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Development of an AI-Assisted Moodle Content Organization Training E-Module for Elementary School Teachers: An Analysis of Feasibility and Practicality

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Abstract. This study aims to analyze the feasibility of the AI-Assisted Moodle Content Organization Training E-Module for Elementary School Teachers based on evaluations by subject matter experts and media experts, as well as to analyze elementary school teachers' practical responses to the use of the developed e-module. This Research and Development (R&D) study applied the ADDIE instructional design model (Analyze, Design, Develop, Implement, Evaluate). The research subjects consisted of one instructional content expert, one instructional media expert, and 16 teachers from SDN 1 Maguan and SDN 2 Maguan in a limited field trial. Data were collected using validation sheets and a user response questionnaire on a 1–5 Likert scale that was found to be reliable (α = 0.909), supplemented with open-ended items to gather qualitative feedback. Validation results showed a feasibility percentage of 92.31% from the content expert (Very Valid) and 96.67% from the media expert (Very Valid). The user response evaluation by elementary school teachers yielded an average score of M = 4.43 (SD = 0.631) with a percentage of 88.50% (Very Practical). Qualitative findings indicate that the structured AI prompting guidelines in the e-module make it easier for teachers to independently design child-friendly visual layouts in Moodle. Based on the expert evaluation results and user perceptions, this e-module has been proven to be highly feasible and practical for use as supplementary instructional material for training or as a self-paced learning guide for elementary school teachers.
Keywords. E-Training Modules, Moodle, Artificial Intelligence, Elementary School Teachers, the ADDIE Model.

INTRODUCTION

Digital transformation in the education ecosystem is a key foundation for accelerating progress toward the Sustainable Development Goals (SDGs), particularly SDG 4 on quality education. Enhancing teachers' information and communication technology (ICT) capacity directly supports the achievement of Target 4.c and Target 4.4 within the global framework (Méndez et al., 2022). Teachers who are proficient in ICT make a tangible contribution to providing learning experiences that are inclusive, adaptive, and relevant to the times. These efforts to strengthen digital literacy serve as a

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strategic means of fostering national awareness and student readiness starting in elementary school (Salsabila et al., 2024). Therefore, the commitment to improving teachers' digital competencies must be realized on an ongoing basis through innovative and structured training programs.

Although ICT integration is vital, the reality on the ground often reveals a significant gap between the availability of digital infrastructure and teachers' pedagogical capacity. Based on the results of an initial needs analysis conducted through surveys at SDN 1 Maguan and SDN 2 Maguan, the schools are actually equipped with internet access and Interactive Flat Panels (IFPs), and this is complemented by students' ownership of smartphones. However, the utilization of this technology has not been optimal due to the low digital literacy of the majority of teachers, with only 2 out of 18 teachers (11.11%) possessing the proficiency to operate interactive learning software. This empirical finding aligns with the national picture reported by Syahid et al. (2022), in which the majority of elementary school teachers remain at a basic level of ICT proficiency (limited to office applications and social media communication), and 44% of them face significant challenges in developing interactive media and digital assessments. This gap indicates that the availability of adequate physical resources does not automatically correlate with the effectiveness of digital learning if it is not balanced by improvements in educators' competencies (Rohmanurmeta et al., 2024).

On the other hand, the widespread use of digital devices among elementary school students calls for the management of digital learning content that is structured and educationally valuable. Most elementary school students primarily use digital devices for entertainment rather than academic activities (Hasan & Bejiman, 2025). If device use is not guided through appropriately designed learning materials, the potential of technology to support the learning process will be wasted (Resti et al., 2024). Theoretically, elementary school students (ages 7–12) are in the concrete operational stage of development, which requires concrete visual representations, systematic classification, and structured presentation of material (Piaget & Inhelder, 1969). Based on the Cognitive Theory of Multimedia Learning (CTML), the presentation of digital content for children of this age must minimize extraneous cognitive load through the harmonious integration of text and illustrations so that students' limited working memory capacity can be focused on generative processing (Mayer, 2014; Sweller, 2011). From a teacher's perspective, this requirement calls for mastery of Technological Pedagogical Content Knowledge (TPACK)—that is, the ability to integrate digital technology into elementary school thematic content through pedagogical strategies aligned with children's cognitive characteristics (Mishra & Koehler, 2006).

