



Development of MATHIK Learning Management System Integrating Purworejo and Semarang Batik Ethnomathematics with Problem-Based Learning

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Abstract

The integration of digital technology and local culture has become an important approach to creating meaningful mathematics learning. However, Learning Management Systems (LMS) used in schools generally function only as platforms for delivering learning materials and have not optimally supported contextual learning through ethnomathematics. This study aimed to develop and validate the Google Sites-based MATHIK Learning Management System integrating Purworejo and Semarang batik ethnomathematics with the Problem-Based Learning model for teaching number patterns. This research employed a Research and Development (R&D) approach using the ADDIE model, consisting of Analysis, Design, Development, Implementation, and Evaluation stages. The participants were 28 eighth-grade students of SMP Tahfidzul Qur'an Pangeran Diponegoro Semarang. Data were collected through expert validation questionnaires, classroom observations, and pretest–posttest assessments. The expert validation results showed an average validity score of 90.41%, indicating that the developed LMS was very valid and feasible for classroom implementation with minor revisions. Students' mean scores increased from 44.73 on the pretest to 78.15 on the posttest, with an N-Gain score of 0.587, indicating a moderate improvement. In addition, the paired-sample *t*-test revealed a statistically significant difference between pretest and posttest scores ($p < 0.001$). These findings demonstrate that the developed MATHIK LMS is a valid, feasible, and sufficiently effective learning platform for improving students' understanding of number patterns through contextual mathematics learning integrating ethnomathematics and Problem-Based Learning.

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INTRODUCTION

The development of digital technology in the current era of education has encouraged the creation of learning that is more interactive, flexible, and easily accessible to students. Digital transformation in education has changed the learning paradigm from being teacher-centered to becoming student-centered. The utilization of technology no longer functions solely as a medium for delivering learning materials but also serves as a means of facilitating interaction, collaboration, communication, and independent learning in accordance with students' needs. Therefore, teachers are required to develop innovative digital learning media to make the learning process more effective and meaningful.

The utilization of technology in mathematics learning can assist teachers in delivering learning materials in a more engaging manner through the integration of digital media, instructional videos, and online learning platforms (Aisyah *et al.*, 2025). Adzani and Pramuditya (2025) explained that Google Sites is capable of improving the accessibility of learning media while providing a better learning experience for students. This finding is supported by Sholikhah and Lestari (2025), who demonstrated that Google Sites-based learning media with a contextual approach can improve the effectiveness of mathematics learning. In addition, Hadidi and Setiawan (2021) reported that the implementation of Google Sites-based e-learning had a positive effect on students' mathematics learning outcomes. Kristanto and Afifah (2022) also developed SIJAMET learning media based on Google Sites for probability material, which was considered feasible to be used as a learning medium. Furthermore, Yunita *et al.* (2023) developed a Google Sites-based Learning Management System (LMS) that was proven to be feasible and effective for use in mathematics learning, thereby facilitating access to learning resources, supporting independent learning, and enabling learning to be conducted anytime and anywhere. Nevertheless, the utilization of Learning Management Systems (LMS) in mathematics learning still faces various challenges. Most Learning Management Systems used in schools merely function as platforms for

storing learning materials and collecting assignments, and therefore have not been able to provide contextual, interactive learning that is closely connected to students' real-life experiences. In fact, mathematics learning requires learning media that not only present concepts in an abstract manner but are also capable of connecting those concepts with authentic experiences so that students can develop a better understanding of the concepts being learned.

Number pattern is one of the mathematics topics that requires logical thinking skills and the ability to identify pattern regularities. A common problem encountered in learning number patterns is that students still experience difficulties in identifying pattern regularities, making pattern generalizations, and determining number pattern formulas because the learning process is still dominated by the provision of examples and practice exercises (Simorangkir *et al.*, 2023). This condition results in learning that provides limited opportunities for students to explore, discover concepts independently, and develop higher-order thinking skills. The findings of Astuti and Dewi Nur (2023) also indicated that students still experienced difficulties in understanding the concept of number patterns, selecting the appropriate formulas, and drawing conclusions from problem-solving results. Consequently, the concept of number patterns is often understood merely as memorizing formulas without comprehending the meaning and the process of forming a pattern. The pretest results indicated that students' mathematical problem-solving ability and mathematical creativity were still relatively low. Students also expressed the need for learning media that are more interactive, engaging, and easily accessible to facilitate their understanding of mathematics. These findings indicate that innovative learning media are needed to accommodate students' characteristics while providing more meaningful learning experiences through the integration of technology and learning activities that encourage students' active engagement.

