ar-Riyadhiyat
JOURNAL OF MATHEMATICS EDUCATION

Vol.6, No.1, July 2025, pp. 30-38
ISSN: 2775-8990 DOI: 10.47766/arriyadhiyyat.v6i1.5923

Interactive Learning Media Using Google Sites to Enhance Students' Understanding of Ratio Concepts in Grade VII

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Article Info

Article history:

Received February 7, 2025
Revised April 25, 2025
Accepted June 30, 2025

Keywords:

Google sites
Interactive Learning Media
Ratio Concepts
Mathematics Education
ADDIE Model

ABSTRACT (10 PT)

This study aims to analyze the effectiveness of Google Sites as an interactive learning medium for teaching ratio concepts to Grade VII students. Despite increasing access to digital tools in education, the adoption of web-based platforms like Google Sites remains limited due to technical constraints and a lack of training among teachers. To address this, a learning website was developed using the ADDIE instructional design model (Analysis, Design, Development, Implementation, Evaluation) and implemented through a Research and Development (R&D) methodology. The platform included structured explanations, interactive exercises, videos, and quizzes aligned with the curriculum. A total of 45 students participated in the implementation phase, and their responses were evaluated using a student questionnaire. The results showed that 84.8% of students found the material presented on the Google Site to be clear and easy to understand, and 83.2% reported that it helped them grasp ratio concepts more effectively. The platform was also rated positively for design and navigation (80.8%). However, student motivation for independent learning was relatively lower at 73.8%, indicating the need for further development of interactive and engaging features. These findings suggest that Google Sites is effective in supporting conceptual understanding in mathematics, and its integration with blended learning and gamification strategies is recommended to enhance student motivation and engagement in digital learning environments.

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INTRODUCTION

The digital transformation in education has underscored the urgent need for innovative learning approaches, particularly those that leverage technology to enhance instructional delivery and student engagement. In the era of Education 4.0, educators are expected to integrate digital tools into their pedagogical practices to meet the evolving needs of students. Among various technological advancements,

the use of web-based platforms such as Google Sites has gained attention for its potential to support flexible, dynamic, and student-centered learning environments (Puspita et al., 2021).

Google Sites, as a web development tool, allows teachers to design personalized instructional content that integrates multimedia elements—such as videos, images, hyperlinks, and downloadable materials—into a single, easily accessible platform. This fosters a more interactive and engaging learning experience. Several studies have shown that Google Sites can facilitate effective communication between teachers and students, allow for the storage and retrieval of learning materials, and enable the submission of assignments online (Maskar et al., 2021; Pratama et al., 2023). These features are particularly beneficial in mathematics education, where abstract concepts often require multimodal representation and repetitive access to materials.

Previous research has highlighted the positive outcomes of using Google Sites in various mathematical contexts. For instance, Jubaidah and Zulkarnain (2020) reported improved understanding of number patterns through video tutorials and online assignments. Similarly, Adzkiya and Suryaman (2021) found that Google Sites enhanced students' engagement in online English learning, while Devya et al. (2022) observed an increase in numeracy skills among elementary students learning fractions. These findings collectively suggest that web-based platforms can contribute meaningfully to conceptual understanding when designed effectively.

Despite its potential, the adoption of Google Sites in classroom instruction remains limited due to several constraints. These include teachers' lack of technical knowledge in developing content-rich websites, insufficient alignment of online materials with national curricula, and the persistent use of conventional teaching methods such as textbooks and printed worksheets. Furthermore, empirical data evaluating the effectiveness of Google Sites as an interactive learning medium for specific mathematical topics—such as ratios—are still scarce, particularly in Indonesian secondary school settings.

To address this gap, the present study aims to evaluate the effectiveness of Google Sites as an interactive learning medium for teaching ratio concepts to Grade VII students. This research adopts the Research and Development (R&D) method with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) to develop and assess web-based instructional materials. By focusing on the topic of ratios—which includes direct proportion, inverse proportion, and scale—the study explores how web-enhanced learning environments can improve students' conceptual understanding and engagement.

The novelty of this study lies in its specific focus on the integration of Google Sites within the mathematics curriculum for junior secondary education, particularly for ratio-related topics. While previous studies have explored general applications of digital platforms, few have systematically examined their development and impact using a structured instructional design model like ADDIE. Furthermore, the study includes empirical measurements of students' responses and levels of motivation, offering practical recommendations for improving digital content and pedagogical strategies in mathematics classrooms.

