

Developing Google Sites Learning Media to Enhance Students' Mathematical Communication and Self-Confidence on Geometry

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Abstrak

Kemampuan komunikasi matematis dan kepercayaan diri siswa masih rendah. Hal ini disebabkan proses pembelajaran yang monoton dan siswa tidak aktif terlibat dalam proses pembelajaran, sehingga membutuhkan media pembelajaran yang efektif untuk meningkatkan kemampuan komunikasi matematika dan kepercayaan diri siswa. Penelitian ini dilakukan untuk mengembangkan media pembelajaran berbasis Google Sites pada materi Geometri Bangun Ruang dan untuk menganalisis validitas, kepraktisan, dan efektivitas media pembelajaran tersebut. Penelitian ini merupakan studi penelitian dan Pengembangan (RnD) dengan menggunakan model ADDIE. Instrumen yang digunakan dalam penelitian dan pengembangan ini adalah kuesioner, tes kemampuan komunikasi matematis, dan lembar observasi. Subjek percobaan adalah siswa kelas delapan SMP Swasta di Kabupaten Garut. Hasilnya diketahui bahwa media pembelajaran berbasis Google Sites memenuhi kriteria validitas, kepraktisan, dan efektivitas dalam meningkatkan kemampuan komunikasi dan kepercayaan diri siswa. Hal ini diketahui dari validitas media pembelajaran, berdasarkan hasil penilaian validitas media dan materi, menunjukkan hasil yang valid; kepraktisan media pembelajaran, menunjukkan hasil yang termasuk dalam kategori praktis; efektivitasnya dalam meningkatkan kemampuan komunikasi matematis diperoleh dari hasil tes yang menunjukkan peningkatan dengan interpretasi sedang dan tinggi; efektivitasnya dalam meningkatkan kepercayaan diri siswa diperoleh dari peningkatan dengan interpretasi sedang.

Kata Kunci: Media pembelajaran berbantuan Google Sites; kemampuan komunikasi matematis; kepercayaan diri; model ADDIE; geometri bangun ruang.

Abstract

Students' mathematical communication ability and self-confidence are still low. This is due to the learning process being monotonous and students not being actively involved in the learning process, thus requiring effective learning media to improve students' mathematical communication ability and self-confidence. This research was conducted to develop Google Sites-assisted learning media on the Geometry of Solid Shapes material and to analyze the validity, practicality, and effectiveness of the learning media. This research is a Research and Development (RnD) study using the ADDIE model. The instruments used in this research and development are questionnaires, mathematical communication ability tests, and observation sheets. The subjects of the trial were eighth-grade students of a Private Junior High School in Garut Regency. The result is known that the Google Sites-assisted learning media meets the criteria for validity, practicality, and effectiveness in improving students' communication ability and self-confidence. This is known from: the validity of the learning media, based on the assessment results of the media and material validity, showed valid results; the practicality of the learning media, showed results that fall into the practical category; its effectiveness in increasing mathematical communication ability was obtained from an increase with moderate and high interpretation; its effectiveness in increasing students' self-confidence was obtained from an increase with moderate interpretation.

Keywords: Google Sites-assisted learning media; mathematical communication ability; self-confidence; ADDIE model; geometry of solid shapes.

I. INTRODUCTION

Digital learning media can not only help students understand subject matter in class but can also be used anywhere and anytime. With the utilization of digital media, the learning process runs effectively and can help students obtain various learning resources (Kusuma & Utami, 2017; Nasrulloh, Ibrahim, & Solihatin, 2024). Website-based learning media offers an engaging presentation with sound, images, and videos; facilitates the understanding of subject matter with concise content that gets straight to the point; eliminates the monotonous impression in delivering subject matter compared to conventional methods; and creates a fun learning atmosphere, attracting students' interest in learning the material (Purba, *et al.*, 2021; Sundayana, 2017; Pitriyani, *et al.*, 2023). For teachers, interactive learning media plays a role in enhancing teacher professionalism in the teaching and learning process through the use of technology (Utami & Sari, 2020; Sundayana, *et al.*, 2017; Noordiana, *et al.*, 2019; Puspitasari & Sari, 2024).