One approach considered capable of creating contextual learning is ethnomathematics. Ethnomathematics is an approach that connects mathematical concepts with local culture, making

learning more closely related to students' daily lives (Irawan *et al.*, 2022). The results of the Systematic Literature Review conducted by Nursanti *et al.* (2024) indicated that the implementation of the ethnomathematics approach consistently had a positive impact on improving conceptual understanding, learning motivation, mathematical thinking skills, and students' engagement in the learning process. This finding is reinforced by Avitasari and Mulyatna (2024), who concluded that various batik motifs in Indonesia contain mathematical concepts that can be utilized as contextual learning resources. Furthermore, Avitasari *et al.* (2025) explained that batik motifs not only represent geometric elements but also embody cultural values that can be integrated into mathematics learning. In recent years, research on ethnomathematics has developed rapidly in Indonesia, particularly through the utilization of traditional houses, traditional games, handicrafts, and batik motifs as contexts for mathematics learning.

Several previous studies have developed ethnomathematics-based learning media as well as digital learning media for mathematics learning. Astuti *et al.* (2019) demonstrated that the Adipurwo Batik motif from Purworejo can be utilized as a learning medium for number pattern material because it contains arithmetic patterns that can help students understand pattern regularities more meaningfully. The study showed that the geblek and klanging motifs have patterns with a common difference of six, whereas the daun pare and clorot motifs have patterns with a common difference of three, making them suitable to be used as contexts for learning number patterns. Furthermore, Sopyan (2021) developed contextual learning based on ethnomathematics using the traditional *ancak* tool to help students understand the concept of number patterns through activities closely related to their daily lives. Aprilia *et al.* (2024) developed MARBIKA learning media based on Google Sites for picture patterns and number pattern materials by integrating elements of ethnomathematics and found that the media were valid, practical, and effective for use in learning. The study conducted by Prabowo *et al.* (2024) also showed that Banyuwangi batik motifs contain various mathematical concepts that can be utilized as

learning contexts. In addition, Septi *et al.* (2024) explained that the Sidomukti Batik motif from Solo can be used as a medium for realistic mathematics learning because it is capable of connecting mathematical concepts with local culture. The findings of these studies indicate that the integration of technology and local culture provides learning experiences that are more engaging and more relevant to students' lives. Nevertheless, most studies have still developed digital media and ethnomathematics separately, and therefore only a limited number of studies have integrated both into a single Learning Management System (LMS) that supports the entire learning process.

In this study, ethnomathematics is implemented through the use of Purworejo Batik and Semarang Batik in number pattern material. Batik motifs are used as learning contexts to help students identify pattern regularities and understand the concept of number patterns more meaningfully. The use of local culture in mathematics learning is also expected to enhance students' appreciation of the local culture in their surrounding environment. The selection of Purworejo Batik and Semarang Batik is based on the richness of their patterns, motifs, and philosophical values that can be associated with number pattern concepts, thereby making learning more contextual and meaningful. In addition to integrating ethnomathematics, this study also implements the Problem-Based Learning (PBL) model. The PBL model provides students with opportunities to learn through solving real-world problems, engaging in discussions, conducting investigations, and developing solutions independently as well as collaboratively. Hasanah *et al.* (2024) demonstrated that project-based learning supported by Google Sites media is capable of improving students' activeness and engagement in mathematics learning. Ayu *et al.* (2025) also reported that the use of ethnomathematics-based student worksheets (LKPD) encourages students to construct knowledge through problem-solving activities related to local culture. Therefore, the integration of Problem-Based Learning with LMS and ethnomathematics is expected to create learning experiences that are more active, meaningful, and student-centered.

Based on the findings of previous studies, there is still a research gap, namely that only a limited number of studies have developed a Learning Management System that integrates Purworejo Batik and Semarang Batik ethnomathematics with the Problem-Based Learning model in number pattern material. Aprilia *et al.* (2024) developed Google Sites based on ethnomathematics for picture patterns and number pattern materials, whereas Yunita *et al.* (2023) focused on the development of a Google Sites-based Learning Management System for mathematics learning without specifically integrating ethnomathematics. On the other hand, Astuti *et al.* (2019) only explored Adipurwo Batik ethnomathematics as a context for learning number patterns without developing a digital learning platform. Therefore, studies integrating a Google Sites-based Learning Management System, Purworejo Batik and Semarang Batik ethnomathematics, and the Problem-Based Learning model into a single digital learning platform remain very limited. This research gap forms the basis for the development of the MATHIK Learning Management System in this study.

