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AN ANALYSIS OF WEB BASED MULTIMEDIA USE IN TEACHING RATIO CONCEPTS IN JUNIOR HIGH SCHOOL

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ABSTRACT
One of the main problems in mathematics learning is students' perception that the subject is difficult and unengaging, often due to the lack of innovative learning media. This study is a descriptive quantitative research aimed at analyzing the use of web-based multimedia learning in teaching the topic of ratios. The study was conducted at SMP Negeri 10 Gorontalo using purposive sampling, involving 19 students as participants. Data were collected using a student response questionnaire based on four indicators: enjoyment, interest, conceptual understanding, and interface design. The questionnaire was validated by experts and analyzed using a 5-point Likert scale, with results presented as percentages for each indicator. The findings show that the *enjoyment* indicator reached 91.13% (very positive), *interest* 86.35% (very positive), and *conceptual understanding* 81.84% (positive). The overall average student response was 86.44%, categorized as very positive. These results indicate that web-based multimedia is an effective and efficient tool for mathematics instruction. Future studies are recommended to examine the effectiveness of this multimedia approach in other mathematical topics and across different educational levels to broaden the generalizability of the findings.
Keywords: mathematics; ratio; student response; web-based learning multimedia.

ABSTRAK
Salah satu permasalahan dalam pembelajaran matematika adalah persepsi siswa yang menganggapnya sulit dan kurang menarik, yang disebabkan oleh keterbatasan media pembelajaran yang inovatif. Penelitian ini merupakan penelitian deskriptif dengan pendekatan kuantitatif yang bertujuan untuk menganalisis penggunaan multimedia pembelajaran berbasis web pada materi perbandingan. Penelitian dilaksanakan di SMP Negeri 10 Gorontalo dengan menggunakan teknik purposive sampling, melibatkan 19 siswa sebagai sampel. Data dikumpulkan melalui angket respon siswa berdasarkan empat indikator: kesenangan, ketertarikan, pemahaman materi, dan tampilan. Angket divalidasi oleh ahli dan dianalisis menggunakan skala Likert (skor 1–5), kemudian diolah dalam bentuk persentase untuk masing-masing indikator. Hasil penelitian menunjukkan bahwa indikator senang memperoleh 91,13% (sangat positif), menarik 86,35% (sangat positif), dan pemahaman materi 81,84% (positif). Rata-rata keseluruhan respon siswa mencapai 86,44% dalam kategori sangat positif. Temuan ini menunjukkan bahwa multimedia pembelajaran berbasis web efektif dan efisien untuk digunakan dalam pembelajaran matematika. Penelitian selanjutnya disarankan untuk menguji efektivitas multimedia ini pada topik matematika lain dan pada jenjang pendidikan yang berbeda guna memperoleh generalisasi hasil yang lebih luas
Kata kunci*: matematika; multimedia pembelajaran berbasis web; perbandingan; respon siswa.*

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Introduction

Twenty-first century learning demands a transformation from traditional approaches toward learning that is active, participatory, and contextual. Learners are no longer positioned as passive recipients of information, but rather as active agents in constructing knowledge and developing critical thinking skills. This shift is particularly crucial in the context of mathematics education, which requires conceptual understanding, analytical abilities, and the application of logical reasoning in problem-solving (Sugeha et al., 2025).

Mathematics is a branch of science that involves arithmetic, logical thinking, and reasoning, and it is introduced as early as the elementary school level (Anwar et al., 2022). However, mathematics is often perceived by many students as a difficult and intimidating subject. This perception presents a significant challenge in the learning process. The lack of adequate learning resources further exacerbates the situation, making the teaching and learning of mathematics more difficult for both teachers and students. Ningtias et al. (2018) state that designing high-quality mathematics instruction often poses a challenge for teachers, partly due to difficulties in finding appropriate textbooks or instructional media.However, a one-size-fits-all approach is not always effective in mathematics instruction. Learners with varying levels of ability require instructional strategies that align with their individual learning styles. Novice students tend to benefit more from visualizations such as images, graphs, and animations, whereas more advanced students need instructional materials that promote deeper analysis and complex problem-solving (Chiu & Mok, 2017). Therefore, it is essential to utilize adaptive learning media that can accommodate the diverse needs of students.

With the rapid advancement of technology in the digital era, the educational process is now supported by a variety of digital platforms and tools that enable learning to become more dynamic. Technology not only facilitates computation, but also allows learners to access real-world data and phenomena, thereby creating learning experiences that are more engaging, contextual, and meaningful (Laurens et al., 2018; Lin et al., 2020; Takaendengan et al., 2024). In mathematics education, the use of interactive media such as graphs, diagrams, and simulations has been shown to enhance students' understanding of abstract concepts and contribute positively to learning outcomes, both in the short and long term (Schoenherr et al., 2024). Nevertheless, the integration of technology-based visualizations in education still requires further investigation to explore both the opportunities and challenges that arise (Schoenherr & Schukajlow, 2024). Several common obstacles include limited access to digital devices, insufficient teacher training in the use of technology-based media, and the inadequate readiness of educational institutions to implement technology optimally (Chaiarwut et al., 2025). Considering the problems mentioned, teaching and learning activities need to be supported by a process that allows students to actively engage in learning through Android-based e-modules; therefore, this study will focus on developing new learning media (Arjoni, et al., 2025).

