



Development of Differentiated Digital Flipbook Teaching Materials to Enhance Sixth-Grade Students' Mathematics Achievement

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ABSTRACT

This study aims to develop feasible, practical, and effective differentiated digital flipbook teaching materials to enhance the mathematics achievement of sixth-grade students in Madrasah Ibtidaiyah. The method used was Research and Development (R&D) with the ADDIE model covering the stages of Analysis, Design, Development, Implementation, and Evaluation. The research subjects consisted of 21 students, one teacher, and two expert validators. The product developed was a digital flipbook featuring videos and interactive content aligned with visual, auditory, and kinesthetic (VAK) learning styles. The results of the expert assessment showed that the teaching materials had a high level of feasibility, with 88.10% for the material and 95.83% for the media, while practicality was rated very good by the students (88.39%) and the teacher (91.67%). The small-scale and large-scale trials showed significant enhancements in learning outcomes, with an average N-Gain score of 0.6867 (moderate). These findings indicate that the differentiated digital flipbook teaching materials are considered feasible, practical, and sufficiently effective for improving the mathematics achievement of sixth-grade students.

Keywords: flipbook, digital, differentiated, mathematics, learning outcomes

INTRODUCTION

Mathematics learning is essentially abstract and requires a high level of analytical ability, so students, particularly elementary school students, often experience difficulties in understanding mathematical material [1][2]. Based on Piaget's theory, elementary school students, who are generally between the ages of 6 and 13, are in the concrete operational stage, in which they will find it easier to understand material when it is presented in a more concrete form [3][4][5]. This indicates that there is a need for learning media that can help explain abstract concepts in mathematics more concretely; thus, students will have a better understanding of the material [6].

The mathematics learning outcomes of sixth-grade students at MI Al-Falah in Gorontalo Regency indicate that achievement remains low, particularly in integer arithmetic operations. Based on classroom observations and discussions with the teacher, it was found that most students struggled to understand the concept of integer calculations, especially negative numbers, because the teaching materials used were still uniform and not yet personalized to students' readiness levels or learning styles. This condition causes students to struggle to understand abstract mathematical concepts, thereby affecting their learning outcomes.

The implementation of the Merdeka Curriculum, which has been applied in recent years, emphasizes differentiated learning, namely learning that accommodates differences in students' learning readiness, interests, and learning profiles. However, at MI Al-Falah, this approach has not been optimally implemented due to limited access to appropriate teaching materials. Teachers still use general learning resources that do not facilitate the diverse needs of students. On the other hand, current digital technology development provides opportunities for teachers to develop innovative teaching materials that are more adaptive and interactive, one of which is through digital media such as flipbooks [7].

Previous studies have widely utilized flipbooks in several subjects, such as Social Studies, arts, and Islamic Religious Education [7][8][9]. Several studies also show that flipbooks can increase students' interest and mathematics learning outcomes, yet they have not taken into account the learning styles possessed by each student [10][11][12]. This condition indicates that flipbooks have a positive impact on mathematics learning, but they have not been optimally utilized in the implementation of the Merdeka Curriculum.

Studies that specifically combine the digitalization of learning through flipbooks with

differentiated learning approaches within a single, structured teaching material design are still rare. Previous research has indeed developed digital teaching materials and differentiation approaches, yet most have not integrated both systematically. In addition, a few studies examine the practicality and effectiveness of differentiated digital teaching materials at the elementary school level [13][14].

Based on this gap, it is necessary to develop digital teaching materials that are not only interactive and engaging but also designed according to the principles of differentiated learning, namely, materials adapted to students' learning styles. The novelty of this study lies in integrating digital flipbooks with a comprehensive differentiation approach, which is expected to provide a more meaningful learning experience and significantly enhance mathematics learning outcomes.

Based on the description above, this study aims to develop feasible, practical, and effective differentiated digital flipbook teaching materials to enhance the mathematics learning outcomes of sixth-grade students at MI Al-Falah, Gorontalo Regency.