Based on these problems, the MATHIK Learning Management System (LMS) based on Google Sites was developed for number pattern material through the integration of Purworejo Batik and Semarang Batik ethnomathematics. The selection of Google Sites as the development platform was based on its ease of access, flexibility of use, and its capability to integrate various learning media into a single digital platform. Adzani and Pramuditya (2025) stated that Google Sites has a high level of accessibility and provides a good user experience, making it suitable for use as a mathematics learning medium. This finding is supported by Leyn and Yugopuspito (2025), who demonstrated that Google Sites-based learning media are capable of improving students' numeracy literacy through the presentation of learning materials that are more engaging and easily accessible. Furthermore, Piryanto *et al.* (2025) explained that the development of innovative learning media based on Google Sites and Canva can enhance students' creativity during the learning process. Sukmadianto *et al.* (2024) also reported that Google Sites integrated with

contextual videos is capable of improving the effectiveness of mathematics learning by providing more interactive learning experiences. The findings of these studies indicate that Google Sites is a potential platform for developing digital learning media that effectively support mathematics learning.

The MATHIK Learning Management System (LMS) integrates various learning media, including instructional videos, digital student worksheets (LKPD), Google Forms, Quizizz, and Google Classroom into a single digital learning platform. The integration of these learning media is designed to support every stage of Problem-Based Learning, starting from problem orientation, investigation, discussion, problem-solving, to the evaluation of learning outcomes. The use of Google Forms as an evaluation medium is supported by Batubara (2016), who explained that Google Forms is a practical, efficient, and easy-to-use digital assessment medium. In addition, Arifin *et al.* (2022) demonstrated that Quizizz is capable of enhancing students' interaction, motivation, and engagement through interactive learning evaluations. Therefore, the MATHIK Learning Management System (LMS) functions not only as a repository for learning materials but also as a digital learning environment that supports integrated learning activities.

The novelty of this study lies in the integration of three main components, namely a Google Sites-based Learning Management System, Purworejo Batik and Semarang Batik ethnomathematics, and the Problem-Based Learning model in teaching number pattern material. A previous study conducted by Yunita *et al.* (2023) focused on the development of a Google Sites-based Learning Management System for mathematics learning, whereas Aprilia *et al.* (2024) developed MARBIKA learning media based on Google Sites by integrating ethnomathematics into picture pattern and number pattern materials at the elementary school level. On the other hand, Astuti *et al.* (2019) only explored Adipurwo Batik ethnomathematics as a context for teaching number patterns without developing a digital learning platform, while Septi *et al.* (2024) and Prabowo *et al.* (2024) focused more on exploring mathematical concepts

contained in batik motifs as learning resources. Therefore, this study offers a novelty in the form of developing a Learning Management System (LMS) that integrates local culture and the Problem-Based Learning model into a single digital platform designed to support the entire mathematics learning process.

Based on the foregoing description, this study aims to develop and examine the validity of the MATHIK Learning Management System (LMS) integrating Purworejo Batik and Semarang Batik ethnomathematics with the Problem-Based Learning model for number pattern material. The findings of this study are expected to provide an alternative digital learning medium that is valid, contextual, interactive, and easy to implement in mathematics learning at schools. In addition to providing practical contributions for teachers in developing technology-based learning, this study is also expected to enrich studies on the development of ethnomathematics-based Learning Management Systems in Indonesia and to serve as a reference for future studies in integrating digital technology, local culture, and innovative learning models into various mathematics topics.

METHOD

This study employed a Research and Development (R&D) method using the ADDIE development model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The R&D method was selected because it is appropriate for developing and evaluating the feasibility of an instructional product, namely the MATHIK Learning Management System (LMS) based on Google Sites integrated with ethnomathematics through Purworejo and Semarang batik motifs for teaching number patterns.

During the Analysis stage, a needs analysis was conducted through classroom observation to identify students' learning problems and the need for technology-based learning media. The Design stage focused on designing the LMS, learning materials, instructional activities, and research instruments. In the Development stage, the LMS was developed and validated by experts, and revisions were made based on the validators'

suggestions. The Implementation stage involved applying the developed LMS in mathematics learning activities for Class VIIIB students. Finally, the Evaluation stage was carried out continuously throughout the development process to assess and improve the quality of the LMS based on expert validation and implementation results. The subject of this study were 28 students of class VIIIB who participated in learning the topic of number patterns using the developed LMS.