As a proactive measure to address these challenges, SDN 1 Maguan and SDN 2 Maguan have established a strategic plan to implement integrated online learning over the next 2–3 years. Previous experience with the Google Classroom platform has revealed fundamental limitations. Although Google Classroom excels in initial ease of use and a minimalist interface for beginners (Setiawan et al., 2020), the platform is considered limited because it tends to function primarily as a tool for managing administrative documents and a static assignment repository, lacking deep pedagogical customization flexibility (Santiadi et al., 2024). In contrast, the Moodle Learning Management System (LMS) has proven to be significantly more effective in facilitating pedagogical needs, such

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as personalizing learning paths, tracking competencies, creating adaptive interactive quizzes, and enhancing student engagement (Gamage et al., 2022; Nafidi & El-Batri, 2023). Moodle enables the modular and integrated organization of elementary school curriculum materials (Budhayanti, 2023). However, implementing Moodle presents a steep technical learning curve and layout complexities that may burden teachers with only basic ICT skills (Hadhiatma et al., 2024; Setiawan et al., 2020). In the context of the pilot study at SDN 1 and SDN 2 Maguan, the Moodle infrastructure was operated via a guided cloud server set up by the development team to facilitate the simulation without the hurdles of local installation; however, this still required adaptive training support materials to foster teacher autonomy.

The integration of artificial intelligence (AI) technology into LMS management is a cutting-edge solution for overcoming teachers' technical limitations. The use of generative AI in e-learning can efficiently provide adaptive support and personalized content (Hardaker & Glenn, 2025). Generative AI has been shown to reduce teachers' workload in developing instructional materials, creating assessment tools, and quickly organizing the sequence of content (Halkiopoulos & Gkintoni, 2024; Shilowaras & Jusoh, 2022). On a practical level, AI assistants function as "thinking partners" that stimulate teachers' pedagogical reflection when designing digital classroom scenarios (Yawan et al., 2025).

Although research on Moodle and AI in education has grown rapidly, an analysis of the current literature reveals a significant research gap. A systematic review by Gamage et al. (2022) found that more than 75% of Moodle-related research is concentrated in higher education in the fields of science and engineering, while empirical research on the adoption of Moodle at the elementary school level remains very limited. Studies on the integration of AI into Moodle, such as those by Shilowaras & Jusoh (2022), are still limited to the development of administrative chatbots to answer students' academic questions at the university level. Meanwhile, the study by Yawan et al. (2025) explores secondary school teachers' perceptions of the ChatGPT API within an English-language LMS. In the realm of teacher training, the study by Rajab et al. (2026) examined self-paced Moodle learning using the ADDIE model; however, it focused on enhancing high school teachers' DigCompEdu competency levels through the curation of open-source (Creative Commons) materials and the general use of Canva. Most teacher ICT training in Indonesia also remains ad hoc and relies on static printed modules that do not facilitate continuous independent learning (Agitaliza & Trihantoyo, 2024). No self-directed training medium has yet been identified that integrates AI instruction engineering (prompt engineering) with beginner-friendly HTML syntax (zero-coding) to design a visual Moodle interface specifically tailored to the concrete operational characteristics of elementary school students.

To address this gap, this study developed an AI-Assisted Moodle Content Organization Training E-Module for Elementary School Teachers. The main novelty of this study lies in the formulation of structured prompt engineering guidelines that enable teachers to transform basic text material into interactive visual components in Moodle (such as thematic information boxes, child-friendly navigation buttons, and story-based adaptive quizzes) without requiring complex web programming skills. Furthermore, this e-module is designed with a dual function: to guide the intervention stages during in-

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person training, while also serving as a self-paced learning guide after the training to ensure the sustainable adoption of technology in schools.

The development of this e-training module is based on the Research and Development (R&D) instructional system design approach using the ADDIE model (Analyze, Design, Develop, Implement, Evaluate) (Branch, 2009). The application of the ADDIE model ensures that each stage of development begins with a careful analysis of field needs and culminates in measurable formative and summative evaluations (Rejeki et al., 2023). E-module-based self-directed training media have proven effective in continuously building educators' professional autonomy and conceptual understanding (Iskandar et al., 2022; Rahmawati et al., 2023). Based on the problem identification above, the main issue in this study is the lack of structured self-directed training materials to guide teachers at SDN 1 Maguan and SDN 2 Maguan in setting up engaging, AI-assisted Moodle digital classrooms that align with the cognitive principles of elementary school students in preparation for the schools' online learning plans.