RESEARCH METHODS

This research used a development research method to produce digital flipbook teaching materials. The method used was Research and Development with the stages of the ADDIE model, namely analysis, design, development, implementation, and evaluation [15]. The ADDIE model was selected because its stages are clearer, can be replicated more easily, and are more flexible, particularly in integrating differentiation principles in digital learning [16].

The research was conducted at MI Al-Falah in Gorontalo Regency from May to October 2024. The research subjects consisted of one mathematics teacher and 21 sixth-grade students of MI Al-Falah, who were divided into two groups: a small-scale trial involving six students consisting of two visual students, two auditory students, and two kinesthetic students, while the large-scale trial involved 15 students consisting of five visual students, eight kinesthetic students, and two auditory students.

The selection of the class was based on observations and interviews with the teacher, which showed that differentiated teaching materials were not yet available in the sixth grade, even though the teacher is required to implement the Merdeka Curriculum.

Therefore, the sixth grade was selected as the focus of the study.

The research design in the trial stage used a one-group pretest-posttest design, which is one type of design in the pre-experimental approach [17]. In this design, students were given a pretest before using the digital flipbook. The learning process continued using the media, and at the end of the learning, students were given a posttest. The main objective is to determine the enhancement in students' learning outcomes resulting from the use of the digital flipbook.

The research procedure followed the ADDIE model. In the analysis stage, an assessment was conducted, ranging from problems with teaching materials to the identification of students' learning styles. The design stage included the design of differentiated digital teaching materials and research instruments. The development stage involved creating the digital flipbook, followed by validation from material and design experts and product revision, while the implementation stage was carried out through small- and large-scale trials in the sixth grade at MI Al-Falah. The evaluation stage emphasized continuous enhancement based on the trial results.

The instruments used in this study were a student learning style instrument for initial identification, a feasibility assessment instrument to determine the feasibility and practicality levels of the digital flipbook teaching materials, and a learning outcome test instrument to evaluate the effectiveness of the digital flipbook teaching materials. The data were analyzed in three aspects, namely feasibility, practicality, and effectiveness.

1. Feasibility Analysis

The feasibility instrument used a Likert-scale questionnaire with a range of 1 to 4, administered to the material expert validator and the media expert validator. To calculate feasibility, the following formula was used [18].

$$X_i = \frac{\sum_{j=1}^m I_{ij}}{m}$$

where X_i = the average score of aspect i ; I_{ij} = the average score of aspect i for indicator j ; m = the number of indicators

$$v = \frac{X_i}{n}$$

where v = the feasibility level, and n = the number of aspects

Table 1. Feasibility Categories

Average expert rating	Criteria
$1 < v < 2$	Not Feasible
$2 < v < 3$	Less Feasible
$3 < v < 4$	Feasible
$v = 4$	Very Feasible

2. Practicality Analysis

The practicality analysis was obtained from the average scores calculated from the response questionnaires of both the mathematics teacher and the students. The formula used is as follows [19].

$$P = \frac{\sum X}{\sum Xt} \times 100\%$$

where P is the percentage score, ΣX is the total score obtained, and ΣXt is the maximum score.

Table 2. Practicality Categories

Percentage Score (%)	Criteria
$80 < P \leq 100$	Very practical
$60 < P \leq 80$	Practical
$40 < P \leq 60$	Less practical
$20 < P \leq 40$	Not practical
$0 < P \leq 20$	Very impractical

3. Effectiveness Analysis

Effectiveness was measured using the N Gain score to assess the effectiveness of the enhancement in learning outcomes.

$$N - Gain = \frac{\text{Posttest Score} - \text{Pretest Score}}{\text{Ideal score} - \text{Pretest Score}}$$

The N Gain values were categorized into three levels, namely high (≥ 0.7), moderate (0.3–0.69), and low (< 0.3) [20].

RESULTS AND DISCUSSION

1. Analysis Stage

In the analysis stage, problem identification was carried out, including reviewing the digital teaching materials used in sixth grade and identifying students' learning styles. Based on the results of the teaching material analysis and interviews with the mathematics teacher, it was found that the sixth-grade mathematics teaching materials still relied on internet sources and did not use standardized materials. The unavailability of these teaching materials was due to the implementation of the Merdeka Curriculum, which had only begun to be applied this semester. The absence of these teaching materials will undoubtedly affect the success of the learning process.

