Development of Android-Based Mathematics Learning Media Using Google Sites to Enhance Learning Motivation

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Abstract. Students often face problems in learning mathematics, such as boredom and lack of motivation due to monotonous learning media. This study aims to develop android-based learning media with google sites. This study uses the Research and Development (R&D) method with the ASSURE model. Validation of the learning media was carried out by two material expert validators and two media expert validators to ensure the quality and feasibility of the media developed. The results of the validation test showed that the developed learning media was very valid, with a percentage of material experts of 96% and media experts of 98%. The results of the practicality test showed that the media was classified as very practical, with an average teacher response of 92% and a student response of 88%. The effectiveness test conducted on 28 students of class VIII G showed that the developed learning media was effective, with a classical level of student learning completion reaching 87%. This study has succeeded in developing android-based mathematics learning media using google sites that can improve student motivation and learning outcomes. The implications of this study indicate that the application of technology in mathematics learning, especially through the use of google sites, is an effective solution to overcome the problem of boredom in learning.

INTRODUCTION

The results of PISA 2022 show that Indonesia is ranked 72nd out of 79 countries, indicating the need to improve the quality of learning, including approaches that can increase student motivation in learning mathematics. Although various learning media have been used, there has not been much research that specifically disseminates the effectiveness of technology media in overcoming low motivation to learn mathematics. Low student motivation in mathematics can have serious impacts, such as difficulty understanding basic concepts. The following is a diagram table of student difficulties in mathematics:
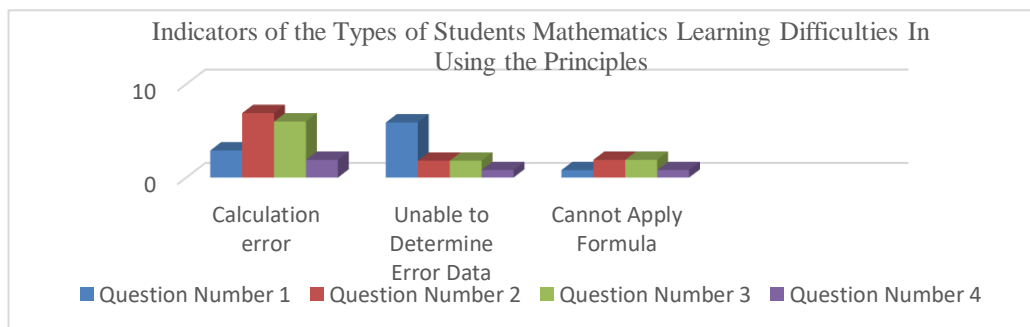

Table 1. Diagram of Results of Analysis of Students Mathematics Learning Difficulties
(Pramesti & Prasetya, 2020)

One of the developing approaches is the use of technology-based learning media to increase students' learning motivation (Atika et al., 2024). Learning media plays an important role in helping students understand mathematical concepts better and increasing their involvement in the learning process (Inawati & Puspasari, 2021). Website-based learning, which can be accessed via the internet, allows students to be more active and understand the material quickly (Mering & Astuti, 2022). Thus, the use of website media can significantly increase student motivation and learning outcomes (Figna et al., 2020). There are several previous studies that show the success of using Google Sites media, namely:

Name	Year	Results	Limitations
Smith & Jones	2021	The level of student engagement increased by 30% after using Google Sites-based media. This shows that Google Sites are effective in increasing participation.	Although learning outcomes have improved, factors such as student background and access to technology have not been taken into account. This research generally only focuses on general learning media and has not touched on the integration of Android–Website media with the ASSURE model approach.
Baka & Lilis	2022	The learning process with Google Sites went well according to the Learning Implementation plan and observations showed that this media was easy to use in hybrid learning.	The limitation of this study lies in the focus on the use of general media, without considering the integration between Android and the ASSURE model.

Table 2. Summary of Previous Research

The development of Google Sites-based media that can be accessed via Android devices is the right solution. Google Sites allows interactive presentation of materials through text, images, videos, and external links. The use of Google Sites is effective in increasing student motivation because its appearance is simple and practical for teachers to use (Prayoga et al., 2023).