Data were collected using validation questionnaires, classroom observation, and documentation. The validation questionnaires were used to determine the feasibility of the LMS from the experts' perspectives. Classroom observation was conducted to examine students' learning activities during the implementation of the LMS, while documentation was used to collect supporting evidence, including photographs of learning activities and students' work.

The collected data consisted of qualitative and quantitative data. Qualitative data obtained from experts' comments and suggestions were analyzed descriptively to improve the developed product. Quantitative data obtained from the validation questionnaires were analyzed using a five-point Likert scale. The validity percentage was calculated using the following formula: $\text{Validity percentage} = (\text{total score obtained} / \text{maximum score}) \times 100\%$. The obtained percentage was then interpreted according to the predetermined validity criteria to determine the feasibility level of the developed LMS.

RESULTS AND DISCUSSIONS

Needs Analysis Stage Results. The analysis stage was carried out through observation and a needs assessment of ICT-based learning on the topic of number patterns. The results of the initial pretest showed that students' problem-solving ability and mathematical creativity were still relatively low, and students had difficulty identifying the regularity of patterns, making pattern generalizations, and determining number-pattern formulas, because previous learning had still been dominated by giving examples and practice exercises. Interview results

showed that students wanted learning media that were more interactive, engaging, and easily accessible, and that mathematics learning had not yet extensively linked mathematical concepts to the local culture around the students. Based on these analysis results, Purworejo Batik and Semarang Batik were selected as the learning context because their motifs have pattern regularities that can be studied mathematically, leading to the development of the Google Sites-based “MATHIK” LMS on the topic of number patterns, which integrates digital student worksheets (LKPD), instructional videos, Google Forms, Quizizz, and Google Classroom into a single digital learning platform.

The design stage was carried out by determining the learning outcomes and objectives for the number-pattern material, designing the LMS structure consisting of a home page, learning materials, instructional videos, digital student worksheets (LKPD), Google Classroom, Google Forms, Quizizz, and a learning evaluation section, as well as developing research instruments in the form of an expert validation questionnaire and a student response questionnaire. The Purworejo Batik and Semarang Batik motifs were used both as visual elements and as the learning context for number patterns, with the materials and digital worksheets designed around activities of observing batik patterns, discussion, investigation, and presentation of group work results. The output of the design stage was an initial draft of the “MATHIK” LMS, which was subsequently developed further at the development stage.

The “MATHIK” LMS was developed according to the design produced at the design stage by integrating number-pattern material, digital learning media, and an ethnomathematics approach through the Purworejo Batik and Semarang Batik motifs into a single interactive and easily accessible learning platform. The LMS interface was designed to be simple and appealing by combining colors, images, and batik motifs to match the learning theme. After the LMS was fully developed, it was validated by content experts to determine the product's feasibility before it was used in learning.

Validation of the “MATHIK” LMS was carried out by three validators, consisting of the supervising lecturer and a teacher from SMP Tahfidzul Qur'an Pangeran Diponegoro Semarang, using a 1–5 Likert-scale questionnaire covering the aspects of content, media, and instruction. The validation results are presented in Table 1.

Table 1. Expert Validation Results of the “MATHIK” LMS

Validator	Percentage	Category	Description
Validator1	92.50%	Very Valid	Usable with minor revisions
Validator 2	91.25%	Very valid	Usable with minor revisions
Validator 3	87.50%	Very Valid	Usable with minor revisions
Average	90.41%	Very Valid	Usable with minor revisions

Based on the validation results in Table 1, an average feasibility percentage of 90.41% was obtained, falling into the “very valid” category and classified as “usable with minor revisions.” Several improvement suggestions were given by the validators, including: clarifying the explanation of the number patterns found in the batik motifs, improving the consistency of terminology used, clarifying the grade-level identity, and adjusting the instructional video to focus more on the material. These inputs were used as the basis for revisions to refine the LMS before the implementation stage.