Based on these issues, this R&D study aims to analyze the feasibility of an AI-assisted Moodle content organization training e-module for elementary school teachers based on evaluations by subject matter experts and media experts, while also analyzing user responses regarding its practicality. This study is expected to make a theoretical contribution by enriching the literature on the application of the TPACK framework through the integration of generative AI in the design of LMS for elementary schools (Mishra & Koehler, 2006). Practically, the resulting e-module provides step-by-step operational guidance for teachers to independently design adaptive and child-friendly digital classrooms, while also serving as an empirical reference for schools and policymakers in designing strategies to improve digital literacy and accelerate sustainable digital learning transformation.

METHOD

This study employs a Research and Development (R&D) approach using the ADDIE instructional design model (Analyze, Design, Develop, Implement, Evaluate) to systematically design, produce, and test the feasibility and practicality of training materials (Branch, 2009).

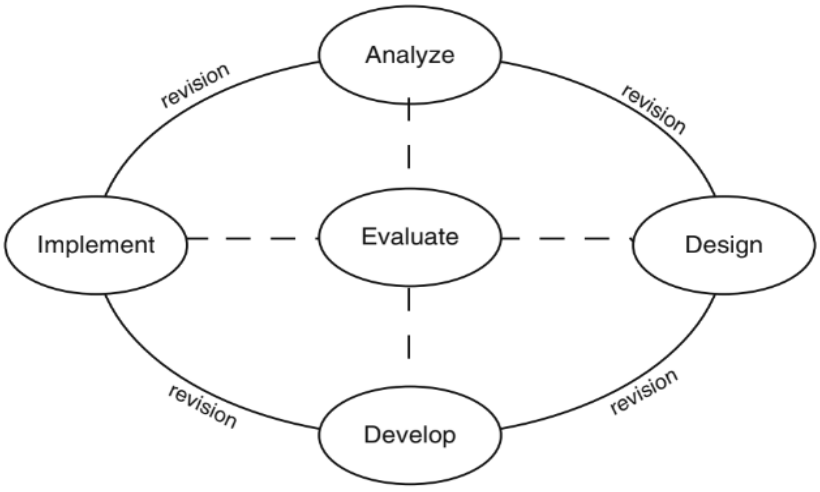


Figure 1. The ADDIE Development Model (Branch, 2009)

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The ADDIE development process consists of five sequential stages (Branch, 2009):

Analysis Phase (Analyze): Identifying performance gaps through observations and interviews at SDN 1 Maguan and SDN 2 Maguan. It was found that the availability of internet access and Interactive Flat Panels (IFPs) has not been matched by teachers' pedagogical capacity to manage interactive digital learning; therefore, a self-paced training module on setting up the AI-assisted Moodle LMS is needed.

Design Phase: Outlining the content of the e-module, designing the visual layout, developing AI prompts aligned with the concrete operational cognitive characteristics of elementary school students, and creating an evaluation instrument rubric.

Development Phase (Develop): This phase involves finalizing the product draft and conducting expert validation. The e-modules are compiled in a digital PDF format integrated with Google Drive. Validity testing involves one instructional content expert and one instructional media expert. The content expert is an academic (a professor of educational technology) and an LMS practitioner with experience in e-learning design. The role of the content expert, who also serves as a resource person in face-to-face training sessions, is openly acknowledged as a limitation of the study that could potentially introduce assessment bias. To mitigate this, the content evaluation instrument was designed in a structured manner and combined with an independent evaluation by an instructional media expert—specifically, a faculty member specializing in the development of instructional media and technology.

Implementation Phase (Implement): Conducted a limited field trial with 16 teachers (classroom and subject teachers) at SDN 1 Maguan and SDN 2 Maguan. Two of the 18 target teachers were unable to attend the entire session due to concurrent administrative duties assigned by the school. All participants had beginner to basic levels of ICT literacy. This study did not specifically document the teachers' ages or years of service, which is acknowledged as a limitation in the reporting of subject profiles. During the training, the Moodle LMS was accessed via a demo cloud server configured by the development team.