In previous studies, it was found that teaching materials can determine the success or failure of a learning process [21]. Teaching materials that are well-designed and structured will enable students to learn more easily in an independent manner, so that they can review the material again at home [22]. This

is reinforced by the findings of Tili et al. in a meta-analysis, which concluded that the availability of adequate, openly accessible digital learning resources contributes to enhanced students' academic achievement. The study emphasized that the integration of structured, easily accessible, and interactive learning resources significantly enhances students' academic achievement and supports students' learning independence [23]. Therefore, sixth-grade students at MI Al-Falah require mathematics teaching materials that not only align with the Merdeka Curriculum but are also adapted to the students' learning needs and characteristics.

Students' learning characteristics were analyzed based on their learning styles. Learning style is understood as the way individuals acquire information involving human sensory functions [24][25]. Three types of learning styles can be applied, namely visual, which is learning by seeing, auditory learning, which is learning by listening, and kinesthetic learning, which is learning by performing activities [26].

At MI Al-Falah, the researchers identified students' learning styles using a diagnostic questionnaire instrument. This instrument consisted of 24 statement items that measured students' tendencies toward the three learning style categories. The results of the identification are presented in Figure 1, which illustrates the distribution of students' learning styles at MI Al-Falah.

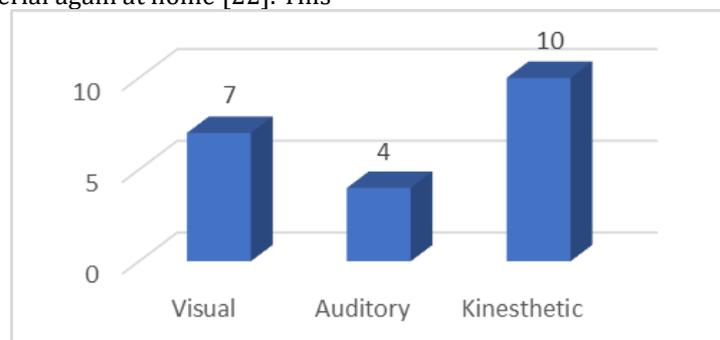


Figure 1. Learning Styles of Sixth-grade Students

Based on Figure 1, most sixth-grade students at MI Al-Falah have a kinesthetic learning style (10 students, 47.62%), followed by a visual learning style (7 students, 33.33%), with the remaining 4 students (19.05%) having an auditory learning style.

These findings indicate that the sixth-grade students at MI Al-Falah have different learning styles. This becomes the basis for selecting the

design of the digital teaching materials in this study. For visual and auditory students, video learning is provided in the digital flipbook so that students can learn by seeing and listening to the material, making what is initially abstract become something concrete, while kinesthetic students are provided with supporting media in the form of number cards and student worksheets (LKPD) that allow them to

perform physical activities to understand the integer arithmetic material. All of these are included in the digital flipbook.

The results of this initial identification indicate that the development of differentiated teaching materials is very important, as students have different needs and learning styles. This finding is also in line with previous studies, which showed that learning tailored to learning styles can improve student engagement and learning outcomes. Ekwarda et al. [27] stated that the implementation of the Visual, Auditory, and Kinesthetic (VAK) learning model resulted in a significant enhancement in learning outcomes in chemistry material. In addition, a classroom action research study by Budiyo et al. [28] showed that the use of marked card media in mathematics learning, particularly in integer material, significantly enhanced students' learning outcomes. Another study by Nasiha and Nurhayati [29] showed that a learning process adapted to students' learning styles can make learning more engaging and enhance learning outcomes.

Overall, these studies provide empirical support that a differentiation approach based on learning styles, as applied in this study, has a strong scientific foundation.

2. Design Stage

In this stage, the researchers designed differentiated teaching materials in the form of digital teaching materials presented as a flipbook. This stage began with developing a content framework based on the learning outcomes in the Merdeka Curriculum, collecting references on sixth-grade material aligned with the curriculum, designing instructional content, gathering learning videos for visual and auditory students, and providing activities for kinesthetic students.