Ultimately, this research seeks to contribute to the growing body of literature on digital learning innovations by providing evidence-based insights into the design, implementation, and effectiveness of Google Sites as a teaching tool. The findings are expected to inform educators, curriculum developers, and policymakers about best practices for integrating web-based technologies into mathematics instruction, with the goal of enhancing both learning outcomes and student motivation.

METHOD

Design

This study employed a Research and Development (R&D) approach to develop and evaluate an interactive learning medium using Google Sites, with the aim of enhancing students' understanding of the topic of ratios in mathematics. The instructional design model adopted was the ADDIE model, which includes five phases: Analysis, Design, Development, Implementation, and Evaluation.

In the Analysis phase, the learning needs and challenges faced by students and teachers in the classroom were identified through interviews. This included an assessment of student characteristics, the current use of digital media, and the potential integration of Google Sites. In the Design phase, the structure and content of the website were planned, including explanations, sample problems, and interactive exercises aligned with the learning objectives. During the Development phase, the website was created based on the instructional design, incorporating multimedia elements and interactive features such as embedded quizzes.

In the Implementation phase, the developed Google Site was introduced and used in a classroom setting with Grade VII students to evaluate its usability and effectiveness. Finally, the Evaluation phase involved collecting student feedback and analyzing responses to determine the extent to which the media facilitated learning and engagement

Participants

The participants of this study were 45 students from a Grade VII mathematics class at a junior secondary school in Indonesia. These students were selected as the target group for implementation based on their curriculum coverage of ratio-related topics. In addition to students, mathematics teachers were also consulted during the early stages of analysis to gain insights into teaching practices and the feasibility of implementing web-based media in the classroom. The students were exposed to the developed Google Site during their mathematics lessons and were asked to interact with the platform both during and outside of class hours.

Instrument

The primary research instrument used in this study was a student questionnaire designed to measure perceptions of the usability and effectiveness of the Google Sites-based learning media. The questionnaire consisted of Likert-scale items addressing three main aspects: (1) clarity and accessibility of the material, (2) ease of navigation and design appeal, and (3) motivation and engagement with the learning process.

The questionnaire items were validated by education experts to ensure content validity and relevance to the research objectives. The students completed the questionnaire after using the Google Site, and the responses were analyzed quantitatively to assess the overall impact of the platform on students' learning experiences. The descriptive analysis included calculating mean scores and percentages to identify trends and areas for improvement.

RESULTS AND DISCUSSION

Result

This section presents the results of the research and development process following the ADDIE model: Analysis, Design, Development, Implementation, and Evaluation. Each phase is described in sequence to illustrate how the interactive learning media using Google Sites was designed, implemented, and assessed for its effectiveness in teaching ratio concepts to Grade VII students.

Analysis Phase

he initial analysis was conducted to identify the learning needs and obstacles experienced by both teachers and students in the context of ratio instruction. Data were collected through interviews with mathematics teachers and a small group of students. The results revealed that students frequently struggled to grasp abstract mathematical concepts presented in traditional textbook formats. Teachers indicated limited access to interactive teaching resources and minimal training in using digital tools like Google Sites.

Moreover, the analysis highlighted students' preference for multimedia-supported materials and their increasing familiarity with online learning platforms, especially following the COVID-19 pandemic. These findings supported the rationale for developing a web-based learning medium to improve accessibility, interactivity, and content clarity

Design Phase

Based on the findings from the analysis phase, the instructional media was designed using Google Sites. The website structure included several key components:

a. A **homepage** introducing the learning objectives and navigation guide
b. Detailed explanations of ratio concepts, including **direct proportion**, **inverse proportion**, and **scale**
c. Visual aids such as diagrams and embedded videos to support conceptual understanding

d. Interactive components including practice problems, quizzes, and downloadable materials