Evaluation Phase (Evaluate): Product quality evaluation was conducted formatively throughout the development cycle and summatively after the training. Summative evaluation is conducted by collecting teacher response questionnaires to measure the practicality of the e-modules. Due to time constraints and the scope of the program, the evaluation in this study is limited to perceptions of the media's suitability and practicality and does not yet include testing the effectiveness of student learning outcomes or the assessment of actual Moodle classroom performance generated experimentally by teachers.

The research data consists of quantitative and qualitative data obtained through three data collection instruments:

Subject Matter Expert Validation Data: Assessing the aspects of self-instruction, self-contained, stand-alone, adaptive, and user-friendly using a 1–5 Likert scale. The validators were academics/instructors in learning technology with expertise in the Moodle LMS; their dual role as training facilitators was acknowledged as a methodological limitation that could potentially introduce assessment bias.

Media Expert Validation Data: Assesses aspects of format and compatibility, cover design, and module content design using a 1–5 Likert scale by academics or instructors

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in learning technology.

User Response Questionnaire Data (Elementary School Teachers): Consists of 10 evaluation items on a 1–5 Likert scale (layout, visualization, language, clarity of technical terms, organization, relevance to elementary school content, practicality of hands-on steps, accessibility, motivation, and the usefulness of AI), as well as an 11th item in the form of an open-ended question to gather qualitative feedback. An internal consistency test on the survey data yielded a Cronbach's Alpha coefficient of α = 0.909 (highly reliable).

The quantitative data were analyzed using the achievement percentage formula (Rejeki et al., 2023):

$$P = \frac{\Sigma x}{N} \times 100\%$$

Description:

P = Percentage of the e-module's suitability or practicality
Σx = Total score earned from validators or users
N = Ideal maximum score

The percentage scores obtained were converted into criteria for the validity and practicality of the media. Given that the instrument used a 1–5 Likert scale with a theoretical minimum score of 20%, the conversion criteria interval was set at 16.00% based on the five-point scale presented in Table 1.

Table 1. Criteria for the Feasibility and Practicality of E-Training Modules

Percentage Range (%)	Feasibility/Practicality Category	Category Decisions
84,01% - 100,00%	Highly Valid / Highly Practical	Highly suitable for use without revisions
68,01% - 84,00%	Valid / Practical	Suitable for use with minor revisions
52,01% - 68,00%	Fairly Valid / Fairly Practical	Fairly suitable, requires moderate revisions
36,01% - 52,00%	Not Very Valid / Not Very Practical	Less suitable, requires major revisions
20,00% - 36,00%	Not Valid / Not Practical	Not suitable, rejected or requires a complete redesign

Source: Researcher

Qualitative data in the form of critiques and suggestions from validators and teachers were analyzed using data condensation, data presentation, and conclusion-drawing techniques (Miles et al., 2014) as the basis for revising the final draft of the instructional materials.

RESULTS AND DISCUSSION

The development of an AI-assisted Moodle content organization training e-module for elementary school teachers was carried out systematically following the five stages of the ADDIE model (Analyze, Design, Develop, Implement, Evaluate) (Branch,

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2009). The research results present empirical findings for each stage of development to address the research questions regarding the feasibility and practicality of the developed module.

Analyze

The initial needs analysis focused on identifying performance gaps and the actual conditions at SDN 1 Maguan and SDN 2 Maguan. The results of preliminary observations and interviews with 18 teachers indicated that the schools already had ICT infrastructure in the form of internet connections and Interactive Flat Panels (IFPs), and that most students were accustomed to using smartphones. Nevertheless, the utilization of these facilities in structured online learning has not been optimal, as only 2 out of 18 teachers (11.11%) possess adequate skills in operating interactive learning software. The majority of teachers are still at a basic level of ICT proficiency. The school plans to transition from Google Classroom to the Moodle LMS to facilitate integrated assessment over the next 2–3 years; however, teachers have expressed concerns about Moodle's steep learning curve (Setiawan et al., 2020). These findings underscore the urgency of self-paced training modules that integrate artificial intelligence (prompt engineering) to simplify the configuration of a Moodle interface that is user-friendly for elementary school students.