The development of the instructional content included theoretical concepts, mathematical formulas, and evaluation questions. The questions were arranged by difficulty level. The learning videos were obtained from YouTube. Canva was used for the development and design of the digital book, while Heyzine was used to create the flipbook. Canva was used due to the convenience of its features and a variety of attractive designs that facilitated the

researchers in developing attractive teaching materials [30]. Meanwhile, the Heyzine application was selected because it is capable of producing flipbooks that support the embedding of videos and images, resulting in a more interactive display [31].

In contrast to the studies of Nurhayati et al. and Chairunnisa, which only focused on the use of flipbooks as learning media [10][11], this study incorporates a differentiation aspect based on students' learning styles, allowing students to learn in a way that best suits their needs.

3. Development Stage

During the development stage, media and materials experts conducted a feasibility assessment of the draft differentiated digital teaching materials. The results were then used as the basis for the first stage of revision. Based on the material expert's evaluation, several aspects still need improvement, such as adjusting the item instructions to the types of questions provided. The instructions for multiple-choice questions differ from those for short-answer or essay questions. On the "Kata Pengantar" (Foreword) page, the recommended term is "Prakata" (Preface) if the introductory text is written by the author of the book. The term "Kata Pengantar" is used if the introduction is written by someone else, not the author of the book. The practice questions provided should be adjusted to the difficulty level: easy, moderate, or difficult.

In addition to the assessment from the material expert, there was also an assessment from the media expert. Several suggestions for improvement were provided, namely: the layout of the media should be changed from portrait orientation to landscape to optimize the display on smartphone devices; the font size in the media content needs to be increased so that it is proportional to the background components; the front and back cover designs are recommended to be made more engaging by adding cartoon illustrations of children that are appropriate for elementary school age, so that they can increase students' interest; similar to the recommendation from the material expert, the practice questions also need to be arranged based on levels of difficulty. Figures 2 and 3 present the results of the feasibility assessment.



Figure 2. (a) Before assessment; (b) After feasibility assessment



Figure 3. (a) Cover before assessment; (b) Cover after feasibility assessment

Figure 2 shows that the textbook was initially displayed in portrait mode and was changed to landscape mode per the media expert's recommendations. The landscape orientation provides a wider visual space, allowing a more proportional presentation of content and illustrations. This aligns with the media expert's feasibility assessment, which emphasized that a landscape display is better suited to students' digital devices, making it easier for them to read and increasing their comfort in learning.

Figure 3 displays the cover design before validation, which was later changed to a display with many child character illustrations to achieve a more appealing visual effect and make it suitable for sixth-grade elementary school students. This modification was based on research showing that attractive visual elements can increase students' attention and create a positive first impression of the teaching materials. For example, Wasito et.al [32] found that visual media can motivate students to learn. Annisa et. al reinforce this [33] who showed that illustrations and animations can increase students' interest in learning. These findings indicate that the expert validation process makes an important contribution to improving the quality of the teaching materials. The change in orientation from portrait to landscape and the adjustment of the cover design make the flipbook display more proportional, appealing, and aligned with students' needs.

The design improvements align with the

Table 3. Feasibility Assessment Results

Expert	Aspect	Average per Aspect (Xi)	Feasibility Level
Material	Content feasibility	3.5	3.725
	Material organization	3.83	
	Material coverage	4	
	Language	3.57	
Media	Presentation	3.8	3.82
	Design	3.84	

Based on Table 3, the assessment of the teaching materials showed that the material aspect received an overall average score of 3.725, indicating that the content, organization, and coverage of the material, as well as the language aspect, were assessed as feasible by the material expert. This shows that the material preparation is appropriate, both in terms of sequential concepts, relevance to

findings of previous studies. The study by Pakaya et al. [34] emphasized that the visual layout in flipbooks plays an important role in increasing students' interest. In addition, Nafingah dan Suciptaningsih [35] also showed that adding attractive image illustrations can enhance the appeal of digital flipbooks. Therefore, the design changes applied to this flipbook are supported by strong empirical evidence and reinforce that the visual aspect is an important component in the development of digital learning media.