This study combines the ASSURE instructional design model with Google Sites for Android-based learning media. The ASSURE model emphasizes needs analysis, goal setting, method selection, media use, and evaluation, offering a suitable structure for integrating Google Sites into the learning process. showed that the implementation of the ASSURE model significantly increased the effectiveness of learning and student motivation (Yilmaz & Baydas, 2020). Learning media developed with the ASSURE model can effectively improve student understanding (Fitroh et al. 2025). Modern learning media is very important for 21st century education because it can increase student participation and more interactive learning (Haliza, 2023). The purpose of this study is to develop Android-based learning media using Google Sites to improve student learning motivation.

The research questions that will be discussed in this study are: (1) How is the validity, practicality, and effectiveness of the developed media? (2) How does Google Sites-based media affect students' learning motivation?

RESEARCH METHODS

Types of research

This study uses the Research and Development (R&D) method. The Research and Development (R&D) method with the ASSURE model is very appropriate to use because before the learning media is developed, the media will be adjusted to the needs and characteristics of students. Previous studies have proven that Google Sites can increase student learning motivation, but most have not integrated the ASSURE design model as a whole. In addition, there is still a lack of research that examines its effectiveness on understanding mathematical concepts, especially in Android-based learning. Google Sites was chosen because compared to other digital media such as Moodle or conventional learning videos, Google Sites offers a simpler appearance, as well as ease in managing content by teachers without requiring special technical skills.

Development Procedure

This research uses the ASSURE development model, which consists of several stages, such as:
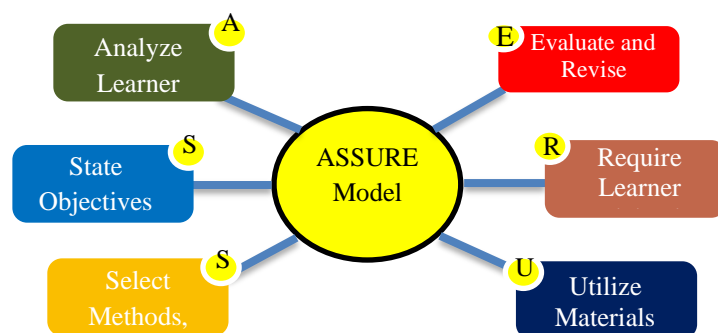

Table 3. ASSURE Model Development Stages

1. Analyzing Learner Characteristics: The initial stage of development begins with identifying learner characteristics through observation and interviews.

2. State Objectives: In the second stage, the researcher describes the learning objectives.

3. Select Methods, Media and Materials: the third stage, the researcher will choose the right media to use, namely the website.

4. Utilizing Materials: after the researcher selects and designs the media, these components are then used in the learning process.

5. Require Learner Participation: at this stage of the learning process, students must actively participate in the material being studied.

6. Evaluate and Revise: after designing learning activities, the next step that needs to be taken is evaluation.

Trial Design

Validators (two material experts and two media experts), mathematics teachers and students became the subjects of the trial of this research product. The criteria for practitioners are as follows:

Subject	Amount	Selection Criteria
Material Expert Validator	2	• Have competence in junior high school mathematics. • Willing to be a validator in this research for materials and questions in the development of a mathematics learning media website.
Media Expert Validator	2	• Have expertise and experience in the field of technology- based learning media. • Willing to be a validator to ensure the eligibility of the learning website.
Math Teacher	2	• Mastering the ability to manage Android-base learning media. • Mathematics teachers who are relevant to their field and have a deep understanding of mathematical concepts.
Students	28	• Students who use Android devices with minimum specifications of 2 GB RAM and the Jelly Bean operating system.

Table 4. Research Subject Data

Trial Subject

The subjects of the trial of the Android-based mathematics learning media development product include: 1) two mathematics teachers of SMP Negeri 1 Kamal, 2) 28 grade VII students of SMP Negeri 1 Kamal. Mathematics teachers must have the ability to manage Android-based learning media and a deep understanding of relevant mathematical concepts. While the grade VII students who are the subjects of the study are students who use Android devices with a minimum RAM specification of 2 GB and the Jelly Bean operating system.

Research Procedures

Before conducting research at SMP Negeri 1 Kamal, the researcher first took care of the research permit by making a research permit letter signed by the head of STKIP PGRI Bangkalan. The letter was then submitted to the school as a form of approval for the implementation of the research. The researcher also ensured that the entire research process followed ethical principles.

Type of Data

Primary data is the type of data used in this study. There are 3 types of primary data obtained. First, the assessment by media experts and material experts is carried out using a validation sheet to turn on the validity of the media. Furthermore, primary data is also calculated based on the response questionnaire given to students and teachers to determine the practicality

of the media. Finally, the results of student learning tests are used to measure how effective the use of learning media is in improving learning outcomes.

