and the management and reuse of learning content (Ellis, 2012). LMS have become essential platforms for managing, delivering, and evaluating educational processes (budi dan Rodgers, 2024). LMS Moodle, as a high-level, strategic planning solution, allows you to manage all training activities, including e-learning, virtual classrooms and online courses. LMS systems develop assignments, assign them to individual students or groups, and monitor the progress and growth of students in all types of training activities (Kerimbayev et al. 2020). Media can also be a bridge or key to transferring the teacher's concept of certain material to student understanding (Makarim and Haimima 2025).

Research by Omonayajo et al. (2022) shows that using interactive technology in education can help overcome various challenges, such as a lack of student motivation and engagement in learning. Therefore, it is crucial to design curricula integrating technology and providing the necessary support to facilitate effective learning. Interactive technology enhances students' critical thinking skills. As Chan et al. show, digital storytelling in instruction improves students' digital literacy regardless of their initial digital competence (Lin et al., 2017). This approach not only aids students in understanding the subject matter but also encourages them to think critically and creatively in using technology to solve problems.

Interactive LMS can create a more engaging and contextual learning environment while simultaneously preparing students in the Elementary School Teacher Education Program (PGSD) to meet the demands of 21st-century education. Research conducted by Al Hadiq et al. (2025) developed a smart classroom through the SAMR model to enhance the digital literacy of prospective elementary school teachers. The findings indicated that the implementation of the SAMR model provided a significantly greater improvement in students' digital literacy compared to conventional learning methods. Furthermore, a study by Note et al. (2025) on the use of Learning Management Systems (LMS) for the competence of Teacher Professional Education (PPG) students at the Faculty of Teacher Training and Education, University of Mataram, highlighted the importance of strengthening the sense of professional calling and utilizing instructional technology to produce prospective teachers who are not only academically superior.

However, despite these advancements, no research to date has explicitly developed an interactive LMS based on the LITERA-TECH model, specifically designed for PGSD students to enhance their digital literacy. A lecture model based on digital literacy that utilizes interactive technology can offer a more immersive learning experience. With the right approach, students will not only improve their technical digital skills but also their critical thinking and collaborative abilities, which are essential in the ever-evolving world of education. Therefore, this study aims to develop interactive learning media based on an LMS using the LITERA-TECH model, which has the potential to enhance the digital literacy skills of PGSD students significantly.

Methods

The type of research conducted is research and development (R&D). Development research in the field of education aims to produce educational products and services that enhance learning outcomes and improve educational experiences. This research led to the development of a new product, an LMS based on the LITERA-TECH lecture model. The development model used in this study is the ADDIE model, which consists of the stages of analysis, design, development, implementation, and evaluation. ADDIE is a coherent and systematic framework for organizing design and development research activities.

The Undergraduate Program in Elementary School Teacher Education (PGSD), Faculty of Education, Yogyakarta State University (FIP UNY), was the subject of this research. The determination of research subjects was carried out purposively. The product trials in this study were conducted in two stages: the main trial, involving 50 trial subjects from undergraduate PGSD students at FIP UNY, and the operational field trial, also involving 100 trial subjects from undergraduate PGSD students at FIP UNY. The developed product underwent validation by subject matter experts and design experts. The obtained data were processed using descriptive percentage techniques and then converted into quantitative descriptive data. The trial results, which were validated through several testing stages, served as the basis for evaluating and refining the product until the final version was produced. After the final product was developed, the next step was to disseminate the product to all PGSD lecturers at FIP UNY.

The instrument used was a closed questionnaire. These steps were employed to determine the quality criteria of the developed product, with the following provisions:

Table 1.
The quality criteria of the developed product

Character	Information
Very Good	5 (100% in agreement with the statement)
Good	4 (80% in agreement with the statement)
Sufficient	3 (60% in agreement with the statement)
Poor	2 (40% in agreement with the statement)
Very Poor	1 (20% in agreement with the statement)

Source: Personal Document

The measurement scale used was a 1–5 Likert scale. Descriptive statistics were used to describe the research object through sample data and to analyze the obtained data as criterion scores using a Likert scale. The instrument used in the product trial was a

response questionnaire regarding the feasibility of the developed learning resources. According to Sukardjo (2012), for quantitative data, the average is calculated first and then converted into a qualitative value on a 4-point scale using a Likert scale..