Figure 1. Homepage Interface of Google Site

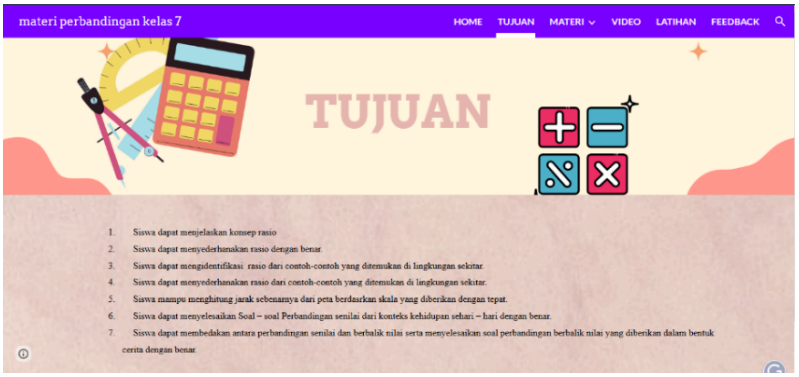

Figure 2. Learning Objectives Page

The design phase focused on ensuring user-friendliness and alignment with the curriculum. Accessibility features were prioritized to allow students to revisit content anytime and anywhere.

Development Phase

The website was developed based on the design blueprint. Instructional materials were created and uploaded to the platform, and multimedia elements were integrated to enrich the learning experience. Interactive quizzes were embedded using Google Forms, and video tutorials were added to reinforce key concepts.

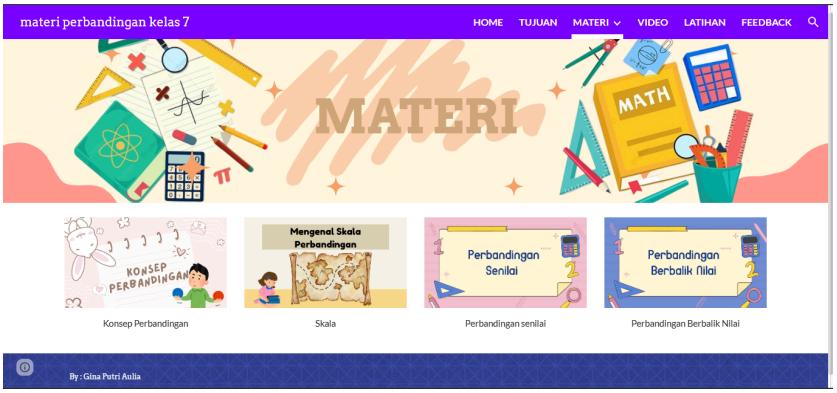

Figure 3. Learning Materials Interface

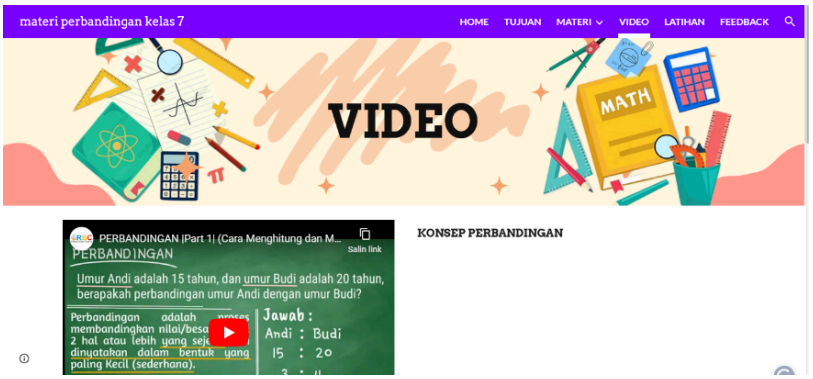

Figure 4. Embedded Video Content on Google Site

To ensure consistency and clarity, all content was reviewed by subject matter experts in mathematics education. Adjustments were made based on feedback to enhance visual presentation, navigation, and cognitive load management.

Implementation Phase

Following development, the Google Site was implemented in a Grade VII mathematics class consisting of 45 students. Students accessed the website during classroom sessions and were encouraged to use it for independent study. Teachers facilitated the learning process and guided students through the materials, including the interactive features.