To address these issues, the selection of appropriate and contextual learning media becomes a critical factor in ensuring that learning objectives can be effectively achieved.

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In the context of Indonesian education, the *Merdeka Curriculum* marks a turning point in instructional approaches, granting schools the autonomy to design and develop learning tools based on the needs of students and the conditions of their surrounding environment (Herwina, 2021; Suleman et al., 2023). This policy enables the design of mathematics instruction that emphasizes practical applications in daily life, allowing students to better understand the benefits and relevance of mathematics in real-world contexts (Daimah & Suparni, 2023; Fianingrum et al., 2023). One way to support this objective is through the use of technology, particularly web-based multimedia, which enables students to learn independently, flexibly, and in accordance with their individual learning styles.

Based on observations at SMP Negeri 10 Gorontalo, this school is one of the institutions that has implemented the *Merdeka Curriculum*, allowing for a diverse range of instructional models and media. One of the media used is web-based multimedia, which refers to a learning system that utilizes electronic devices to support the teaching and learning process. The use of this media offers several advantages, such as enabling students to learn independently, select materials according to their needs, and study anytime and anywhere as long as internet access is available. The supporting infrastructure at this school is also considered adequate, with facilities such as a computer laboratory and Wi-Fi network. Although web-based multimedia has been integrated into the learning process, further investigation is needed to understand students' responses to its use in order to evaluate its effectiveness and impact on content comprehension. Based on this context, the researcher intends to conduct a descriptive study analyzing the use of web-based comparative mathematics learning media in Grade VII at SMP Negeri 10 Gorontalo.

Research Methods

This study is descriptive quantitative research aimed at illustrating students' responses to the use of web-based multimedia learning on the topic of ratios. A quantitative approach was employed because the data collected were numerical in nature, obtained through questionnaires, and analysed statistically to generate an objective and systematic depiction of students' perceptions. The research was conducted in the second semester of the 2023/2024 academic year with seventh-grade students at SMP Negeri 10 Gorontalo, a school that has implemented the *Merdeka Curriculum* and actively uses web-based multimedia as part of mathematics instruction. A total of 19 students participated in the study. The sampling technique used was purposive sampling, selecting a class that had actively used web-based multimedia in learning the ratio topic.

The research instrument was a closed-ended questionnaire consisting of 10 items using a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." The questionnaire was developed based on three main indicators: enjoyment, interest, and conceptual understanding. Instrument validation involved expert review by two mathematics education lecturers and a pilot test on students outside the study sample. The reliability test using Cronbach's Alpha yielded a value of 0.84, indicating high internal consistency and the instrument's appropriateness for use.

The data collected were analysed using descriptive statistics with the following percentage formula:

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$$Student\ Response\ (\%) = \frac{Total\ Score\ Obtained}{Maximum\ Possible\ Score}\ x\ 100\%$$

The total score was the sum of all respondents' scores on each indicator, while the maximum score was calculated by multiplying the number of respondents, the number of items in the respective indicator, and the highest possible score (5). The resulting percentages were interpreted using the following categories: ≥ 85% (very positive), 70%–<85% (positive), 50%–<70% (less positive), and <50% (not positive). These categories were used to evaluate students' responses to various aspects of the multimedia used in instruction.

Results and Discussion

Results

The multimedia used in this study was developed by Tomaili et al. (2023), as shown in Figure 1. The use of this multimedia was analyzed through a questionnaire distributed to students of SMP Negeri 10 Gorontalo, focusing on the topic of ratios. The results of the questionnaire revealed various student responses to the web-based learning media utilized. Display of the learning multimedia as shown in the Figure 1 below.

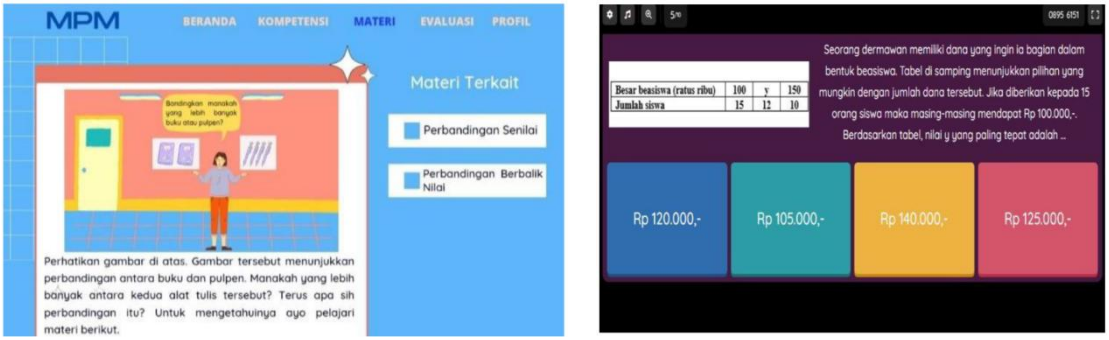

Figure 1. Display of the learning multimedia

Following the visualization of the multimedia in Figure 1, its effectiveness was evaluated through a questionnaire distributed to students. The percentage results of student responses are summarized in Table 1, which presents the outcomes across three main indicators: enjoyment, interest, and concept understanding. This table provides a comprehensive overview of students' perceptions toward the use of the learning multimedia. Percentage of student responses as shown in the Table 1 below