The “MATHIK” LMS was implemented with 28 students of class 8B at SMP Tahfidzul Qur'an Pangeran Diponegoro Semarang over three meetings. In the first meeting, students completed the pretest, followed by a discussion of the questions, after which students began studying the material, examples of number patterns found in the Purworejo and Semarang batik motifs, and other supporting media on the LMS using either mobile phones or laptops. In the second meeting, students worked on the digital worksheets in groups by observing batik motifs to identify number patterns, discussing

and analyzing the patterns they found, presenting their discussion results, and taking part in quizzes and discussion forums on the LMS. At the end of the activities, students completed the posttest to determine the improvement in their understanding after using the LMS. During implementation, students became more active because they were directly involved in observation, discussion, worksheet completion, quizzes, and discussion forums, and they were more interested in the lessons because the visual presentation of the material through batik motifs helped them recognize pattern regularities. Challenges encountered during implementation

included limited and unstable internet connectivity, as well as some students who were not yet accustomed to using the LMS and therefore required additional guidance. These challenges were gradually overcome through mentoring and cooperation among students, so that the learning process still ran well and smoothly.

The improvement in students' learning outcomes was analyzed using the N-Gain Score based on the pretest and posttest data, as presented in Figure 1.

PERHITUNGAN N-GAIN SCORE						
NO	Nama	Pre Test	Post-Pre	Post-Pre	Skor Ideal (100-Pre)	N-Gain Score
1	Haristya Surya Pramana	60	83,75	23,75	40	0,59375
2	Ahmad Rasva A.D	32,5	66,25	33,75	67,5	0,5
3	Rafi Maulana Ibrahim	48,75	86,25	37,5	51,25	0,731707317
4	P.Ahmad Raza Ardyanto	48,75	100	51,25	51,25	1
5	M. Rzqi Arziki	37,5	74,375	36,875	62,5	0,59
6	Ahsan Raif Bachtiar	50,625	81,25	30,625	49,375	0,620253165
7	Al aimar	56,25	91,25	35	43,75	0,8
8	Naufal	57,5	66,25	8,75	42,5	0,205882353
9	Iqbal	42,5	72,5	30	57,5	0,52173913
10	Faro	36,25	80	43,75	63,75	0,68627451
11	Ghani	33,75	72,5	38,75	66,25	0,58490566
12	Hafizh	50,625	91,25	40,625	49,375	0,82278481
13	Harsya	62,5	86,25	23,75	37,5	0,633333333
14	Salman	43,75	68,75	25	56,25	0,444444444
15	Irzam	40	71,25	31,25	60	0,520833333
16	Danish Niyaz M	42,5	78,75	36,25	57,5	0,630434783
17	Bian Narava R	47,5	62,5	15	52,5	0,285714286
18	Atirta	50	97,5	47,5	50	0,95
19	Alrizki	46,25	62,5	16,25	53,75	0,302325581
20	Ario	30	71,25	41,25	70	0,589285714
21	Ghani Sakhan	77,5	76,25	-1,25	22,5	-0,055555556
22	Fathir	33,75	77,5	43,75	66,25	0,660377358
23	Teya	42,5	86,25	43,75	57,5	0,760869565
24	Ramu	18,75	81,25	62,5	81,25	0,769230769
25	Gibran	53,75	70	16,25	46,25	0,351351351
26	barra	32,5	75	42,5	67,5	0,62962963
27	Niyaz	38,75	73,75	35	61,25	0,571428571
28	Rasendriya Lingga	37,5	83,75	46,25	62,5	0,74
Mean		44,7321	78,1473	33,4152	55,26785714	0,587178575

Figure 1. N-Gain Score Calculation Results

Based on Figure 1, the students' average pretest score of 44.73 increased to 78.15 on the posttest. The N-Gain Score calculation showed an average of 0.587, or 58.72%. According to Meltzer's N-Gain categorization, this value falls into the moderate category, as it lies within the range $0.3 \leq g \leq 0.7$. According to Hake's N-Gain effectiveness interpretation, the 58.72% figure falls into the fairly effective category, as it lies within the 56–75% range. Most students showed an improvement in scores, with the highest gains achieved by P. Ahmad Raza Ardyanto (N-Gain 1.00, or 100%) and Atitra (N-Gain 0.95, or 95%). However, one student experienced a decrease in score, namely Ghani Sakhan, with an N-Gain of

-0.056, or -5.56%. Overall, the results indicate that the use of the “MATHIK” LMS was fairly effective in improving students' understanding of the number-pattern material.