Result

The development of learning tools based on a Learning Management System (LMS) using the Litera-Tech lecture model was carried out by following the ADDIE development model, which includes five main stages: Analysis, Design, Development, Implementation, and Evaluation. The steps in the ADDIE model are described as follows:
First, Analysis Stage

In the needs analysis stage, information was collected through questionnaires, interviews, and document analysis to obtain initial data regarding the needs of Elementary School Teacher Education Study Program students at the Faculty of Education, Universitas Negeri Yogyakarta concerning the learning model.

The findings revealed diversity in the use of digital tools among 219 Elementary School Teacher Education Study Program students. This diversity includes the use of digital tools to build networks and communication, as well as mapping their utilization patterns. The breakdown of digital platform usage among prospective elementary school teachers is as follows: WhatsApp 99.5%, Instagram 93.2%, TikTok 77.2%, Telegram 34.2%, LINE 5.5%, Twitter 33.8%, Facebook 14.2%, and Other applications: 15.5%

These digital tools are primarily used by students to facilitate access to diverse learning resources and to broaden their understanding of course materials. Students with broader and more diverse digital networks tend to have better access to information, job opportunities, and educational resources. They are also more likely to engage in academic discussions and research collaborations, enriching their learning experience. Regarding didactic strategies, most students use Zoom for formal learning activities, YouTube for hands-on (learning-by-doing) and informal (discovery) learning, and Canva for collaborative learning or discourse activities. These findings indicate that Elementary School Teacher Education Study Program students have already utilized digital tools to support their learning processes.

Therefore, the Litera-Tech lecture model developed in this study is designed to support the development of digital literacy competencies among future elementary school teachers by integrating interactive technology within the LMS platform BeSmart.

Second, Design Stage

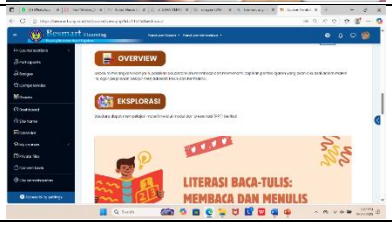
At the design stage, instructional media development begins with creating a media flowchart to illustrate the structure and navigation of the interactive learning process. The uniqueness of the media flowchart lies in its navigation structure, which is specifically mapped to cover the six fundamental literacies in elementary education: linguistic (reading and writing), numeracy, scientific, digital, financial, and cultural and civic literacy. Unlike generic Learning Management Systems (LMS), this navigation ensures a systematic transition for students, moving from theoretical concept mastery toward practical integration in learning scenarios.

Furthermore, the storyboard is designed to create a visual interface, with the primary distinction being the "Integrated Literacy Dashboard" feature. This dashboard visualizes the learning trajectory from theoretical studies to field observations in schools and innovative project planning. The layout is intentionally designed to facilitate diverse learning experiences, such as digital portfolio management and virtual simulation spaces.

The prototype digitalizes the entire course assessment framework, encompassing engagement tracking, presentation modules, simulation practice feedback loops, and more, within a single interactive environment. It aims to equip students with the concepts and principles of basic literacy in elementary schools. Throughout this course, students are empowered to integrate their understanding into actual classroom instruction. Given the theoretical and practical nature of the course, it provides comprehensive learning experiences, including presentations, discussions, school-based observations, and projects to develop innovative literacy programs. The assessment within this LMS environment encompasses active participation, presentations, portfolios, simulation practices, projects, as well as mid-term and final examinations.

Subsequently, a digital literacy-based learning model prototype is created, which integrates interactive technology into the lecture process for Elementary School Teacher Education Study Program students at UNY. This design is the foundation for building an LMS environment that facilitates active engagement, independent learning, collaboration, and enhances students' digital literacy skills.

Table 2.
Deign media LMS

Media components	Picture	Information
Home page		This component is the home page of the LMS.
Login Area		The login area is a component of e-learning that allows students to access e-learning facilities.
Course description		This component allows lecturers to add specific types of activities according to learning needs.

Source: Personal Documents

Third, Development Stage

The Development stage was carried out to validate the interactive LMS application based on the Litera-Tech lecture model. This validation involved two expert reviewers: a subject matter expert and a design expert.