For students, websites provide a private learning environment. When a student makes an error on a practice site, only the system is aware of it. This eliminates social anxiety and encourages students to engage in trial and error without psychological pressure (Sumaji, Ekayanti, & Sari, 2025). Furthermore, through websites, students can re-watch instructional videos or re-read materials repeatedly without the feeling of being a burden to others. Once students are able to solve problems at their own pace, they experience a sense of achievement, which is a primary factor in the development of self-confidence.

Google Sites can be utilized by teachers to manipulate objects in delivering instruction. Teachers and students can easily create and operate it. The advantages of Google Sites include: 1) it's easy to use and completely free; 2) the platform allows for collaboration among users; 3) it provides free online storage space; 4) sites created are easy to find via the Google search engine; 5) its use doesn't require downloading, saving internet quota and device memory; 6) evaluation of learning outcomes becomes efficient, making it easier for teachers to monitor student progress; 7) the display can be creatively designed, combining colors, images, videos, or interactive quizzes, making the learning process more engaging (Islanda & Darmawan, 2023).

The learning media is designed with attractive features integrated with live worksheets, such as presenting material with interactive videos, quizzes, and evaluations, allowing students to learn actively and gain a fun learning experience. This enables students to discover concepts, communicate mathematically, and solve problems. Developing more effective, innovative, and efficient learning media with Google Sites is expected to facilitate students in improving their mathematical communication ability and self-confidence (Ulfa & Sundayana, 2022; Maulani & Sundayana, 2017; Dewi, *et al.*, 2020).

The teacher's role in creating teaching materials and designing lessons can provide opportunities for teacher-student interaction during the learning process and problem-solving. Furthermore, teachers must actively participate, both inside and outside the classroom, by holding

discussions and asking students questions to encourage students to express their ideas, defend their ideas, and provide more explanations related to their ideas, which is expected to improve students' mathematical communication ability and self-confidence.

Indicators of communication ability are: 1) Expressing real objects, situations, and daily events into mathematical models (pictures, tables, diagrams, graphs, algebraic expressions); 2) Explaining mathematical ideas and models (pictures, tables, diagrams, graphs, algebraic expressions) into ordinary language; 3) Explaining and creating mathematical questions learned; 4) Listening, discussing, and writing about mathematics; 5) Reading with comprehension a written presentation; 6) Making conjectures, constructing arguments, formulating definitions, and generalizations (Hendriana & Soemarmo, 2017; Ikhsan & Afriansyah, 2023). The indicators of self-confidence used in this study are: 1) Believing in one's own ability; 2) Acting independently in making decisions; 3) Having a positive self-concept; 4) Daring to express opinions (Lestari & Yudhanegara, 2018; Nuraeni & Afriansyah, 2021).

The nature of mathematics is a structured yet abstract science where its parts are interconnected (Sundayana, *et al.*, 2018; Suyitno, 1985). The implication is that mathematics has its own difficulties that students must face. Not only students, but teachers also experience difficulties in teaching it. Students who experience difficulties learning mathematics at the elementary school level will experience

learning difficulties at other school levels. One effort to overcome this is by presenting mathematical concepts in a concrete form. Then they are guided to the semi-concrete stage, and finally, students can think and understand mathematics abstractly (Sundayana, 2014; Efwan *et al.*, 2024).

To present mathematical concepts concretely, learning media can be used (Hadiansyah & Sundayana, 2023). Learning that uses appropriate media will help bridge the gap between abstract mathematical concepts and concrete ones (Qori, *et al.*, 2023). In line with this paradigm, this research develops Google Sites-based learning media integrated with live worksheets for mathematics subjects with the geometry of solid shapes material. This integration will change the paradigm that mathematics is abstract into concrete by visualizing mathematical material in a more engaging and easy-to-understand way.