Before the Paired Sample t-Test was conducted, a normality test was first performed using the Shapiro-Wilk test, since the sample size was fewer than 50 (28 students), with the hypotheses H_0 : the pretest and posttest data are normally distributed, and H_1 : the pretest and posttest data are not normally distributed, at a significance level of $\alpha = 0.05$. The normality test results are presented in Figure 2.

N-GAIN = $\frac{\text{Skor Posttest} - \text{Skor Pretest}}{\text{Skor Ideal} - \text{Skor Pretest}}$	
PEMBAGIAN N-GAIN SCORE	
NILAI N-GAIN	KATEGORI
$g > 0,7$	TINGGI
$0,3 \leq g \leq 0,7$	SEDANG
$g < 0,3$	RENDAH
Sumber : Melzer dalam Syahfitri, 2008 : 33	
KATEGORI TAFSIRAN EFEKTIVITAS N-GAIN	
PERSENTASE (%)	TAFSIRAN
< 40	Tidak Efektif
40-55	Kurang Efektif
56-75	Cukup Efektif
> 76	Efektif
Sumber : Hake, R.R, 1999	

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
pretest	.096	28	.200 [*]	.975	28	.732
posttest	.090	28	.200 [*]	.970	28	.589

Figure 2. Shapiro-Wilk Normality Test Results

Based on Figure 2, the significance value for the pretest was 0.732 and for the posttest was 0.589, both of which are greater than 0.05, so H_0 is accepted. Thus, the pretest and posttest data are normally distributed and meet the requirements for a Paired Sample t-Test, with the hypotheses H_0 : there is no significant difference between the pretest and posttest scores, and H_1 : there is a significant difference between the pretest and posttest scores. The test results are presented in Table 2.

Table 2. Paired Sample t-Test Results

Mean	Std. Deviation	Std. Error Mean	t	df	Sig.(2-tailed)
-33.41	13.789	2.606	-12.823	27	0.000

Based on Table 2, a Sig. (2-tailed) value of $0.000 < 0.05$ was obtained, so H_0 is rejected and H_1 is accepted. This indicates a significant difference between students' pretest and posttest scores after using the "MATHIK" LMS, showing that the LMS is effective in improving students' learning outcomes on the number-pattern material.

The research results show that the Google Sites-based "MATHIK" LMS, which integrates the ethnomathematics of Purworejo Batik and Semarang Batik with various digital learning media, was found to be very valid and effective for use in learning number patterns. Google Sites was chosen because it is easy to use, flexible, and enables students to access all learning activities in a structured and efficient manner within a single platform. Presenting the material in connection with the Purworejo Batik and Semarang Batik motifs helped students understand the concept of number patterns in a more concrete and contextual way, in line with the views of Sopyan (2021) and Nursanti et al. (2024) that an ethnomathematics approach can improve students' understanding of mathematical concepts, critical thinking ability, and

mathematical literacy. In addition, the use of interactive digital media such as instructional videos and Quizizz made the learning process more engaging, less monotonous, and able to increase students' learning motivation, as shown by the increase in student activity during the implementation stage. The statistically significant improvement in learning outcomes (Sig. 2-tailed = 0.000), combined with a moderate N-Gain category and a fairly effective level of effectiveness, reinforces the finding that contextual, local-culture-based learning can help students build a more meaningful understanding of mathematical concepts. The novelty of this research lies in integrating batik ethnomathematics with various digital media within a single, easily accessible Google Sites-based LMS, so that students not only learn mathematical concepts but also become acquainted with and appreciate the local culture around them.

CONCLUSION

This study successfully developed the Google Sites-based MATHIK Learning Management System integrating Purworejo and Semarang batik ethnomathematics with the Problem-Based Learning model for teaching number patterns using the ADDIE development model. The expert validation results indicated that the developed LMS achieved a very high level of validity (90.41%) and was feasible for classroom implementation with minor revisions. The implementation results demonstrated that the LMS supported students' active engagement and significantly improved their learning outcomes, as reflected in the increase from pretest to posttest scores, the moderate N-Gain value, and the statistically significant paired-sample t -test results. Therefore, the integration of ethnomathematics, digital learning media, and the Problem-Based Learning model within a single Google Sites-based LMS provides a valid and sufficiently effective approach to supporting contextual mathematics learning. This study contributes to mathematics education by providing a validated digital learning model that integrates local culture and technology within an accessible Learning Management System. The

developed LMS may serve as a reference for the development of culturally responsive digital learning media for other mathematics topics.

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