Table 3.
Expert Input Suggestion

Suggestion	Follow up
This course material discusses basic literacy learning and literacy learning strategies in elementary schools. However, it does not sufficiently link to the stages of reading and writing development in elementary school children, and is not explicitly explained.	For example, stages of emergent literacy, early reading, and reading to learn have been added (Chall, 1983).
There needs to be variety in both assignments and projects for students.There needs to be variety in both assignments and projects for students.	There has been a variety of practice activities and assignments for students.

Source: Personal Documents

The course content has been validated and several suggestions for substantial improvement have been made. Based on the evaluation results, an average score of 4.75 was obtained. This score falls within the range of 4.21 to 5.00, which, according to the data conversion criteria, places the product in the "Excellent" category. Therefore, the

product developed is of high quality and appropriate for use, based on the expert review of the content.

Design validation was conducted and evaluated the product using nine assessment aspects: interface, media user, navigation, interactivity, feedback, affective considerations, robustness, invisible features, and help and support. The average score obtained was 3.87, which lies within the 3.41–4.00 range and is categorized as "Excellent" according to the assessment criteria. This indicates that the developed product has met the eligibility criteria in terms of instructional design, content, and user interface. Thus, it can be concluded that the interactive LMS application based on the Litera-Tech model is highly suitable as an interactive learning medium.

Fourth, Implementation and Evaluation Stage

The practicality testing of the interactive LMS application based on the Litera-Tech model was conducted involving Elementary School Teacher Education Study Program students and lecturers teaching the Basic Literacy Learning course in the Undergraduate Elementary School Teacher Education Study Program.

This testing aimed to assess the responses from students and lecturers who had used the LMS in actual learning scenarios. Furthermore, this stage aimed to ensure that no significant deficiencies remained in the application, which had previously been validated by experts and was deemed ready for instructional use.

Feedback was collected from practitioners, which included suggestions and comments from both lecturers and students. Lecturers emphasized the importance of the Litera-Tech model in enhancing digital literacy and promoting peer interaction, which simulates the atmosphere of face-to-face classroom learning within an LMS environment. Moreover, online learning requires skills and knowledge in using digital tools, access to the necessary technology, and a stable internet connection (Mulenga & Marbán, 2020).

Based on the data analysis, the total score from two lecturers teaching the course was 117 out of a maximum of 120. This results in an average score of 58.5 out of 60, or 3.9 on a four-point scale, which falls within the 3.41–4.00 range and is categorized as "Very Good" (Strongly Agree). Therefore, the developed product is considered very good and practically applicable for lectures, particularly for pre-service elementary school teachers.

The main tryout was conducted with 50 undergraduate Elementary School Teacher Education Study Program students at FIP UNY. The results showed an average score of 59.1, equivalent to 3.94 on a four-point scale, which is categorized as "Excellent".

However, suggestions for improvement were given regarding some features of the LMS. During implementation, instructions and the user interface were sometimes confusing. Thus, it is necessary to refine the application to make it more user-friendly by providing explicit guidance, simple usage examples, and visual aids to support navigation and understanding. Further testing was conducted with 100 Elementary School Teacher Education Study Program undergraduate students at FIP UNY. The results showed an average score of 59.27 or 3.95 on a four-point scale, which also falls into the "Excellent" category. Recommendations from this stage included: Adding more interactive media, such as online quizzes, simulations, or digital discussion forums, and providing training and mentoring for students to improve their critical, ethical, and creative digital literacy, rather than just being passive users, including illustrations or short case studies to help students better connect theoretical content with practical application in schools or fieldwork. The interactive LMS based on the LITERA-TECH model was developed, and a practicality test was conducted to gather students' responses. The results showed that the interactive LMS based on the LITERA-TECH model can improve students' understanding of basic literacy learning material content in elementary school..