Data Collection Instruments

In this study, the researcher used three types of testing to evaluate the instruments used, namely validity testing (two material experts and two media experts), practicality testing, and effectiveness testing. The following is an explanation of the instruments used:

1) Validity Test Instrument

    a. Questionnaire to test the validity of the material

The data collection process begins with a questionnaire that assesses the appropriateness of the material, the accuracy of the language, and its usability. Once the questionnaire is created, two content experts will be asked to rate it and provide feedback. The raters will complete the questionnaire and provide feedback to help improve the material.

No	Rated Aspect	Assessment Items	Evaluation			
			SD	DA	A	SA
I	Material Aspects	The material is in accordance with Learning Outcomes.				
		The material is in accordance with the Learning Objectives.				
		Accuracy of the sequence of presentation of the material.				
		Compliance of the example questions with the formula.				
		The material is appropriate to the students' ability level.				
		The notations and symbols in the material are appropriate and correct.				
		Suitability of video explanation of the material.				
II	Language Accuracy	The language used is easy to understand.				
		The language used is simple and clear.				
III	Benefit	Explanation of the material can help the student learning process.				

Table 5. Material Validation Sheet

    b. Media validity test questionnaire

The data collection method begins with compiling a questionnaire such as design, quality, media appearance, and appeal. The questionnaire will be given to two media experts for evaluation. After the assessment is complete, comments from media experts will be used to improve the learning media..

Table

6.

No.	Observed Aspects	Observation Value			
		SD	DA	A	SA
1	Design				
	a. The shape, size, layout, fonts used are appropriate.				
	b. The background chosen for website-based learning media is appropriate.				
	c. The color proportions are appropriate				
2	Media Quality and Appearance				
	a. The appearance of website-based learning media attracts students' attention.				
	b. The website-based learning media used is not prone to errors.				
	c. The website-based learning media used is easy to access.				
	Attractiveness				
3	g. The use of website-based learning media can help the understanding process for students				

Media Validation Sheet

2) Product practicality test instrument

To collect practicality test data, a response questionnaire was given to teachers and students after they used the learning media. Various aspects, such as learning, quality, function, and appearance of the Google site, were discussed in this questionnaire.

No.	Assessment Items	Evaluation			
		SD	DA	A	SA
1	Google sites-based learning media uses easy-to-understand language.				
2	Google sites-based learning media is very useful for me.				
3	The material presented is easy to follow.				
4	The sentences used in the questions are easy to understand.				
5	The selection of font types and sizes is interesting to read.				
6	The use of interesting background colors.				
7	I enjoy learning mathematics with the help of Android-based learning media because there are examples of questions that are easy to understand.				
8	I can re-watch the videos in the Android-based learning media when the lesson is finished.				
9	Learning using Android-based learning media makes the material easy to remember.				
10	Android-based learning media makes mathematics more interesting to learn.				

Table 7. Student Response Sheet

No.	Assessment Items	Evaluation			
		SD	DA	A	SA
I	Media Display and Effects on Learners				
	The appearance of learning media based on Google sites is interesting for students to learn.				

	The appearance of learning media based on Google sites can increase students' learning motivation.
	By using Google Sites-based learning media, learning becomes more enjoyable.
II	Practical Aspects
	Learning using Google Sites-based learning media is more efficient.
	Learn using Google Sites-based learning media, without time limits.
III	Media Content Aspects
	The media content contained in Google Sites-based learning media is easy for students to understand.
	The media content contained in Google Sites-based learning media is able to explain material to students with the help of videos.
	Media content can make students active in learning activities.

Table 8. Teacher Response Sheet

3) Product effectiveness test instrument

To collect effectiveness test data, student learning outcomes are assessed through tests. After students use the learning media, students will be tested to determine the extent to which they have achieved competence. Students are given time to complete the test during the data collection process. The results of this test will be analyzed to determine how effective the learning media created is.

Essay Questions
Class 7 Mathematics

Materials:
- Social Aritgmetic (Profit & Loss)
- Comparison (Equivalent & Inverse Value)

Instruction:
- Do the questions below on the paper provided.
- Write your name and attendance number on the answer sheet.
- Complete the questions below by writing down the method and results.
- Duration to work on the question is 30 minutes.