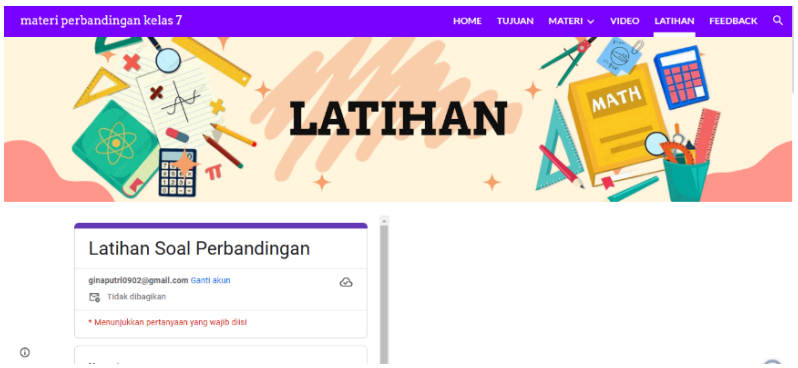

Figure 5. Interactive Practice Exercises Page

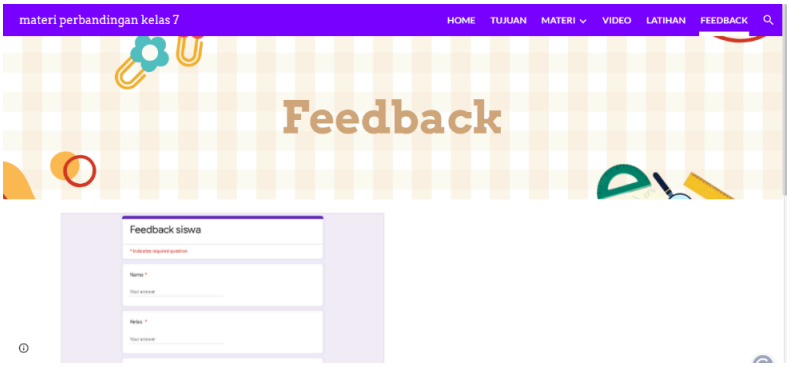

Figure 6. Student Feedback Form on Google Site

During the implementation, students engaged with various components of the website, including video explanations, self-paced quizzes, and downloadable exercises. Observations and informal interviews indicated that students were generally enthusiastic and found the platform easy to navigate.

Evaluation Phase

To evaluate the effectiveness of the Google Sites-based learning media, a student questionnaire was administered after the implementation phase. The questionnaire measured three aspects: clarity of materials, ease of use, and student motivation. The results from the 45 respondents are summarized in Table 1

Table 1. Students' Responses

Indicator	Total Score	Number of Respondents	Mean	Percentage
Clarity of materials	191	45	4.24	84.8%
Support in understanding ratio concepts	187	45	4.16	83.2%
Ease of navigation/design	182	45	4.04	80.8%
Motivation to learn via website	166	45	3.69	73.8%

The evaluation showed that students perceived the learning media as effective in presenting clear and accessible material (84.8%) and supporting conceptual understanding (83.2%). The interface design was generally well-received (80.8%), although student motivation for self-directed learning scored lower (73.8%), suggesting a need for improvement in interactivity and engagement features.

Discussion

The findings of this study demonstrate that the development and implementation of Google Sites as an interactive learning medium significantly enhanced students' understanding of ratio concepts in Grade VII mathematics. The high percentages for clarity of materials (84.8%) and conceptual comprehension (83.2%) confirm that the use of digital learning media can effectively support the acquisition of mathematical concepts that are often abstract and challenging when delivered using conventional methods. These findings are consistent with the studies of Jubaidah and Zulkarnain (2020) and Devya et al. (2022), who found that integrating Google Sites in mathematics instruction facilitates better comprehension through multimedia-based explanations and repeated access to materials.

The use of Google Sites enabled a flexible learning environment that accommodates both synchronous and asynchronous activities. Students could access explanations, practice problems, and video demonstrations at their own pace, which supports the principles of self-regulated learning. This finding aligns with Maskar et al. (2021), who highlighted that Google Sites can improve accessibility and resource management for both teachers and students. By integrating text, visual, and audio materials, the platform catered to diverse learning preferences, making it suitable for differentiated instruction in mathematics classrooms.

Moreover, the interactive structure of Google Sites—featuring hyperlinks, embedded quizzes, and downloadable worksheets—allowed students to engage actively with the content rather than passively consuming information. This interactivity not only increased understanding but also encouraged exploration and problem-solving, which are essential components of mathematical literacy. According to Adzkiya and Suryaman (2021), students' engagement tends to increase when digital media includes interactive features that simulate real-time feedback. Similarly, Rahayu et al. (2021) found that web-based learning environments foster a more stimulating atmosphere that enhances students' cognitive engagement compared to traditional media.