Design

The design phase translates the solutions derived from the needs analysis into a design for an e-module training program based on the TPACK framework (Mishra & Koehler, 2006). The e-module content is organized into three main topics: (1) Introduction to Learning Management Systems (LMS); (2) Introduction to Moodle; (3) Implementing Learning Content in Moodle by Optimizing AI Tools.

The operationalization of elementary school students' cognitive characteristics at the concrete operational stage (Piaget & Inhelder, 1969) nd the principle of multimedia integration (Mayer, 2014) are realized through the formulation of structured AI prompts. Teachers are guided in creating AI instructions that define the system's roles (Senior Front-End Developer and Instructional Designer), Moodle's technical security constraints (100% inline CSS, no JavaScript, responsive layout), and visual parameters tailored for elementary school students (cheerful color schemes, step-numbering badges, separate instruction cards, and direct embedding of interactive quizzes). One of the prompt outputs generated by the module is presented in Example 1.

Example 1. AI Prompt Formula for Designing an Elementary School Learning Interface

> *"Serve as a Senior Front-End Web Developer and Instructional Designer specializing in the Moodle LMS. Your task is to create plain HTML code with styling (inline CSS) to be embedded in the 'CORE LEARNING' section of Moodle.*
> *[PARAMETERS]: Grade Level: Elementary School; Subject: Science – Solar System; Structure: 1 Stage (Exploration & Observation of Planets); Media: Illustrations and links to educational videos.*
> *[DESIGN & UI GUIDELINES]: Layout style: Playful & Fun Soft Cards (elementary school-friendly); Primary accent color: #1f62ff; Visual elements: Stage number badges, separate instruction cards, callouts for important tips, soft rounded corners (rounded-xl), and soft shadows; Language: Communicative and motivating.*

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[MOODLE TECHNICAL REQUIREMENTS]: Must be 100% inline CSS (style='...'), external <style> tags are prohibited, no JavaScript (<script>), responsive layout (desktop & mobile), and quizzes/videos must be embedded directly via iframe.
[OUTPUT FORMAT]: Provide ONLY ready-to-use HTML code within a Markdown code block without the <html>, <head>, or <body> tags."

Develop

This phase involves creating a draft of the digital module in an interactive PDF format that can be accessed via a Google Drive repository (access link: https://s.id/modul_pelatihan_guru). Formative evaluation was conducted through a feasibility validation test by one instructional content expert (an educational technology scholar and LMS developer) and one educational technology instructor specializing in instructional media.

The results of the quantitative assessment by the content expert are presented in Table 2.

Table 2. Results of the Feasibility Validation of the Training E-Module Learning Materials

Evaluation Criteria	Score Achieved	Maximum Score	Percentage (%)	Eligibility Category
Self Instruction	32	35	91,43%	Highly Valid
Self Contained	10	10	100,00%	Highly Valid
Stand Alone	9	10	90,00%	Highly Valid
Adaptive	4	5	80,00%	Valid
User Friendly	5	5	100,00%	Highly Valid
Grand Total	**60**	**65**	**92,31%**	**Highly Valid**

Source: Researcher

Based on the data in Table 2, the subject matter expert evaluation yielded an overall percentage of 92.31%, which falls within the "Highly Valid" category (interval scale ≥ 84.01%). The "Self-Contained" and "User-Friendly" aspects received a perfect score (100.00%), indicating that the content is presented comprehensively and is easy to use independently. The "Self-Instruction" aspect scored 91.43%, and "Stand-Alone" scored 90.00%, showing that the module is capable of guiding teachers' learning without absolute dependence on an instructor. The "Adaptive" aspect scored 80.00% and was categorized as "Valid," indicating that the flexibility of the module examples still requires ongoing adaptation to the dynamic context of the elementary school curriculum. Next, the results of the quantitative assessment by instructional media experts are presented in Table 3.