1. Mr. Anton bought a plot of land for Rp40,000,000.00. Due to family problems, Mr. Anton was forced to sell the land for Rp38,000,000.00. Determine the percentage of loss borne by Mr. Anton!
2. Adi bought a study table for Rp4,000,000.00. He sold the study table for Rp4,200,000.00. Determine:
   a. The profit obtained by Adi
   b. The percentage of profit obtained
3. Dika bought 3 rulers for Rp7,500.00. If Raya wants to buy 5 of the same rulers, then determine how much money Raya must spend!
4. A building is built in 40 days by 25 workers. In order for the work to be completed in 20 days, determine the number of workers needed!

Figure 1. Essay Question Sheet

Data Analysis Techniques

In this study, the data analysis method used is descriptive analysis, which shows the validity of Android-based learning media using google sites to increase learning motivation.

1. Validity Analysis

    Validity analysis is carried out with the following stages:

a. Determining the maximum score

a. Maximum score = maximum score x number of component items.

b. Determining the score that has been obtained by adding up the scores from each validator.

c. Determining the percentage of validity:

$$\text{Percentage of validity} = \frac{Score\ obtained}{Maximum\ score} x\ 100\%$$

No	Category	Presentation (%)
1	Invalid	0-25
2	Less Valid	26-50
3	Valid	51-75
4	Very Valid	76-100

Table 9. Validity Test Result Criteria

Website-based learning media google sites are declared suitable for use if they obtain validity with an interval of $\geq 51\%$ of all aspects contained in evaluation survey conducted by material experts and media experts.

2. Product Practicality Analysis

    Analysis of the practicality of learning media using a rating scale by:

a. Determining the maximum score

a. Maximum score = maximum score x number of teachers or students x number of components.

b. Determining the score that has been obtained by adding up the scores from teacher or student assessments.

c. Determining the percentage of practicality:

$$\text{Percentage of practicality} = \frac{Score\ obtained}{Maximum\ score} x\ 100\%$$

No	Rating Value	Category
1	81% - 100%	Very Practical
2	61% - 80%	Practical
3	41% - 60%	Quite Practical
4	21% - 40%	Less practical
5	0% - 20%	Not Practical

Table 10. Practicality Test Result Criteria

Learning media is considered practical if it meets practical criteria with an interval range of at least $\geq 61\%$.

3. Analysis of Product Effectiveness Results

Analysis of the effectiveness of learning media using a rating scale by: Determine the percentage of effectiveness:

$$\text{Percentage of effectiveness} = \frac{Score\ obtained}{Maximum\ score} x\ 100\%$$

No	Classical Completion	Criteria
1	< 80%	Ineffective
2	≥ 80%	Effective

Table 11. Effectiveness Test Result Criteria

Google sites website-based learning media is effective to use if it meets the effective criteria with a classical completion percentage score of at least ≥ 80%.

RESULT

The results of the research from the Research and Development (R&D) section in the form of Android-based learning media used through the SMP Negeri 1 Kamal website in class VII. This study applies the ASSURE development model which consists of six stages, namely:
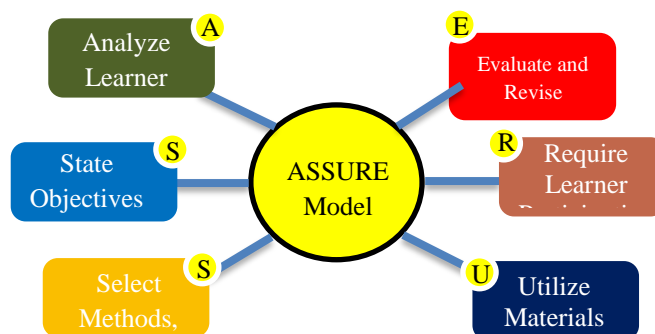

Table 12. ASSURE Model Development Stages

1. Analyze Learner Characteristics

In the analysis stage of the field study, the researcher asked questions by providing previously validated interview guidelines to students and mathematics teachers at SMP Negeri 1 Kamal. Based on the results of the interview excerpts, the researcher found that all students and mathematics teachers in class VII of SMP Negeri 1 Kamal were willing to use android-based media in mathematics learning.

2. State Objectives

After conducting the field study analysis, the researcher then reviewed the Learning Outcomes (CP) and Learning Objectives (TP) related to the material of comparison and social arithmetic. Furthermore, after understanding the CP and TP, the researcher created learning indicators.