Next, the validation instruments completed by the material and media validators were analyzed in accordance with the procedure. The data were obtained from assessment sheets that used a scale of 1 to 4 and included evaluations of content feasibility, material organization, material coverage, and language aspects for the material validator, while the media validator assessed presentation and design aspects. Each validator provided scores for each indicator based on their perceptions.

The data obtained in the form of scores for each indicator were then used to calculate the average score of each aspect (Xi) using Equation (1), while the feasibility level of the material expert and media expert was calculated using Equation (2) to determine the product feasibility category. The calculation results were interpreted based on the criteria in Table 1. The final feasibility assessment scores are presented in Table 3.

the basic competencies, and ease of understanding for students.

The media aspect received a slightly higher overall average score of 3.82, indicating that the media expert found the presentation and design feasible. This was due to the textbook's digital layout, which appeared neat, consistent, visually attractive, and easy for students to use. This finding is

consistent with the study by Nurhayati et al. [10], which was considered feasible by validators because it presented information visually and systematically in the flipbook format. This consistency reinforces the idea that the use of interactive digital media, such as flipbooks, has advantages for visually presenting material and attracting more students' attention.

The strength of these teaching materials lies in the well-structured content and visual design that facilitate students' information retrieval, particularly through the inclusion of automatically played learning videos that allow students not only to read the material but also to listen to engaging animated learning videos. However, the limitation is that the number of validators and the assessed feasibility aspects are still limited. Further evaluation can be carried out by involving more experts to improve the objectivity of the product feasibility results.

Overall, the results of the feasibility assessment indicate that the differentiated digital teaching materials developed meet quality standards and are feasible for use in mathematics learning,

particularly in the topic of integer arithmetic operations.

4. Implementation Stage

During the implementation stage, the revised product draft was tested in sixth-grade mathematics instruction at MI Al-Falah. The trial consisted of two types, namely a small-scale and a large-scale trial. In the small-scale trial, the researchers involved 6 students, comprising 2 visual, 2 auditory, and two kinesthetic students, while in the large-scale trial, there were 15 students, comprising 5 visual, 8 kinesthetic, and 2 auditory students. The learning process consisted of four meetings, with the main topic being "Integer Arithmetic Operations." The evaluation of learning outcomes was conducted at the beginning (pretest) and at the end of the learning (posttest) to assess students' mastery of integer arithmetic operations. After learning, students were also asked to fill out a feedback questionnaire after using the teaching materials. The recapitulation of the questionnaire results from students and teachers in the small-scale and large-scale trials is presented in Table 4.

Table 4. Recapitulation of Practicality Assessment Results

No.	Trial Type	Response (%)	
		Students	Teacher
1	Small-scale	90.10	91.67
2	Large-scale	86.67	
	Average	88.39	91.67
	Description	Sangat praktis	

Referring to Table 4, the average percentage of students' responses to the digital textbook assessment is 88.39%, which is categorized as very practical. This result indicates that students find the provided textbook easy to use, quite engaging, and helpful in understanding the material more quickly. This is because presenting the material in visual, audio, and interactive formats allows students to learn according to their preferred learning styles. Thus, the learning experience becomes more personal and more meaningful for students.

The teacher's response also showed a very high practicality percentage of 91.67%. This strengthens the finding that this digital textbook is not only practical for students but also assists teachers in the learning process. According to the teacher, the digital flipbook greatly helps organize the learning flow, provides more varied media, and supports the implementation of the Merdeka Curriculum, which emphasizes differentiation based on students' needs. This factor makes this digital teaching material product assessed as very practical by the two direct users, namely, students and teachers.

The digital teaching materials developed in this study have the main strengths of visual design, content, and alignment with students' needs in the field; thus, they are not only theoretically feasible but also practical to use. However, this study has a

limitation, namely that the trial was conducted at a single school with a limited number of subjects, thereby limiting the generalizability of the results.