Table 3. Results of the Feasibility Validation of the E-Module Training Learning Media

Evaluation Criteria	Score Achieved	Maximum Score	Percentage (%)	Eligibility Category
Format and Compatibility	20	20	100,00%	Very Valid
Cover Design	19	20	95,00%	Very Valid
Module Content Design	19	20	95,00%	Very Valid
Overall Total	**58**	**60**	**96,67%**	**Very Valid**

Source: Researcher

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The results of the media experts' evaluation in Table 3 show an overall percentage of 96.67% in the "Highly Valid" category. The format and compatibility aspects received a perfect score (100.00%), demonstrating that the interactive PDF can be opened seamlessly on various mobile devices and computers. The cover design and module content aspects each scored 95.00%, confirming that the typography, layout, and color harmony are professionally arranged.

The formative evaluation was supplemented by a qualitative analysis of the validators' feedback, summarized in Table 4.

Table 4. Matrix of Validator Input and Follow-Up Actions for E-Module Improvements

Validator	Evaluation Criteria	Feedback and Suggestions for Improvement	Follow-Up on Product Revisions
Subject Matter Expert	Content and Relevance	"That's fine, please continue."	Maintain the conceptual framework and prompt formula that have been developed, and proceed with the module to the field testing phase.
Media Expert	Visual Design and Presentation	"Overall, it's good—the structure is solid—but if the content is text-based, it should be visualized using graphs or charts, especially if the content relates to procedures."	Include step-by-step visual guides and visual flowcharts in the procedural material section before the module is pilot-tested with teachers.

Source: Researcher

Implement

The implementation phase was carried out through a limited field trial involving 16 teachers from SDN 1 Maguan and SDN 2 Maguan. Of the total target of 18 teachers, 2 were unable to attend the entire training due to school administrative duties that conflicted with the training schedule. All participating teachers had initial ICT literacy levels ranging from beginner to basic. This study did not document detailed demographic information regarding the teachers' individual ages and years of service, which is acknowledged as a limitation in reporting the profiles of the trial participants. The e-module served as supplementary teaching material during face-to-face training as well as a self-paced learning guide for practicing the setup of a virtual Moodle classroom run on a demo cloud server.

Evaluation

A summative evaluation was conducted by analyzing the data from the practicality questionnaire completed by 16 teachers following the training. The questionnaire instrument was found to be reliable, with a Cronbach's alpha coefficient of $\alpha = 0.909$. A summary of the descriptive statistical data on the teachers' responses is presented in Table 5.

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Table 5. Results of the User Survey on the Practicality of the E-Module

No	Assessment Indicator	Actual Score	Maximum Score	Mean	SD	Percentage (%)	Practicality Category
1	The layout, color scheme, and variety of illustrations in the e-module are arranged in an engaging and professional manner.	71	80	4,44	0,629	88,75%	Very Practical
2	The images and visualizations presented in the e-module are very clear and help clarify the delivery of the training material.	72	80	4,50	0,632	90,00%	Very Practical
3	The language and instructions used in the e-module are simple, communicative, and easy to understand.	70	80	4,38	0,619	87,50%	Very Practical
4	Explanations of technical terms (such as LMS, Moodle, source code, and AI prompts) are presented clearly and do not cause confusion.	72	80	4,50	0,632	90,00%	Very Practical
5	The training material is presented systematically, ranging from the basic concepts of LMS and Moodle to the practical application of AI-assisted content organization.	70	80	4,38	0,719	87,50%	Very Practical
6	The practical examples of digital classroom content organization presented in the e-module are relevant and easy to apply for learning in elementary school.	68	80	4,25	0,683	85,00%	Very Practical
7	The step-by-step (hands-on) instructions for using Prompt Builder, OneCompiler, and embedding HTML code in Moodle are structured logically and are easy to follow.	70	80	4,38	0,619	87,50%	Very Practical
8	This e-module can be accessed and studied smoothly and flexibly across various devices (smartphones, laptops, and computers).	72	80	4,50	0,632	90,00%	Very Practical
9	Studying this e-module boosts motivation and confidence in designing digital classes in Moodle that are appropriate and	72	80	4,50	0,516	90,00%	Very Practical

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	engaging for elementary school students.						
10	This e-module provides insights and tangible benefits in utilizing AI tools to simplify the organization of learning content.	71	80	4,44	0,629	88,75%	Very Practical
	Total / Average	**708**	**800**	**4,43**	**0,631**	**88,50%**	**Very Practical**

