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Development Of A Google Sites-Based Learning Management System (Lms) For Grade X High School Trigonometry Material

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ABSTRACT

This study aims to develop a Google Sites-based Learning Management System (LMS) for trigonometry learning for grade X high school students and to test its validity, practicality, and effectiveness. This study uses the Research and Development method using the ADDIE model, which includes the stages of Analysis, Design, Development, Implementation, and Evaluation. The study was conducted at SMA Negeri 14 Bandar Lampung involving one material expert, one media expert, one language expert, one mathematics teacher, and 30 grade X students. Data were collected through interviews, questionnaires, and learning outcome tests, then analyzed descriptively quantitatively and qualitatively. The results showed that the Google Sites-based Learning Management System (LMS) obtained a validation score of 4.83 from the material expert, 4.75 from the media expert, and 4.67 from the language expert, all of which were included in the valid category. The results of the practicality test showed a teacher response score of 4.78 with a very practical category and a student response score of 4.59 with an interesting category. In addition, the results of the effectiveness test showed that 25 out of 30 students (83%) achieved learning completion in a classical manner, so that the Learning Management System (LMS) was declared effective for use in learning. Thus, the Google Sites-based Learning Management System (LMS) developed meets the criteria of being valid, practical, and effective so that it is suitable for use as an alternative digital learning media for trigonometry material for grade X high school.

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INTRODUCTION

Education is a crucial foundation for national development. 21st-century learning requires students not only to passively acquire knowledge but also to equip them with higher-order thinking skills, problem-solving skills, and digital literacy. This transformation

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demands interactive, student-centered learning, supported by the use of information technology as a more engaging and flexible means of delivering material.

Mathematics is a subject that trains logical, analytical, and systematic thinking skills, yet it is often considered difficult by students due to its abstract nature. This also applies to 10th-grade students at SMA Negeri 14 Bandar Lampung. Pre-research observations and interviews revealed that the learning media used were still conventional and lacked variety, making them less effective at engaging students, particularly in trigonometry. The limited duration of face-to-face learning also hindered teachers from optimally utilizing technology-based media.

These conditions demand learning media that can be accessed independently and flexibly, both inside and outside of face-to-face learning hours. Google Sites offers a relevant solution because it allows teachers to freely design learning sites without requiring special programming skills, does not require large storage capacity, and can be directly integrated with other Google products such as Google Docs, Sheets, Forms, and Calendar (Aziz, 2019; Yunita et al., 2025). Its simple, responsive interface, and accessibility across multiple devices make Google Sites an appropriate platform to be developed into a Learning Management System (LMS) for mathematics learning.

Based on this description, this study aims to (1) analyze the feasibility of a Google Sites-based Learning Management System (LMS) for trigonometry in terms of learning media validity, (2) analyze student and teacher responses to the Learning Management System (LMS) in terms of attractiveness and practicality, and (3) analyze the effectiveness of using the Learning Management System (LMS) in terms of learning outcomes of grade 10 students at SMA Negeri 14 Bandar Lampung in trigonometry.

RESEARCH METHOD

This research is a research and development (R&D) that uses the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) development model to produce a Google Sites-based Learning Management System (LMS) for trigonometry material for grade X SMA.

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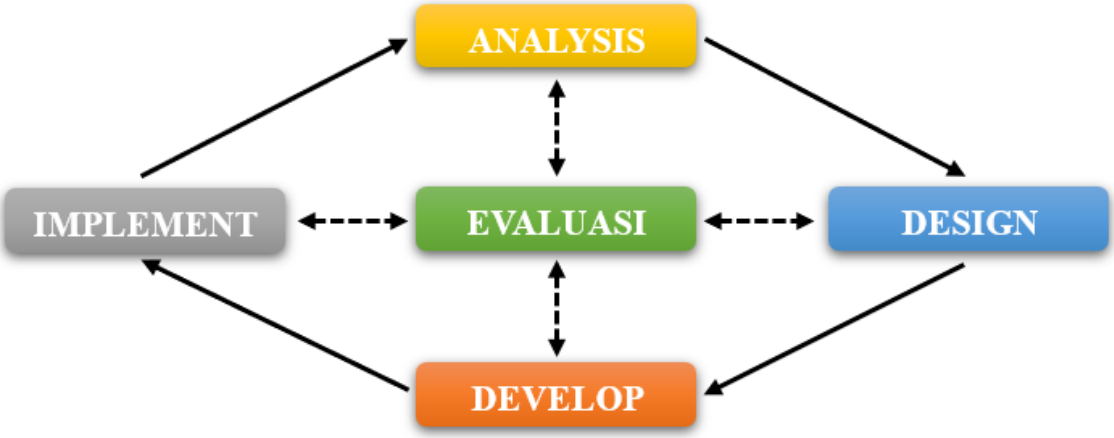