Discussion

Digital transformation has been one of the most significant phenomena in the last decade, making a huge impact in various sectors, including the education sector (Qurtubi 2024). Therefore, innovation in instructional tools becomes crucial in education and relevant (Wahyuni, Suriadi, and Miaz n.d.). E-learning is an innovation that can be effectively utilized in the learning process, not only for delivering content but also for enhancing various student competencies (Tobing & Pranowo, 2020). A Learning Management System (LMS) is a pivotal platform that integrates educational courses' management, delivery, and tracking, fostering a structured and efficient learning environment for students (Oktarin et al., 2023). Its adoption underscores the flexibility it offers, enabling learners to access resources anytime and anywhere—an essential feature during the shift from traditional to online learning ("Enhancing eLearning System through

Learning Management System (LMS) Technologies: Reshape the Learner Experience," (winarno, 2024). LMS is an effective tool that provides features that support learning activities, such as assignments, quizzes, discussion forums (chats), collaboration tools, and the ability to upload learning materials in various formats (Word documents, PowerPoint presentations, animations, audio, and video). These features enable students to engage in inquiry-based learning, including observing, gathering information, conducting experiments, and practicing problem-solving through available links.

the Learning Management System (LMS) is software designed to enhance and support teaching processes across various settings, particularly in online education. An LMS serves as a digital platform that enables educators and trainers to create, organize, and deliver educational content more efficiently. It includes features such as assignment submission, discussion forums, and interactive video presentations, thereby improving user experience and learner satisfaction (Darmawan and Meisyani 2025). If you use an LMS, learning materials will be more interesting and interactive and can be accessed without time and place restrictions (Rahman and Adawiyah 2025). Integrating technology into education also allows for the creation of a more interactive and collaborative learning environment (Laksana et al. 2024).

Irwansyah et al. (2023) found that using Moodle-based e-learning positively influenced the improvement of digital literacy among Biology Education students at STKIP Bima, with results categorized as excellent, good, and sufficient. This aligns with findings by Mahabu et al. (2025), who showed that LMS usage facilitates access to learning materials, provides flexibility in learning time, enhances two-way communication, and offers systematic evaluation tools. Moreover, personalization features in LMS allow students to learn at their own pace and according to their own learning styles. the LMS is set up to provide an educational workflow that can be used for different environments including in-person, online (both synchronous and asynchronous environments), and hybrid courses (Lang 2023).

That LMSs contribute significantly to developing independent learning by strengthening students' planning, self-control, and reflection skills. Furthermore, LMSs have been proven to improve learning outcomes, including conceptual mastery, academic engagement, and critical thinking skills, when combined with interactive learning models

such as blended learning, project-based learning, and self-directed learning (Haikal, Azahra, and Awalia 2025).

According Asrida, Amanda, and Fadilah (2024)Some students feel that the use of LMS helps the learning process when offline learning is not possible. Learning Management Systems (LMS) have become vital tools in modern education, transforming traditional learning environments into interactive digital spaces. In Indonesia, platforms like Moodle, Google Classroom, and Schoology are widely used at all educational levels, providing flexible access to resources, assignments, and interactive tools. This review aims to motivate students to use LMS in the student learning process, as technology is widely used by society today. It can be concluded that the use of LMS for the learning process has significant potential to improve language teaching and learning. By addressing the identified limitations and implementing a balanced approach, educators can harness the power of LMS to create engaging and effective learning environments that promote student success. LMS platforms, with their flexible learning resources, self-paced modules, and interactive assessment tools, have the potential to bridge this gap by empowering students to take charge of their learning experiences (Chen and Razak 2024).

Literacy encompasses the skills to read, write, and comprehend texts, which are fundamental in education. It also includes using language effectively for communication, critical thinking, and understanding written information in various contexts. Literacy is not merely about decoding text, but about comprehending meaning, allowing individuals to apply what they have read to solve problems, understand information, and broaden their perspectives (Lahagu et al., 2024).

This indicates that interactive technology benefits students and educators in enhancing their teaching methods. Therefore, training and developing technological skills among teachers is crucial to maximizing the potential of digital tools in education. Furthermore, Bibi et al. (2023) emphasize that technological developments require educators to design learning experiences that are more active and engaging, especially since students tend to prefer interactive and participatory learning methods.

Most of the existing LMSs are still generic and have not addressed the specific pedagogical needs of PGSD students in teaching early reading and writing skills. Therefore, there is an urgent need to develop innovations in the form of an interactive LMS based on the LITERA-TECH model. The interactive LMS based on the LITERA-

TECH model was developed, and a practicality test was conducted to gather students' responses. The results showed that the interactive LMS based on the LITERA-TECH model can improve students' understanding of basic literacy learning material content in elementary school.