Source: Researcher

Based on Table 5, the results of the practicality evaluation showed an overall mean score of M = 4.43 (SD = 0.631) with an achievement percentage of 88.50%, which falls into the "Very Practical" category. Respondents gave the highest ratings (M = 4.50; 90.00%) for the clarity of image visualization (Indicator 2), the readability of technical terms (Indicator 4), the flexibility of cross-device access (Indicator 8), and the increase in teachers' motivation and self-confidence in designing virtual classes (Indicator 9). The indicators for layout display (Indicator 1) and the practical benefits of AI tools (Indicator 10) received a rating of 88.75% (M = 4.44). Meanwhile, the linguistic aspects (Indicator 3), the systematic sequence of material (Indicator 5), and the practicality of hands-on steps (Indicator 7) each scored 87.50% (M = 4.38). The lowest score was for Indicator 6 regarding the relevance of practical examples to elementary school curriculum content, at 85.00% (M = 4.25; SD = 0.683), indicating that some teachers still need a wider variety of thematic examples beyond the field of basic science.

A qualitative analysis of the 11th open-ended item was conducted transparently using the data condensation technique described by Miles, Huberman, and Saldaña (2014) to mitigate confirmation bias. Of the 16 respondents, 15 teachers provided written comments and 1 teacher responded with a hyphen (-). The results of the data condensation grouped the teachers' responses into two main themes.

First, Appreciation and Perceived Benefits: A total of 11 teachers stated that the e-modules provided clear guidance and were very helpful in utilizing AI to manage Moodle. Representative responses included: "The module really helped me apply Moodle, especially in enhancing AI-based learning," "The e-module was very helpful to us—thank you again," "This training was very beneficial and expanded my knowledge," and "The module is excellent—it's well-designed and easy to understand."

Seond, Constructive Feedback and Future Needs: Four teachers highlighted the importance of the training program's continuity ("Hopefully, these activities can continue" and "Hopefully, there will be further professional development training in the future"). One teacher suggested the availability of an offline option ("If possible, it should be accessible offline"), and another teacher recommended simplifying the subtopics ("The e-module is already good; for the subtopics, the focus could be on aspects that can be put into practice immediately"). The lack of an offline access feature and the need for ongoing support were noted as operational limitations of the medium during the field trial.

The empirical findings of this study indicate that the AI-Assisted Moodle Content Organization Training E-Module for Elementary School Teachers was rated as "Highly

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Valid" by subject matter experts (92.31%) and media experts (96.67%), and was perceived as "Highly Practical" by 16 elementary school teachers (M = 4.43; 88.50%). These high results reflect the fulfillment of the basic characteristics of self-directed learning materials, namely self-instruction, self-contained, stand-alone, adaptive, and user-friendly. These findings are consistent with the studies by Rejeki et al. (2023) and Rahmawati et al. (2023) which demonstrate the reliability of the ADDIE model in producing teacher training e-modules that are proven to be valid and practical. However, given the limitations of summative evaluation data, this achievement should be interpreted solely in terms of conceptual feasibility and users' perceptions of practicality, rather than as a causal claim regarding improvements in learning outcomes or the retention of teachers' skills in actual classroom settings.

An analysis of the score distribution revealed the aspects that received the lowest ratings and require critical scrutiny. In the evaluation of the content, the "Adaptive" aspect received the lowest score (80.00%, "Valid" category). This indicates that the e-module content still focuses on specific examples of interface design and is not yet fully flexible enough to accommodate the diversity of cross-subject thematic curricula in elementary schools. A similar pattern was observed in teachers' responses, where Indicator 6 (the relevance of practical examples to elementary school learning) received the lowest percentage (M = 4.25; 85.00%; SD = 0.683). This variation in responses indicates that some classroom teachers still have difficulty drawing analogies. This is reinforced by qualitative feedback from teachers suggesting that the module's subtopics should focus on aspects that can be directly applied in practice. The limited variety of examples is an important consideration for refining the next set of thematic prompt templates.