This research complements previous studies, such as the research by Haya (2023); Khasanah & Atini (2023); Islanda & Ela (2023), which did not utilize live worksheets in presenting student worksheets. Thus, this research needs to be conducted to develop websites-based learning media assisted by Google Sites integrated with live worksheets for mathematics subjects applied in Junior High Schools, thereby improving students' mathematical communication ability and self-confidence.

II. METHOD

The research method used is Research and Development (RnD) with procedures adapted from the ADDIE research design

(Analyze, Design, Develop, Implement, and Evaluate). The ADDIE model is considered the best and most complete research and development model, and the stages in the ADDIE development model align with

standards, can be monitored, and are easy to implement in research and development. The stages of the ADDIE development model in this research are presented in the following flowchart in Figure 1.

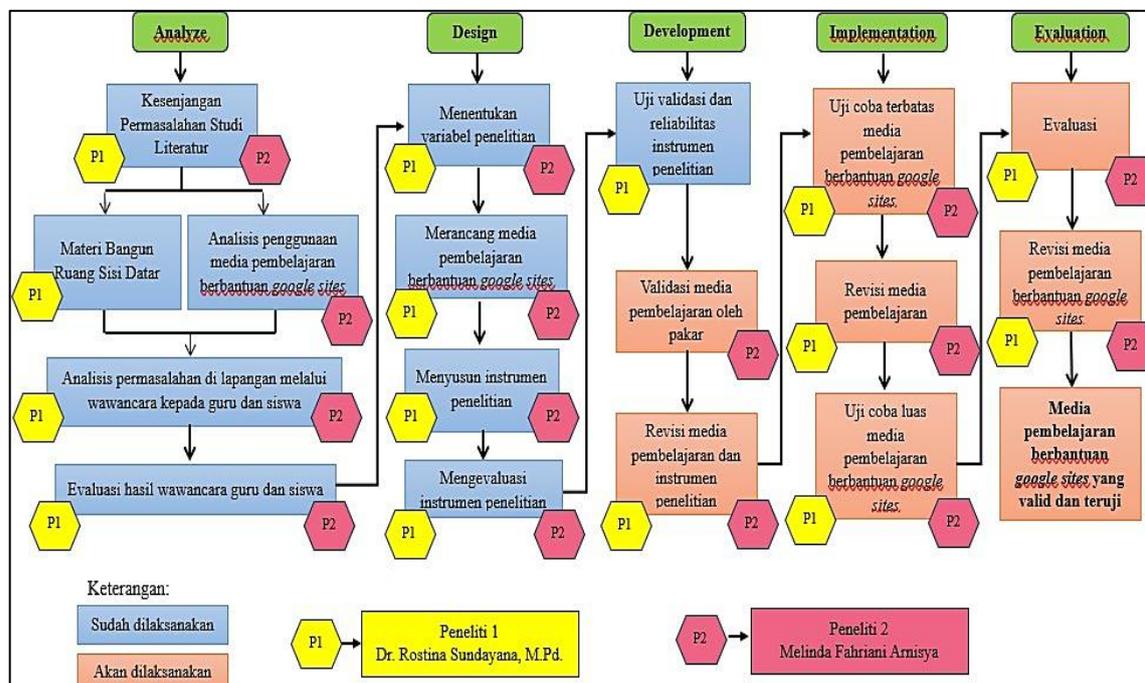


Figure 1. Research Flowchart.

The research procedure is: 1) developing Google Sites-assisted learning media in the odd semester of 2025-2026 for mathematics subjects with the main topic of geometry of solid shapes material; 2) conducting validation by experts; 3) conducting limited trials of the Google Sites-assisted learning media; 4) conducting extensive trials in Junior High Schools in Garut Regency. The targeted achievement indicators are: the existence of valid and tested websites-based mathematics learning media assisted by Google Sites that can improve students' mathematical communication ability and self-confidence.