Despite the positive cognitive outcomes, student motivation was identified as an area requiring improvement. The motivation percentage (73.8%) suggests that some students were less inclined to learn independently through online platforms. This reflects findings by Rokhayati (2020), Mazaly and Saragih (2022) and Bintharingrum Hanatan et al. (2023), who observed that although web-based media can enhance

learning outcomes, they often lack the social and emotional interaction that drives intrinsic motivation. The current results therefore emphasize that technological innovation alone is insufficient to sustain learner engagement; pedagogical support and guided facilitation remain crucial components of effective digital learning.

One possible reason for the lower motivation levels could be the absence of interactive peer collaboration and gamified feedback. Prior studies, such as Mulyawati (2012), Maulidia and Lestari (2024) and Maharani et al. (2022), suggest that incorporating gamification elements—such as achievement badges, progress tracking, and leaderboards—can increase learners' enthusiasm and participation. Integrating these features into Google Sites could make learning experiences more dynamic and competitive in a constructive way, promoting deeper engagement. Furthermore, providing spaces for student discussion or comment-based interaction within the platform could enhance the sense of community in learning, reducing isolation during digital study sessions.

The structured implementation of the ADDIE model played a critical role in the effectiveness of the developed media. The systematic sequence—from need analysis to evaluation—ensured that each development stage addressed specific pedagogical objectives and contextual challenges. The Analysis and Design phases allowed alignment with the curriculum, while the Development and Implementation phases ensured usability testing and refinement based on learner feedback. This methodical approach distinguishes the study from other works that employ digital platforms without a formal instructional design model (Pramuditya & Noto, 2018; Prihatini et al., 2024). Consequently, this study contributes a replicable framework for designing technology-enhanced mathematics instruction.

The positive student responses toward clarity, usability, and visual design demonstrate that digital literacy among secondary school learners is sufficiently high to support web-based instruction. However, as noted by Rahmawati and Hidayati (2022), digital literacy must be accompanied by appropriate scaffolding strategies to ensure students not only access information but also process and apply mathematical reasoning effectively. Teachers must thus be trained to develop structured online materials and guide students in navigating them, particularly when transitioning from teacher-centered to learner-centered environments.

Finally, while the findings affirm the effectiveness of Google Sites as a web-based instructional tool, several limitations must be acknowledged. The study's scope was restricted to a single grade level and one specific topic—ratios—limiting the generalizability of the results. In addition, motivation was assessed through self-reported measures rather than behavioral observations or academic performance data. Future studies should expand sample diversity, include longitudinal designs, and incorporate mixed-method evaluations to better capture the impact of digital media on both cognitive and affective learning outcomes. Integrating **blended learning approaches**, as suggested by Kamilah et al. (2023), Rahmi, et al. (2023) and Prayudi et al. (2022), could also bridge the gap between online flexibility and traditional classroom interaction, thus maximizing both comprehension and motivation in mathematics learning.

CONCLUSION

This study explored the effectiveness of using Google Sites as an interactive learning medium for teaching ratio concepts to Grade VII students through a structured Research and Development (R&D) approach based on the ADDIE model. The findings indicate that the developed platform effectively enhanced students' understanding of ratio concepts, as evidenced by high levels of perceived material clarity (84.8%) and support in learning conceptual topics such as direct proportion, inverse proportion, and scale (83.2%). These outcomes affirm the potential of integrating web-based tools in mathematics instruction to address learning challenges associated with abstract content.

The research also revealed that students responded positively to the design and usability of the Google Site, with 80.8% indicating ease of use and comfort with the interface. These results suggest that digital platforms, when properly structured and aligned with curricular goals, can provide accessible and flexible learning opportunities. However, a notable limitation emerged in terms of student motivation, which scored comparatively lower (73.8%). This highlights the need for more interactive and engaging features within digital platforms to sustain learners' interest and encourage autonomous learning.

Based on these findings, several educational implications can be drawn. First, teachers should consider incorporating multimedia and interactive components into their teaching strategies to increase student engagement and understanding. Second, the integration of blended learning—combining digital platforms like Google Sites with face-to-face interactions—can serve to balance flexibility with guided

instruction. This hybrid approach is especially useful in fostering motivation, providing real-time feedback, and supporting collaborative learning experiences.

Future research should build upon this study by implementing the developed media across different schools, subjects, and student demographics to examine broader applicability and effectiveness. In addition, researchers are encouraged to explore the integration of gamification, adaptive learning features, and student analytics within web-based platforms to enhance personalization and engagement. Ultimately, the successful use of Google Sites in this study underscores the importance of thoughtfully designed digital tools in enriching mathematics education and preparing students for digitally integrated learning environments.

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