Table 1. Percentage of student responses

Indicator	Student Response	
	Average Score	Score Category
Enjoyment	91,13%	Very Positive
Interest	86,35%	Very Positive
Concept Understanding	81,84%	Positive
Overall Average	86,44%	Very Positive

Based on Table 1, it can be seen that the overall average of all statement items across the three indicators is 86.44%, which falls into the very positive category. More specifically, the enjoyment indicator received an average of 91.13%

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(very positive), the interest indicator scored 86.35% (very positive), and the concept understanding indicator scored 81.84%, which is categorized as positive.

Discussion

Students' response comprehension measured in the use of web-based multimedia is categorized into three indicators: enjoyment, interest, and conceptual understanding.

1. Enjoyment

The first indicator analysed is *enjoyment*, which consists of two statements. Based on the data in Table 1, the average score for this indicator reached 91.13%, falling into the very positive category. This result indicates that students felt happy and engaged during the learning process using web-based multimedia. Such enjoyment may arise from the learning experience being more engaging, less monotonous, and more accessible in terms of understanding the material.

This finding is in line with the other research (Hadijah, 2018; Rahmadi et al., 2024), which shows that learning multimedia is not only valid and practical to use, but also effective in creating interactive and enjoyable learning experiences. Sapriyah (2019) also asserts that multimedia greatly supports both students and teachers in the learning process, making it more effective and efficient. Furthermore, Rohani and Zulfah (2021) emphasize that web-based learning is time-efficient because it allows students to access learning materials independently. The flexibility is further supported by students' familiarity with digital devices such as Android smartphones. Nevertheless, the role of teachers remains essential in fostering a pleasant learning atmosphere and encouraging students' interest in learning, particularly in mathematics (Valentina & Wulandari, 2022).

2. Interest

The second indicator is interest, which consists of three statements. Based on Table 1, the average score for this indicator reached 86.35%, placing it in the very positive category. This result indicates that students perceive web-based multimedia learning as engaging, which in turn increases their enthusiasm for participating in the learning process. This finding aligns with the research of Maghfiroh, et al (2024), who stated that the use of interactive learning media contributes positively to mathematics instruction, particularly in facilitating the internalization of material through appealing and easy-to-understand visualizations. Furthermore, interactive multimedia allows students to interact directly with the learning content through available menu options. This helps prevent boredom and makes the learning experience more meaningful. Students are also able to represent or illustrate abstract mathematical concepts through concrete media. As a result, a dynamic, enjoyable, and efficient learning environment is created, which positively impacts students' interest and motivation to learn (Rahmawati & Hidayati, 2022; Sakiah & Effendi, 2021).

3. Conceptual Understanding

The third indicator is conceptual understanding, which consists of four statements. Based on Table 1, this indicator received an average score of 81.84%, categorized as positive. This result indicates that the use of web-based multimedia contributed positively to students' understanding of the material, particularly in the topic of ratios. The ease of access and operation of this media made the

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learning process more effective. The use of media in learning is essential to encourage students' active participation so that learning does not rely solely on the teacher's explanation or on students' imagination (Sule et al., 2024). In addition, web-based multimedia has been shown to improve the quality of the learning process and empower students to learn independently, which ultimately enhances their academic performance in class (Ihwono et al., 2023). Other studies also show that exploratory activities within multimedia offer students the opportunity to learn from failure, explore different problem-solving strategies, and develop new skills in overcoming challenges (Kusumawati et al., 2021). Therefore, multimedia that facilitates active exploration and independent learning plays a significant role in strengthening students' conceptual understanding.

Conclusion and Suggestion

Based on the research findings, it can be concluded that the use of web-based multimedia learning has a positive impact on students' learning experiences, particularly in the topic of ratios. The three measured indicators—*enjoyment*, *interest*, and *conceptual understanding*—showed results that fell predominantly within the positive to very positive categories. This indicates that the media not only created an engaging and enjoyable learning atmosphere but also supported students' understanding of mathematical concepts more effectively.

In line with these findings, it is recommended that teachers continue to utilize and develop web-based multimedia as part of an active and enjoyable learning strategy. Future researchers are encouraged to conduct further studies involving different subject matter and educational levels to gain a broader understanding of the effectiveness of web-based multimedia learning.

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