The trial subjects in this research and development consist of material experts, media experts, and students who use the

Google Sites-assisted learning media in mathematics learning. The criteria for students who become subjects in this research are eighth-grade Junior High School students who have studied prerequisite material and have access to digital devices and the internet. The trials of the Google Sites-assisted learning media include a limited trial involving 6 eighth-grade students, an extensive trial involving 25 eighth-grade students, and a field trial involving 2 Junior High Schools in Garut Regency. Data collection techniques in this research consist of questionnaires, tests, and observation. The instruments utilized in this study include a 4-point Likert scale questionnaire validated by experts, student response questionnaires, self-confidence

scales, mathematical communication ability tests, and observation sheets to assess the implementation of learning through Google Sites-assisted media.

III. RESULT AND DISCUSSION

This research has produced a product in the form of Google Sites-assisted learning media. The research results of the developed learning media align with the ADDIE stages: analyze, design, development, implement, and evaluate.

Untuk penelitian kualitatif, bagian hasil memuat bagian-bagian rinci dalam bentuk sub topik-sub topik yang berkaitan langsung dengan fokus penelitian dan kategori-kategori.

Analyze

In the analyze stage, the researcher selected the material to be used in the development of the Google Sites-assisted learning media: geometry of solid shapes. This is because the geometry of solid shapes material is abstract, demands high visualization ability, and students' absorption ability of this material is relatively low. Next, the researcher formulated the learning objectives to be achieved through learning using the Google Sites-assisted learning media. In the analyze stage, the researcher also conducted pre-research activities to confirm the level of students' mathematical communication ability and self-confidence in the field. The pre-research results showed that students' mathematical communication ability and self-confidence were still low. Therefore, there is a need to develop learning media that is easy to use and can assist the learning

process according to the needs of the students.

Design

The design of the Google Sites-assisted learning media began with creating a flowchart to explain the development and usage flow of the Google Sites-assisted learning media. The arrangement of the Google Sites-assisted learning media starts with creating the initial display, material menu, material discussion, student worksheets, and example and practice problems.

The teaching materials menu presents material and learning videos that students can use as references during the learning process. The Student Worksheets menu presents several activities through live worksheets that students can work on directly on the device they are using. Examples and practice evaluation problems related to the material studied are also presented. In this stage, the necessary instruments for research purposes were also compiled.

Development

The development stage resulted in the Google Sites-assisted learning media on the geometry of solid shapes material, accessible via the link <https://sites.google.com/guru.smp.belajar.id/ruangmatematikabrsd/beranda>. The visual appearance of the developed media is as follows:



Figure 2. Visual interface of the Google Sites media.

Next, the developed learning media was validated by experts. The Google Sites-assisted learning media was validated by 3 material experts: a Junior High School mathematics teacher, a mathematics lecturer, and a representative from the Garut Regency Education Office. The validation provided by the material experts regarding this learning media includes the suitability of the Google Sites-assisted learning media with: (1) the quality of the material content; (2) learning objectives; (3) feedback and adaptation; and (4) motivation. Table 1 shows the results of the material expert validation.

Table 1.
Material Expert Validation Results

Aspect	Max Score	Achieved Score			Total Achieved Score	Achievement Percentage (%)
		V1	V2	V3		
Material Quality	120	30	32	31	93	77,5
Learning Objectives	60	20	20	20	60	100
Feedback and Adaptation	30	8	8	7	23	76,67
Motivation	15	4	4	4	12	80
Total Achievement	225	62	64	62	188	83,56

Information: V1 = Validator 1, V2 = Validator 2, V3 = Validator 3

Based on the expert assessment results, the percentage of material quality in the Google Sites-assisted learning media is 77.5%, indicating that the Google Sites-assisted learning media already contains suitable geometry of solid shapes material. The expert assessment result for the learning objectives aspect shows a percentage of 100%, indicating that the content/material in the learning media is

suitable for achieving the expected learning objectives. The feedback and adaptation aspect shows a percentage of 76.67%, meaning the Google Sites-assisted learning media is quite adaptive in the learning process. The motivation aspect shows a percentage of 80%, meaning the learning media is capable of providing learning motivation to students, thereby expected to increase student self-confidence in the mathematics learning process.

From the results of filling out the validity questionnaire for the Google Sites-assisted learning media, comments, and suggestions from the material experts, it is generally known that the Google Sites-assisted learning media is feasible to use with revisions.