Figure 1. Tahapan Model ADDIE

The development procedure consisted of five stages. In the analysis stage, students' needs, curriculum, and characteristics were analyzed through observations and interviews at SMA Negeri 14 Bandar Lampung to identify mathematics learning challenges. The design stage involved designing a Learning Management System (LMS) framework, compiling materials according to the curriculum, and determining the product's appearance.

In the development stage, the product design was realized as a Learning Management System (LMS) containing a main page, teaching materials, assignments, discussion forums, and evaluations. It was then validated by subject matter experts, media experts, and language experts before being piloted. The product, deemed feasible, was then implemented in classrooms in grade 10 of SMA Negeri 14 Bandar Lampung (implementation stage). In the evaluation stage, student and teacher questionnaire responses, as well as learning test results, were analyzed to form the basis for final product revisions.

The trial subjects in this study were one mathematics teacher and 30 grade 10 students at SMA Negeri 14 Bandar Lampung. The data collection techniques used included questionnaires (expert validation questionnaires and teacher and student response questionnaires), interviews during the preliminary study stage, and learning outcome tests to measure the effectiveness of the product on student understanding of trigonometry. The data analysis technique used descriptive qualitative analysis. Data from expert validation

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and questionnaire responses were analyzed by determining the average score for each indicator and aspect, to obtain a total average value (Va for validation and IO for practicality/attractiveness), following the steps of Hobri (2021). Score interpretation refers to the following criteria.

Table 1 Expert Validation Criteria

Quality Score	Category
$1 \leq Va < 2$	Invalid
$2 \leq Va < 3$	Less Valid
$3 \leq Va < 4$	Quite Valid
$4 \leq Va < 5$	Valid
$Va = 5$	Very Valid

Product effectiveness is analyzed based on the percentage of classical learning completion of students using the formula:

$$P = \frac{n}{N} \times 100\%$$

Description:

P = Percentage of trials achieving subject completion

n = Number of trial subjects achieving subject completion

N = Total number of trial subjects

A product is declared effective if the percentage of classical completion is at least in the moderate category and meets the school's Minimum Completion Criteria (KKM).

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RESULTS AND DISCUSSION

The Google Sites-based Learning Management System (LMS) was developed through analysis, design, and development stages, resulting in a product that includes a homepage, user manual, teaching materials (measuring angles, trigonometric ratios, related angles, and trigonometric identities), assignments, discussion space, and evaluation pages.