Conceptually, this e-module bridges the design of LMS interfaces with the cognitive characteristics of elementary school students. Children aged 7–12 are in the concrete operational stage, which requires concrete visual representations, systematic classification, and structured presentation of material (Piaget & Inhelder, 1969). Moodle's default monolithic text layout risks causing extraneous cognitive overload that hinders students' processing of essential material (Mayer, 2014; Sweller, 2011). Through an AI-powered prompting system, teachers are guided to transform content into a layout of progressive "soft cards," progress indicators ("badges"), and integrated media (iframes) that apply the principle of multimedia spatial integration to reduce the strain on children's working memory capacity (Mayer, 2014). From the perspective of teacher competence, this approach reinforces the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006). As identified by Syahid et al. (2022), the challenges faced by elementary school teachers generally lie in the pedagogical integration of technology, not merely in the operation of devices. This e-module trains teachers to utilize AI as a "thinking partner" to produce child-friendly HTML code (zero-coding) without having to learn complex web programming.

The findings of this study underscore the novelty of this research within the literature on LMS design and AI integration. A review by Gamage et al. (2022) notes that more than 75% of Moodle research is concentrated in STEM-related higher education institutions, while empirical studies at the elementary school level remain very limited. Existing studies on Moodle adoption in elementary schools generally are limited to the use of question banks without interface customization (Hadhiatma et al., 2024). On the

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other hand, the integration of AI into LMSs, as investigated by Shilowaras and Jusoh (2022) and Gudonienė et al. (2026) still focuses on administrative chatbots or master's-level modules. In teacher training, Rajab et al. (2026) examined self-directed Moodle learning to enhance high school teachers' DigCompEdu competencies through Canva and general curation. The novelty of this study lies in the formulation of zero-coding-based prompt engineering guidelines specifically designed for a Moodle interface that is child-friendly for children in the concrete operational stage at the elementary school level. The scheme of utilizing the module as a guide for both face-to-face instruction and post-training self-directed learning also addresses the challenge of limited teacher training time, in line with the findings of Iskandar et al. (2022) and Winiharti (2021).

Although teachers have responded positively to AI assistance, its use requires strict ethical and pedagogical caution. In line with UNESCO guidelines (2023), the teacher's role as the primary controller (human-in-the-loop) is absolutely essential to anticipate risks such as disinformation or AI-generated hallucinations, content inappropriate for children's ages, and overreliance on automation (Yawan et al., 2025). Therefore, the e-module emphasizes the verification of materials before they are uploaded to the digital classroom. Additionally, copying code from a third-party online compiler (OneCompiler) into Moodle is governed by strict technical protocols, namely a prohibition on the use of active JavaScript scripts and a prohibition on including students' personally identifiable information in prompts to safeguard cybersecurity and children's privacy.

This study has a number of limitations, including a limited field trial involving 16 teachers at two rural elementary schools, which restricts generalizability, as well as an evaluation of practicality based on self-reported questionnaire responses without experimental effectiveness measurements (pre-test/post-test) or assessments of actual digital classroom performance. Furthermore, the role of the material validator, who also served as a facilitator, has the potential to introduce assessment bias, and the Moodle infrastructure—which currently relies on a temporary demo cloud server—requires the availability of a dedicated server, funding, and technical personnel to ensure the sustainability of its adoption. These field dynamics provide a foundation for future research to test the effectiveness of the module on a larger scale.

CONCLUSION

The development of an AI-assisted Moodle content organization training e-module for elementary school teachers using the ADDIE model has provided measurable answers to two research questions. First, the media's feasibility was rated as "Highly Valid" based on evaluations by subject matter experts (92.31%) and media experts (96.67%), demonstrating compliance with criteria for self-directed instructional content and good visual readability. Second, the practicality response from elementary school teachers reached the "Very Practical" category with a mean of M = 4.43 (SD = 0.631) and a percentage achievement of 88.50%. The availability of this e-module facilitates teachers' understanding of zero-coding workflows through the formulation of AI prompts to generate visually appealing Moodle classroom layouts for students at the concrete operational stage.

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As a practical follow-up, it is recommended that the module be developed to include offline access features, expand the variety of prompt libraries for subject content, and incorporate a plan for periodic technical support and school server infrastructure readiness. Given that this study's evaluation is still limited to the perceptions of field trial participants at two schools, further research is recommended to experimentally test the effectiveness of the e-module's implementation on a larger sample scale to measure its real impact on improving teachers' digital competencies and the quality of digital classroom delivery in elementary schools.

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