Conclusion

The development model used in this study is the ADDIE model. The results of the design expert validation of nine aspects of the interface, user media, navigation, interactivity, feedback, affective considerations, robustness, invisible features, and help and support showed an average score of 3.87 in the range of 3.41 - 4.00, which, according to the assessment criteria, is included in the "Very Good" category. The results of the material validation showed an average score of 4.75 (Very Good category). The lecturer's practicality test produced an average score of 3.9 (Very Good category), indicating that this application is suitable for lecture use. The main trial with 50 students produced an average score of 3.94 (Very Good), and the field trial with 100 students recorded an average score of 3.95 (Very Good). So the interactive LMS application based on the Litera-tech lecture model can support lectures.

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The authors declare that there is no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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References

Abiltarova, E., L. Lisina, Y. Zhuravel, L. Neizhpapa, and Y. Mengyi. 2022. "Interactive Student Learning Technologies in Higher Education." Journal of Curriculum and Teaching 11(9):107.

Alexander, B., Adams Becker, S., Cummins, M. and Hall Giesinger, C. (2017), Digital Literacy in Higher Education, Part II: An NMC Horizon Project Strategic Brief, No. 3.4, The New Media Consortium, Austin, TX, https://library.educause.edu/resources/2017/8/digital-literacy-in-higher-education-part-ii-an-nmc-horizon-project-strategic-brief

Aljad, R. R. (2023). Analysis of development trends and experience of using lms in modern education: An overview. *E-Learning Innovations Journal*, *1*(2), 86–104.

Ammenwerth, E., Hackl, W. O., Hoerbst, A., & Felderer, M. (2019). Indicators for cooperative, online-based learning and their role in quality management of online learning. In *Student-Centered Virtual Learning Environments in Higher Education* (pp. 1–20). IGI Global Scientific Publishing.

Asrida, Yulischa Nur, Fathira Amanda, and Jenisa Ul Fadilah. 2024. "Effectiveness and Limitations on Learning Management Systems (LMS) in Learning and Teaching: A Systematic Review." *ICOERESS* 1(1):141–52.

Borba, M. C., Chiari, A. S. de S., & de Almeida, H. R. F. L. (2018). Interactions in virtual learning environments: new roles for digital technology. *Educational Studies in Mathematics*, *98*(3), 269–286. https://doi.org/10.1007/s10649-018-9812-9

Chan, S., & Chan, K. (2017). Digital Literacy Learning In Higher Education Through Digital Storytelling Approach. Journal of International Education Research, 13(1), 1-10. doi:10.19030/jier.v13i1.9907

Chauhan, T., Visnu, S., & Kumar, S. (2025). Bridging the Digital Divide: A Review on Digital Literacy, E-Learning, and LMS Solutions for Rural Communities.

Darmawan, I. Putu Ayub, and Leiria Meisyani. 2025. "A Decade of Learning Management System Research: A Bibliometric Analysis (2014–2023)." *Indonesian Journal of Instructional Media and Model* 7(1):1–17.

Feerrar, J. (2019). Development of a framework for digital literacy. Reference Services Review, 47(2), 91-105.

Fredin, A., & Ndiaye, M. (2023). Using an Online Learning Tool to Increase Digital Literacy in Rural Areas of Mozambique: A Minor Field Study.

García-Martínez, José-Antonio, Francisco-César Rosa-Napal, Isabel Romero-Tabeayo, Sara López-Calvo, and Eduardo-José Fuentes-Abeledo. 2020. "Digital Tools and Personal Learning Environments: An Analysis in Higher Education." *Sustainability* 12(19):8180. doi:10.3390/su12198180.

Hall, R., Atkins, L. and Fraser, J. (2014), "Defining a self-evaluation digital literacy framework for secondary educators: the DigiLit leicester project", Research in Learning Technology, Vol. 22, available at: https://doi.org/10.3402/rlt.v22.21440

Haikal, Ahmad, Najwa Azahra, and Ananda Ayu Awalia. 2025. "Kajian Literatur: Efektivitas Learning Management System (LMS) Dalam Meningkatkan Kemandirian Dan Hasil Belajar Siswa Di Era Digital." *Paedagogie* 20(2):343–52.