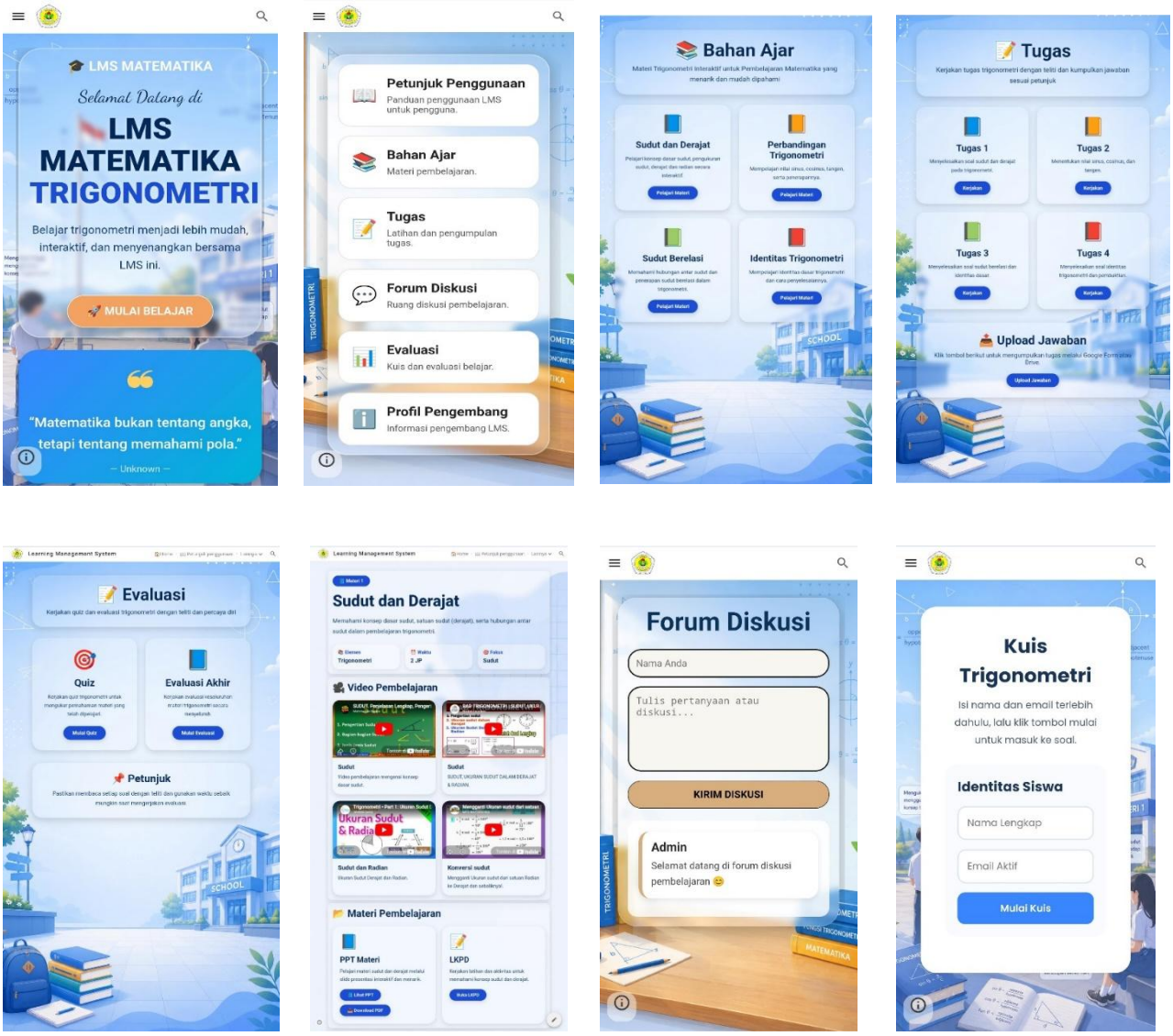


Figure 2. Google Sites-based Learning Management System (LMS) view

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The developed product was validated by material experts, media experts, and language experts through two stages of validation. After revisions were made based on validator input in the first stage, the results of the final validation stage showed improved scores across all assessment aspects, as presented in Table 2.

Table 2. Product Validation Results

Validator	Average	Category
Materials Expert	4,83	Valid
Media Expert	4,75	Valid
Linguist	4,67	Valid

The product trial was conducted on 30 class X students of SMA Negeri 14 Bandar Lampung. The results of the questionnaire on student and teacher responses to the developed Learning Management System (LMS) are presented in Table 3.

Table 3. Teacher and Student Response Results

Respondents	Assessment Aspect	Average Score	Category
Teachers	Appeal, practicality, and usefulness of media	4,78	Very Practical
Students ($n = 30$)	Appeal, ease of use, learning motivation, and usefulness of media	4,59	Very Interesting

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The average student response score of 4.59 falls into the "Interesting" category, while the average teacher response score of 4.78 falls into the "Practical" category. These results indicate that the developed LMS is easy to use, provides benefits in the learning process, and is able to increase student learning motivation in trigonometry material..

Table 4. Google Sites-Based LMS Effectiveness Test Results

Value	Frequency	Percentage (%)	Description
≥ 70	25	83%	Completed
< 70	5	17%	Not Completed

The effectiveness of the Learning Management System (LMS) was measured by the results of student learning tests after using the product. Of the 30 students, 25 (83%) obtained a score of ≥ 70 and were declared to have completed the program, while 5 (17%) had not achieved completion (Table 4 and Figure 3). The classical completion percentage of 83% indicates that the Google Sites-based Learning Management System (LMS) is effective in teaching mathematics in trigonometry.