This finding is in line with the study by Nurhayati et al., which found that the developed flipbook achieved very good results and was practical to use in mathematics learning [10]. This indicates that interactive digital media, such as flipbooks, can be an effective solution for improving learning efficiency, particularly in line with the Merdeka Curriculum. In addition, this differentiated digital teaching material can also enrich the literature on the development of digital-based learning media.

5. Evaluation Stage

The evaluation was conducted at this stage to determine the extent to which students achieved mastery of the learning objectives after using the textbook, and to provide feedback on the development of the teaching materials. A multiple-choice test on integer operations was used, with the pretest and posttest results compared to the predetermined minimum mastery criterion (KKM), which was 70.

a. Small-Scale Trial

The evaluation was conducted at the beginning of learning, before the implementation of the digital textbook (pretest), and after learning with the digital textbook (posttest).

Figure 4 presents the results of the small-scale evaluation.

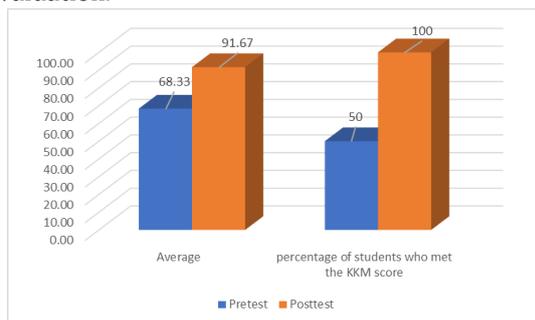


Figure 4. Learning outcomes of students in the small-scale trial

Based on Figure 4, the average pretest score in the small-scale trial was 68.33 (below the minimum mastery criterion, $KKM = 70$), while the average posttest score was 91.67. This shows that the students' scores increased after using the digital teaching materials. In addition, Figure 4 shows that in the pretest, only 50% of students achieved mastery or met the KKM score, whereas in the posttest, 100% of students achieved mastery or met the KKM score. This illustrates a significant enhancement in the percentage of students mastering the material.

This enhancement indicates that the differentiated digital teaching materials had a positive effect on understanding integer concepts. The main factors affecting this enhancement include integrating visual media and videos to support visual and auditory students, and using number cards to help kinesthetic students manipulate tangible objects. These three approaches make it easier for students to relate the abstract concept of integers to a concrete and interactive learning experience.

The results of the small-scale trial provide initial evidence that the differentiated design of the digital textbook has produced the expected outcomes. However, the limited number of students involved has not yet provided a depiction of students' abilities on a larger scale. A large-scale trial is needed to assess the consistency of the results and ensure the effectiveness of the teaching materials with a more diverse population.

b. Large-Scale Trial

The evaluation was conducted at the beginning of learning, before the implementation of the digital textbook (pretest), and after learning with the digital textbook (posttest). Figure 5 shows the evaluation results for the large-scale trial.

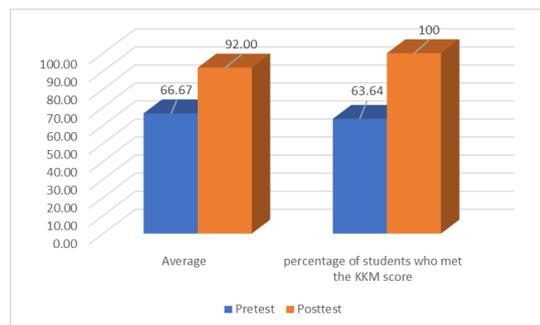


Figure 5. Learning outcomes of students in the large-scale trial

As shown in Figure 5, the average pretest score in the large-scale trial was 66.67, still below the minimum mastery criterion (KKM) of 70, while the average posttest score reached 92. The enhancement in students' learning outcomes was also evident in the percentage of students who achieved mastery. If previously only 63.64% of students achieved mastery in the pretest, after the learning process, it increased to 100% in the posttest. In other words, the use of the differentiated digital textbook had a positive effect, with all students eventually achieving the KKM. This enhancement in learning outcomes cannot be separated from the integration of audiovisual media, including learning videos and student activities using marked number cards, which support visual, auditory, and kinesthetic learning styles.

This finding also reinforces the results observed in the small-scale trial. Thus, the use of digital teaching materials on a larger scale continues to enhance students' learning outcomes.