Herrador-Alcaide, Teresa C., Montserrat Hernández-Solís, and Ramon Sanguino Galván. 2019. "Feelings of Satisfaction in Mature Students of Financial Accounting in a Virtual Learning Environment: An Experience of Measurement in Higher Education." *International Journal of Educational Technology in Higher Education* 16(1):20. doi:10.1186/s41239-019-0148-z.

Hidayat, N., & Khotimah, H. (2019). Pemanfaatan Teknologi Digital Dalam Kegiatan Pembelajaran. JPPGuseda | Jurnal Pendidikan & Pengajaran Guru Sekolah Dasar, 2(1), 10–15. https://doi.org/10.33751/jppguseda.v2i1.988

Irwansyah, M., Jayanti, M. I., & Perkasa, M. (2023). Pengaruh E-Learning Moodle Terhadap Kemampuan Literasi Digital Mahasiswa STKIP Bima. Jurnal Biogenerasi, 8(2), 446-451.

Kaeophanuek, S., Jaitip, N. S., & Nilsook, P. (2018). How to enhance digital literacy skills among information sciences students. International Journal of Information and Education Technology, 8(4), 292–297. https://doi.org/10.18178/ijiet.2018.8.4.1050

Kerimbayev, N., Nurym, N., Akramova, A., & Abdykarimova, S. (2020). Virtual educational environment: interactive communication using LMS Moodle. *Education and Information Technologies*, *25*(3), 1965–1982.

Koc, E. M. (2024). LMS-supported HyFlex clinical supervision model: Illuminating perspectives from teacher candidates in the department of English language teaching. Heliyon, 10(8).

Lahagu, D. K., & Lahagu, T. S. (2024). Pemanfaatan Teknologi Digital Dalam Meningkatkan Literasi Mahasiswa. Jurnal Ilmu Ekonomi, Pendidikan dan Teknik, 1(3), 108-113.

Laksana, Sigit Dwi, Anip Dwi Saputro, Ayok Ariyanto, and Dirga Ayu Lestari. 2024. "Development of Learning Media Gamification Based on Gamimath Android in Mathematics Learning for Elementary School." *Al-Bidayah: Jurnal Pendidikan Dasar Islam* 16(2):329–48.

Lang, Susan. 2023. "Learning Management Systems (Lmss)." Pp. 173–82 in *Digital Writing Technologies in Higher Education: Theory, Research, and Practice*. Springer.

Lin, M. H., Chen, H. C., & Liu, K. S. (2017). A study of the effects of digital learning on learning motivation and learning outcome. Eurasia Journal of Mathematics, Science and Technology Education, 13(7), 3553–3564. https://doi.org/10.12973/eurasia.2017.00744a

Lyashenko, M. S., & Frolova, N. H. (2014). LMS projects: A platform for intergenerational e-learning collaboration. *Education and Information Technologies*, *19*(3), 495–513.

Macfadyen, L. P., & Dawson, S. (2010). Mining LMS data to develop an "early warning system" for educators: A proof of concept. *Computers & Education*, *54*(2), 588–599

Mahabu, F. F., Subhan, M., Pramadita, O. I., Fahriza, A., & Ekabudi, A. (2025). Pemanfaatan Learning Management System (LMS) Untuk Meningkatkan Efektifitas Pembelajaran. Jurnal Teknologi Pendidikan Dan Pembelajaran| E-ISSN: 3026-6629, 3(1), 27-34.

Makarim, Muhammad Fikruzzaman, and Deana Indah Haimima. 2025. "Development of Learning Media Flash Card Combinations in English Lessons Grade IV MI Al-Huda Karangnongko Sleman." *Al-Bidayah: Jurnal Pendidikan Dasar Islam* 17(1):1–22.

Nasution, S. M., Latuconsina, R., Septiawan, R. R., & Ruriawan, M. F. (2024). Peningkatan Literasi Digital di SD Binekas melalui Pendampingan Penggunaan LMS. In The Proceeding of Community Service and Engagement (COSECANT) Seminar (Vol. 4, No. 2).