In addition to being validated by material experts, the results of the development of the Google Sites-assisted learning media were also validated by 3 media experts. The validation provided regarding this learning media includes the aspects of learning, media, and design. Table 2 shows the results of the media expert validation.

Table 2.
Media Expert Validation Results

Aspect	Max Score	Achieved Score			Total Achieved Score	Achievement Percentage (%)
		V1	V2	V3		
Learning	75	25	23	25	73	97,33
Media	75	24	24	23	71	94,67
Design	75	23	24	24	71	94,67
Total Achievement	225	72	71	72	215	95,56

Information: V1 = Validator 1, V2 = Validator 2, V3 = Validator 3

The expert assessment results show an achievement percentage for the learning aspect of 97.33%. This indicates that the

Google Sites-assisted learning media supports the mathematics learning process on the geometry of solid shapes material. The achievement percentage for the media aspect is 94.67%, indicating that the quality of the Google Sites-assisted learning media is very good. The design aspect shows a percentage of 94.67%, meaning the display of the Google Sites-assisted learning media is proportional in terms of size, color combination, font usage, and language use. Generally, from the assessment, comments, and suggestions provided by the three validators, it is known that the Google Sites-assisted learning media is feasible to use without revisions.

Implement

In this stage, the trial of using the Google Sites-assisted learning media in the mathematics learning process and the collection of data on the implementation results of the Google Sites-assisted learning media development was carried out. The implementation of the Google Sites-assisted learning media was carried out through three stages: limited trial, extensive trial, and field trial.

During the trial process, learning was conducted using the Google Sites-assisted learning media. Students accessed the learning media using a Chromebook or smartphone by opening a browser and accessing the learning media link provided by the teacher. After the learning process was complete, students were asked to complete the mathematical communication ability test, fill out the self-confidence questionnaire, and fill out the response questionnaire regarding the learning media used during the learning process. This stage

aims to obtain feedback in the form of data on the results of the practicality and effectiveness trial of using the learning media.

The practicality of the learning media was obtained through student response questionnaires to the learning media and the teacher observation sheet results. Based on the student response questionnaire results, it is known that in the limited trial, the average practicality percentage obtained was 71.21%, in the extensive trial it was 80%, and in the field trial it was 82%, indicating that the Google Sites-assisted learning media is practical to use. This is supported by the observation sheet results, which showed that 97.35% of the learning activities were implemented according to plan.

The effectiveness of the learning media was obtained through the mathematical communication ability test and the student self-confidence questionnaire. Based on the mathematical communication ability test results, it is generally known that the increase in students' communication ability after receiving instruction using the Google Sites-assisted learning media is in the moderate category. In the limited trial, the increase in mathematical communication ability was at a score of 0.651 with a moderate interpretation. In the extensive trial, 72% of students experienced an increase in the moderate interpretation, and in the field trial, 75% of students experienced an increase in the moderate interpretation.

Based on the self-confidence questionnaire results, it is generally known that the increase in students'

communication ability after receiving instruction using the Google Sites-assisted learning media is in the moderate category. In the limited trial, the increase in self-confidence was at a score of 0.6228 with a moderate interpretation. In the extensive trial, 96% of students experienced an increase in the moderate interpretation, and in the field trial, 95% of students experienced an increase in the moderate interpretation.

Analysis of the post-test data for mathematical communication ability between the class using the Google Sites-assisted learning media and the class with direct instruction was conducted. This aims to strengthen the data analysis related to the effectiveness of the Google Sites-assisted learning media in improving mathematical communication ability. The results of the difference test for the average post-test scores of the two classes yielded a Sig. value of 0.043, with degrees of freedom (*df*), so the Sig. value $< \alpha$. Thus, it is known that there is a significant difference in mathematical communication ability between students who received the Google Sites-assisted learning media and students in the direct instruction class. This is because the average post-test score of students who received the Google Sites-assisted learning media is greater than the average score of the direct instruction class. Therefore, it can be interpreted that the improvement in students' mathematical communication ability is more effective in the class that received the Google Sites-assisted learning media.