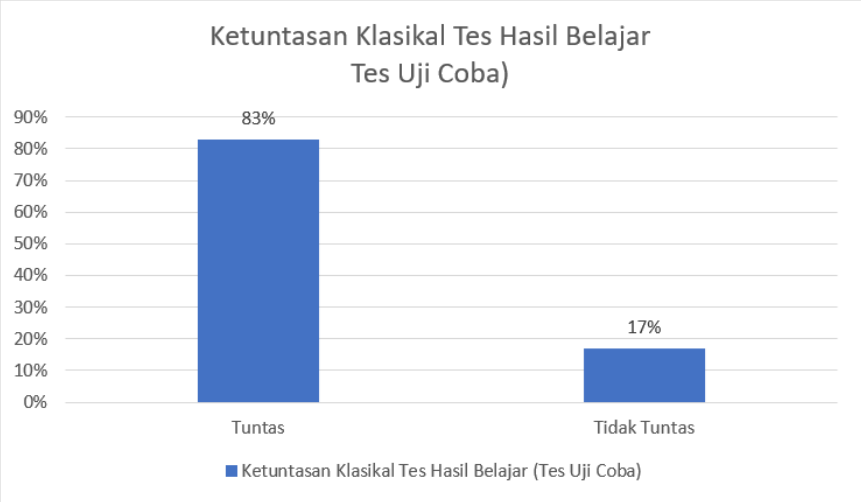


Figure 3. Percentage of Student Learning Outcomes Completion

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DISCUSSION

The research results show that the Google Sites-based Learning Management System (LMS) for trigonometry for grade 10 high school students meets the criteria for validity, practicality, and effectiveness. In terms of validity, the average scores from subject matter, media, and language experts were all in the valid category after undergoing a revision process, particularly for the refinement of the related angles subtopic, font size adjustments for easier reading, and sentence structure refinements for more communicative content.

In terms of practicality and appeal, positive responses from students and teachers indicate that the developed Learning Management System (LMS) is easy to use and supports the learning process, both inside and outside the classroom. In terms of effectiveness, the 83% classical completion rate indicates that the use of the Learning Management System (LMS) can help students understand trigonometry concepts previously considered difficult due to their abstract nature.

These findings align with research by Fitriani (2020), which states that Learning Management Systems can support more flexible learning, and research by Pubian & Herpratiwi (2022), which shows that Google Sites is easily accessible and supports students' independent learning. These results also reinforce the findings of Wahyuning & Karim (2024) and Yunita et al. (2025) that a Google Sites-based Learning Management System (LMS) is suitable for use in mathematics learning because it meets the aspects of validity, practicality, and effectiveness. They also support research by Munandar et al. (2022) which showed that utilizing a Learning Management System (LMS) helps students understand abstract mathematical concepts. Research by Danev (2024) and Ernest & Putra M (2023) also confirms that Google Sites is capable of supporting structured digital learning and encouraging student learning independence.

This study has limitations, including the material coverage focused only on 10th-grade trigonometry, the limited number of test subjects (30 students in one school), and the measurement of effectiveness based solely on learning outcomes without examining other mathematical skills such as problem-solving, reasoning, or mathematical communication.

Further development can be directed at expanding the material coverage and integrating more interactive features.

CONCLUSION

Based on the results of research and development, it can be concluded that the Google Sites-based Learning Management System (LMS) for trigonometry material for grade X SMA is declared valid, with an average validation score of 4.83 from material experts, 4.75 from media experts, and 4.67 from language experts. The developed Learning Management System (LMS) also received positive responses from students (score 4.59, interesting category) and teachers (score 4.78, practical category). From the effectiveness aspect, the Learning Management System (LMS) has proven effective in supporting student learning outcomes with a classical completion rate of 83%. Thus, the Google Sites-based Learning Management System (LMS) is suitable for use as a medium and source for learning mathematics on trigonometry material, especially to support independent learning for grade X students of SMA Negeri 14 Bandar Lampung. For future researchers, this Learning Management System (LMS) can be further developed for other mathematics materials or integrated with more interactive features.

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