Naveh, Gali, Dorit Tubin, and Nava Pliskin. 2010. "Student LMS Use and Satisfaction in Academic Institutions: The Organizational Perspective." *The Internet and Higher Education* 13(3):127–33

Qurtubi, Ahmad. 2024. "Transforming Education Management in the Digital Age: Strategic Innovation to Improve Education Quality and Efficiency." *Journal of Pedagogi* 1(6):156–66.

Rabiman, R., Nurtanto, M., & Kholifah, N. (2020). Design and Development E-Learning System by Learning Management System (LMS) in Vocational Education. *Online Submission*, *9*(1), 1059–1063.

Rahman, Arif, and Arabiatul Adawiyah. 2025. "Digitalization of School Academic Processes by Implementing a Learning Management System (LMS)." Pp. 502–9 in *8th FIRST 2024 International Conference on Global Innovations (FIRST-ESCSI 2024)*. Atlantis Press.

Setiawan, B., & Rodgers, A. (2024). Determinants Affecting Students' Satisfaction In The Use of Learning Management Systems on Instructional Content, Interaction, and Accessibility. International Journal of Pedagogy and Teacher Education, 8(2), 128-141.

Sholeha, Herisa Hardiyanti, Zakiyah Ismuwardani, Mochamad Guntur, Anasya Putri Febigyo, and Nonih Nur Syah Lukiyah. 2025. "Development of Augmented Reality-Based Game-Based Learning Integrated with Character Values to Improve Literacy and Problem-Solving Skills of Elementary School Students." *Al-Bidayah: Jurnal Pendidikan Dasar Islam* 17(1):39–64

Sparks, J., Katz, I. and Beile, P. (2016), "Assessing digital information literacy in higher education: a review of existing frameworks and assessments with recommendations for next-generation assessment", ETS Research Report Series, Vol. 2016 No. 2, pp. 1-33

Sulianta, F. (2020). Literasi digital, riset dan perkembangannya dalam perspektif social studies. Feri Sulianta.

Syarifuddin, S., Majid, A., & Hasyim, I. (2023). Studi Literasi Digital Melalui Pembelajaran Bahasa Pada LMS Kalam UMI. Jurnal Edukasi, 10(1), 19-32.

Tinofa, Nelva Ade, Ani Khoirotun Nisa, Faisal Abdullah, and Ts Saiful Nazri bin Nordin. 2024. "THE IMPLEMENTATION DIGITAL-BASED BASIC EDUCATION OF PANCASILA STUDENT PROFILE PROGRAM: AN EFFORT TO STRENGTHEN STUDENTS'CRITICAL AND CREATIVE THINKING." *Al-Bidayah: Jurnal Pendidikan Dasar Islam* 16(1):1–18.

Tria Zulviana et al., Optimalisasi Penggunaan Learning Management System (LMS) dalam Meningkatkan Mutu Pembelajaran, ed. Maulidia Rahmi, Direktorat Sekolah Menengah Atas (Jakarta Selatan: Direktorat Sekolah Menegah Atas, 2021): 8

Tobing, L. W., & Pranowo, D.D. (2020). Blended Learning in French Intermediate Grammar Learning: is it effective? Jurnal Cakrawala Pendidikan,39(3),652.

Ussarn, Anyamanee, Paitoon Pimdee, and Thiyaporn Kantathanawat. 2022. "Needs Assessment to Promote the Digital Literacy among Students in Thai Community Colleges." *International Journal of Evaluation and Research in Education (IJERE)* 11(3):1278. doi:10.11591/ijere.v11i3.23218

Warsito, M. B., & Djuniadi. (2016). Pengembangan e-learning berbasis Schoology pada mata pelajaran matematika kelas VII. Jurnal Pendidikan Matematika FKIP Unissula, 4(1). https://doi.org/10.24127/ajpm.v9i4.3137.

Winarno, H. R., & Legowo, N. (2024). Analysis of success factor of the e-learning system using Delone and Mclean models. International Journal of Pedagogy and Teacher Education, 8(2), 142-158.

Wahyuni, Yulia Septi, Hari Suriadi, and Yalvema Miaz. n.d. "Development of Student Worksheets Based on Project Based Learning on the Material'Indonesia Kaya Budaya'for Class IV SDIT Tiara Islamic School Pekanbaru." *Al-Bidayah: Jurnal Pendidikan Dasar Islam* 17(1):111–36.