3. Select Methods, Media and Materials

The next stage is to choose the method, media, and teaching materials. This study develops android-based learning media using google sites to increase learning motivation. The materials developed in this study include social arithmetic (advantages and disadvantages) and social comparison (equivalent and inverse value) for class VII.
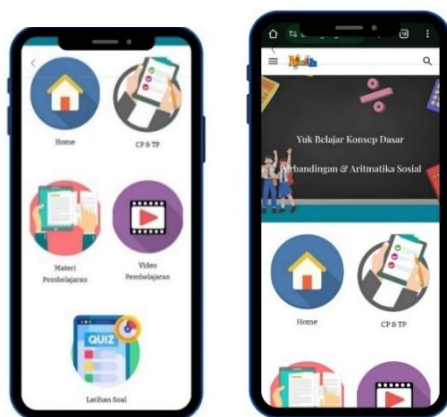

Figure 2. Website Page View

The next stage after the Google Sites website-based learning media is completed is to validate it with material experts and media experts. The validation results obtained an average score of 96% from material experts and 98% from media experts, falling into the very valid category. This high score indicates that the media has met the criteria for design, quality, media appearance, and appeal. Compared to the minimum eligibility threshold of 75% which is often used in learning media validation standards, the validity level above 95% far exceeds expectations.

Validator	Percentage	Category
material expert$_1$	92%	very valid
material expert$_2$	100%	very valid
media expert$_1$	96%	very valid
media expert$_2$	100%	very valid

Table 13. Results of Material and Media Validation

4. Utilize materials

The field trial involved two teachers and 28 students in class 7G. The results of the questionnaire showed that Google Sites media was very practical, with a score of 92% from teachers and 88% from students. Several students verbally stated that they felt more motivated to learn because the material was presented in a format that was not boring and could be accessed via mobile phones at any time. When compared to the minimum threshold of practicality of 75%

which is commonly used in assessing learning media, the results of practicality of 88% of students and 92% of teachers indicate that this media exceeds the expected practicality standards

Name	Percentage	Category
S_1	87%	very practical
S_2	87%	very practical
S_3	89%	very practical
S_4	81%	very practical
S_5	85%	very practical
S_6	81%	very practical
S_7	81%	very practical
S_8	85%	very practical
S_9	95%	very practical
S_{10}	93%	very practical
S_{11}	81%	very practical
S_{13}	91%	very practical
S_{14}	89%	very practical
S_{15}	79%	Practical
S_{16}	79%	Practical
S_{17}	85%	very practical
S_{18}	79%	Practical
S_{19}	85%	very practical
S_{20}	75%	Practical
S_{21}	81%	very practical
S_{22}	91%	very practical
S_{23}	75%	Practical
S_{24}	81%	very practical
S_{25}	93%	very practical
S_{26}	89%	very practical
S_{27}	79%	Practical
S_{28}	81%	very practical
amount	88%	very practical

Table 14. Results of Teacher Practicality Test

5. Require Learner Participation

Name	Number of Values	Category
S_1	90	Complete
S_2	70	Incomplete
S_3	100	Complete
S_4	90	Complete
S_5	70	Incomplete
S_6	70	Incomplete
S_7	100	Complete
S_8	90	Complete
S_9	80	Complete
S_{10}	70	Incomplete
S_{11}	70	Complete
S_{13}	100	Complete

S$_{14}$	80	Complete
S$_{15}$	90	Complete
S$_{16}$	100	Complete
S$_{17}$	70	Incomplete
S$_{18}$	90	Complete
S$_{19}$	100	Complete
S$_{20}$	100	Complete
S$_{21}$	90	Complete
S$_{22}$	80	Complete
S$_{23}$	80	Complete
S$_{24}$	90	Complete
S$_{25}$	90	Complete
S$_{26}$	100	Complete
S$_{27}$	100	Complete
S$_{28}$	90	Complete
Amount	2.350	Complete