The advantage of the large-scale trial stage is its stronger validation, as it was conducted with a larger, more heterogeneous sample. However, since the large-scale trial was conducted at only one school, the results cannot be generalized. The characteristics of schools, technological support, and teacher readiness can vary; thus, these findings need to be further examined in a broader population.

The results of this study are consistent with those of Nurhayati et al. [10] yang menemukan bahwa media flipbook mampu meningkatkan hasil belajar matematika siswa. Selain itu, Ambarwati, et.al [36] menemukan bahwa media flipbook berbasis pemecahan masalah sangat layak dan efektif meningkatkan capaian siswa. Kesamaan hasil ini menunjukkan bahwa media flipbook digital dalam menjadi media pembelajaran yang dapat diintegrasikan dengan pembelajaran berdiferensiasi.

The practical implication of these findings is that the digital textbook has the potential to be applied in mathematics learning, particularly in the Merdeka Curriculum. These findings can also serve as an important input for teachers to

consider the use of interactive digital media to make learning more interesting.

c. Effectiveness Analysis

The effectiveness of the flipbook teaching materials was measured to determine the enhancement in students' learning outcomes

Table 5. N Gain Test Results

	Mean	Standard Deviation
N-Gain Score	0.6867	46.03
N-Gain Percent	68.67	

The results presented in Table 5 show that the average N Gain score of 0.6867 (68.67%) falls into the medium category according to Hake's classification. This value indicates that the use of differentiated digital teaching materials helped students better understand the material. The enhancement in the medium category indicates that most students experienced learning progress, although it has not yet reached the high N-Gain category. This provides an overview of how the differentiated design and integration of digital media have successfully made learning more effective than conventional learning.

In addition, the standard deviation of 46.03 indicates variation in improvement among students, with some improving above the average and others not. This variation may be caused by several factors, such as differences in students' initial abilities, differences in their learning styles, and the level of activeness in utilizing the features of the digital flipbook. Students with higher initial abilities tend to show greater improvement because they can use digital content more quickly than students with lower initial abilities, who tend to require more time. These findings indicate that although the digital teaching materials are already sufficiently effective, there is still a need to provide more specific additional support, for example, by adjusting supplementary materials for students who have not yet achieved maximum enhancement, providing additional exercises, or offering more intensive individual guidance. With such strategies, enhancements in learning outcomes can be more evenly distributed and have the potential to reach the high N-Gain category, thereby further optimizing the quality of mathematics learning in elementary schools.

These findings are consistent with the meta-analysis study by Tlili et al. [23], which emphasized that interactive, open-access digital teaching materials have a positive effect on enhancing students' learning outcomes. Ambarwati et al. also found similar results, namely that digital flipbooks were effective in increasing mathematics learning outcomes because they combine strong visualization and interactivity, enabling students to understand concepts more deeply.

In other words, this study strengthens the

after using the differentiated digital flipbook materials. The effectiveness testing was conducted using the N-Gain test to assess the effectiveness of the differentiated digital teaching materials implemented at MI Al-Falah. Table 5 presents the N Gain testing results.

evidence that developing digital teaching materials based on the ADDIE model and differentiated learning is not only feasible and practical but also effective in improving the quality of mathematics learning, while also opening opportunities for further optimization to achieve a high N-Gain category.

CONCLUSION

Based on the study's results, it can be concluded that the development of differentiated digital flipbook teaching materials for sixth-grade students at MI Al-Falah Gorontalo has successfully met the three main criteria: feasibility, practicality, and effectiveness in supporting mathematics learning. The developed product was assessed as feasible by material and media experts. The differentiated digital flipbook was also rated as very practical to use, with practicality levels of 88.39% among students and 91.67% among teachers. In addition, this digital flipbook was shown to be very effective in improving learning outcomes, as indicated by 100% mastery in both the small-scale and large-scale trials and an N-Gain score of 0.6867 in the medium category. Thus, the differentiated digital flipbook can serve as an alternative teaching material that supports the implementation of the Merdeka Curriculum and has the potential to improve the quality of mathematics learning in elementary schools.

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