Analysis of the post-test data for the student self-confidence questionnaire in the class using the Google Sites-assisted

learning media and the class with direct instruction was also conducted. This aims to strengthen the data analysis related to the effectiveness of the Google Sites-assisted learning media in improving students' self-confidence. The results of the difference test for the average post-test scores of the two classes yielded a Sig. value of 0.000, with degrees of freedom (*df*), so the Sig. value $< \alpha$. Thus, it is known that there is a significant difference in self-confidence between students who received the Google Sites-assisted learning media and students in the direct instruction class. This is because the average post-test self-confidence score of students who received the Google Sites-assisted learning media is greater than the average score of the direct instruction class. Therefore, it can be interpreted that the improvement in students' self-confidence is more effective in the class that received the Google Sites-assisted learning media.

Evaluate

The evaluation stage in this research is the revision of the product based on comments and suggestions from experts and students. Based on the comments provided by the validators, it can be stated that the Google Sites-assisted learning media is feasible and can be used as learning media after revision.

This research resulted in a product of Google Sites-assisted learning media on the geometry of solid shapes material. The developed learning media is Google Sites-assisted, making it easy for users to access. Learning media is considered feasible if it meets three main criteria: validity,

practicality, and effectiveness (Sukmawati, *et al.*, 2023).

Based on the product validation results by material experts and media experts, the Google Sites- assisted learning media received a rating in the good category. Thus, the Google Sites-assisted learning media can be said to meet the quality of validity. Media validity is in the range of 80%- 85%, which shows that digital media in mathematics learning has proven to be valid and pedagogically beneficial (Devya, *et al.*, 2024).

The high practicality score from teachers and students indicates that the Google Sites-assisted learning media is suitable for user needs. This aligns with the opinion of Devya *et al.* (2024) who state that learning media with a practicality score above 80% is classified as practical and can be used directly in the learning process without requiring additional training.

The effectiveness trial results of the Google Sites-assisted learning media yielded good results, and this Google Sites-assisted learning media is said to be effective in improving students' mathematical communication ability and self-confidence. This aligns with the research results of Aziz (2023) which mentions that the application of Google Sites learning media can improve students' mathematical communication ability.

The Google Sites-assisted learning media is also effective in improving students' self-confidence. The effectiveness of the Google Sites-assisted learning media in improving communication ability and self-confidence is supported by the availability of interactive visual material that clarifies abstract

concepts like geometry of solid shapes; navigation features that make it easy for students to learn independently and access content flexibly; and the integration of engaging learning videos, worksheets, and practice problems. This finding aligns with the research results of Aziz (2023), Mufidah (2023), and Devya *et al.* (2024), who concluded that Google Sites-assisted learning media supports the improvement of students' mathematical communication ability, learning motivation, and self-confidence in mathematics learning.

IV. CONCLUSION

Based on the results and discussion presented, this research concludes that the Google Sites- assisted learning media on the Geometry of Solid Shapes material is declared feasible to use. This media meets the criteria for validity, practicality, and effectiveness as a learning media product. Findings supporting this conclusion are: (1) the validity of the learning media, based on the assessment results of the media and material validity, showed valid results with revisions, with a material achievement percentage of 83.56% and a media achievement percentage of 95.56%; (2) the practicality of the learning media, assessed from the student response questionnaire, obtained a percentage of 80%, showing results in the practical criteria; (3) the effectiveness of the learning media in improving mathematical communication ability, assessed from the mathematical communication ability test, showed that 72% experienced an increase in the moderate category, and there was a significant difference in mathematical

communication ability between students who used the Google Sites-assisted learning media and students who received direct instruction; (4) the effectiveness of the learning media in improving students' self-confidence, assessed from the self-confidence questionnaire, showed that 96% experienced an increase in the moderate category, and there was a significant difference in self-confidence between students who used the Google Sites-assisted learning media and students who received direct instruction. The development of this Google Sites-assisted learning media was only on a limited scale, so it is suggested for future researchers to continue the research on a larger scale and develop Google Sites-assisted learning media with a wider scope of material.

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