Table 15. Results of Learning Completion Effectiveness Test

The results of the essay questions worked on by students showed a percentage of 87%. This figure exceeds the minimum threshold of learning effectiveness, which is 80% which is generally used as a standard to state that learning media is effective in increasing learning motivation. It can be concluded that Google Sites website-based learning media is effective to use, because it has met the effectiveness criteria. Oerall, the data shows consistency between validity, practicality, and effectiveness. These three aspects support each other, thus proving that Google Sites-based learning media is not only feasible to use, but also able to significantly increase student motivation and learning outcomes.
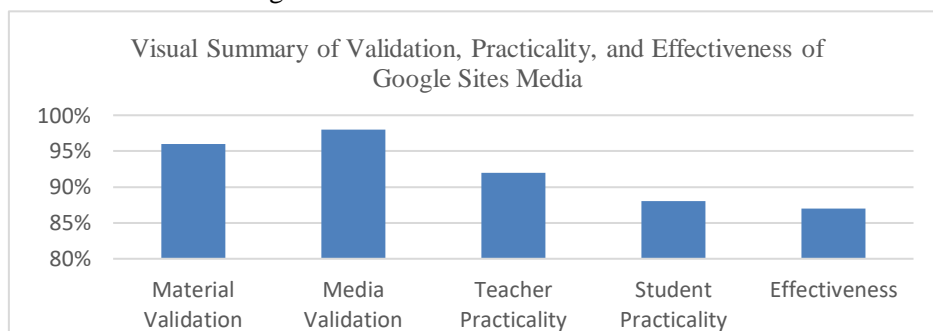

Table 16. Visual Summary of Validation, Practicality, and Effectiveness Data.

6. Evaluate and Revise

Direct responses from users were obtained. Students stated that learning through Google sites was more enjoyable because it could be accessed via mobile phones and allowed for repeating the material until it was understood. Meanwhile, a math teacher said that the simple media display was very helpful.

DISCUSSION

The trial results showed that the teacher's response was very good with a score of 92%, and the student's response was positive at 88%, who considered this media very feasible and practical to use. This finding is in line with the results of research (Andi & Aan, 2022) which recorded a questionnaire score of 93%, as well as research (Fadilah & Aslan, 2022) which obtained a student response of 92% and a teacher response of 96%, all of which were in the very feasible category. Research (Purnama & Pramudiana, 2021) also showed a response rate of 93% with very good criteria.

However, the main contribution of this study lies not only in the consistency of the results, but also in the unique features of the developed media, namely the integration of interactive quizzes, explanations of the material in the form of videos, and accessibility via Android devices. Compared to international research, namely (Al-Samarraie et al., 2021) which shows that there are differences in the effectiveness of digital learning media which are greatly influenced by user navigation skills and the integration of multimedia content, this study has not tested these aspects in depth.

In terms of effectiveness, this media has proven to be effective in learning with a student learning completion rate of 87%. This finding is in accordance with research (Anin & Junaid, 2024) which recorded overall learning completion of 90.3% and research (Andi & Aan, 2022) which obtained post-test results of 93%. Research by Ela & Deni (2023) also showed an increase in scores from a pre-test of 78 to a post-test of 80.

The results of the study indicate that constructivism-based learning through Google Sites media has a positive impact on students' learning motivation. This media allows students to learn independently, access materials at any time, and participate actively in line with the principles of constructivism. The integration of Android, website learning media and the ASSURE model is a new contribution. These findings support previous research (Yilmaz & Baydas, 2020) which states that technology can improve learning outcomes. Different from complex digital platforms, this study emphasizes the effectiveness of simple, contextual, and easily accessible media.

The practical implications of this study suggest that while technology-based learning media can enhance student motivation, implementation challenges such as the need for adequate teacher training and infrastructure must be addressed. Without proper training, teachers may struggle to utilize technology effectively, which may reduce the expected positive impacts. In addition, inadequate infrastructure, such as unstable internet connections, may hinder students' access to learning materials.

Although this study shows positive results, there are several limitations. First, unequal access to mobile phones among students is a major challenge in implementing digital-based learning media. Second, the problem of unstable internet connections. Third, the limited scope of material in the learning media developed limits the diversity and depth of topic exploration by students. These limitations reflect the challenges of technology in education, especially related to the digital divide. Unequal access to devices and the internet can widen the learning gap. Further research needs to develop inclusive strategies, including policy support media for equitable access to technology in schools.

This study also has the potential for bias, such as the influence of the learning environment and parental support on student motivation, as well as subjective assessments of teachers or researchers. Therefore, it is important to use more objective evaluation methods so that future research results are more accurate.

CONCLUSION

Based on the findings and discussions that have been presented, this study has succeeded in developing android-based mathematics learning media using google sites to increase students' learning motivation. This study can help teachers to link the curriculum in schools with current technological developments. In this study, researchers have only used 1 platform for research, therefore further research is needed using other android-based platforms so that it can be reviewed which platform will later become the most effective learning media for the mathematics learning process in the future.

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