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Development of Discipline-Based Character Education Media on the Learning Outcomes of Fifth-Grade Students

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Abstract

The limited use of learning media in schools has hindered the effective implementation of learning, particularly in integrating discipline character education. Therefore, developing learning media is expected to support the implementation of discipline character education while improving students' mathematics learning outcomes. This study aimed to develop learning media based on discipline character education that meet the criteria of validity, practicality, and effectiveness. The study employed the Research and Development (R&D) method using the 4-D development model, consisting of the define, design, develop, and dissemination stages. The development process included media design, expert validation, and field testing. The results showed that the media and design validation achieved an average score of 3.86, while the material validation obtained an average score of 3.75, both categorized as highly valid. The effectiveness test yielded a score of 94.73%, indicating that the media were highly effective, whereas the practicality test based on students' responses reached 93%, indicating that the media were highly practical. These findings demonstrate that the developed learning media based on discipline character education are valid, practical, and effective for improving mathematics learning among fifth-grade students at SD Negeri 203 Bongkamanu.

Keywords Discipline Character Education; Learning Media; Mathematics Learning Outcomes

INTRODUCTION

Education is a conscious effort to prepare learners for their future roles through teaching and learning activities and/or educational processes, enabling them to develop self-control, noble character, personal integrity, and religious spirituality that are essential for themselves, the nation, and the state, as stipulated in Law No. 20 of 2003 on the National Education System. The teaching and learning process can be conducted flexibly across various places and times because, fundamentally, education is a lifelong journey that continues throughout an individual's life.

Education is defined as an instructional process involving interactions between educators

and learners. Through these interactions, educators are expected to stimulate students' intellectual development while fostering noble character and moral values through meaningful guidance. The family and the community constitute essential foundations for nurturing critical thinking skills and enhancing students' understanding. Teachers serve as the primary driving force and play a pivotal role in sustaining the educational process. Through structured programs designed by educational institutions, education aims to produce students who are not only academically competent but also capable of critically understanding personal issues and the social realities surrounding them. According to Supriatna and Asmahasanah (2019), the fundamental concept of education emphasizes the teaching of values that enable students to develop their innate potential while shaping and strengthening their personality, disposition, and character.

Elementary School Teacher Education (PGSD) is a teacher preparation program that equips prospective educators with the knowledge and competencies required to become effective teachers and mentors for elementary school students. Elementary school teachers are responsible not only for facilitating students' academic development but also for fostering their personal growth, as they serve as facilitators in providing the knowledge and skills necessary for students to continue to higher levels of education.

The undergraduate (Bachelor's degree) Elementary School Teacher Education (PGSD) program was established in response to the growing public demand for improving the academic qualifications of teachers and in accordance with Law No. 14 of 2005 concerning Teachers and Lecturers. Teachers' instructional performance is reflected in the quality of students' learning outcomes. According to Anugraheni (2016), the teaching and learning process can be carried out effectively when the delivery of instructional materials is able to motivate students through engaging learning approaches. Therefore, teachers are required to carefully prepare diverse instructional designs from the outset in order to maximize students' participation and active engagement in the classroom.

Mathematics has consistently contributed to the growth and advancement of various fields of knowledge, both in terms of theoretical development and practical application in everyday life. Fundamentally, mathematics is the study of patterns and order. Its body of knowledge is organized hierarchically in a structured and systematic manner, progressing from fundamental concepts to increasingly complex theories. Problem-solving is not merely the ultimate objective of learning mathematics; rather, it serves as a strategic means of facilitating the internalization of mathematical concepts and the development of students' mathematical competencies (Wariyanti et al., 2021).

In the teaching and learning process at the elementary school level (SD/MI), instructional media constitute one of the most influential factors in facilitating student learning. Instructional media are particularly beneficial for students who are in the concrete operational stage of cognitive development, as they help them understand abstract concepts or topics that are difficult to explain through verbal instruction alone. Complex learning materials can be more easily understood when presented with the support of instructional media, enabling students to

grasp the concepts more effectively (Batubara, 2017). The mastery of essential competencies and learning content is one of the primary objectives of every instructional activity (Masykur, 2017). Instructional media that incorporate digital technology and Information and Communication Technology (ICT) have proven to be highly effective tools for enhancing students' learning outcomes. The integration of digital technology has also transformed the educational landscape and reshaped instructional paradigms. Given the significant influence of technological advancements, integrating digital tools into classroom instruction has become an essential responsibility for teachers. Competence in utilizing educational technology plays a vital role in strengthening teachers' pedagogical and professional competencies while simultaneously fostering students' character development.

Referring to Law No. 20 of 2003, the implementation of character education is intended to develop individuals with strong character that reflects the identity and values of the Indonesian nation. In practice, the Ministry of National Education (Kemendiknas) has identified 18 core character values derived from religious principles, Pancasila, Indonesian culture, and the goals of national education. These values include religiosity, honesty, tolerance, discipline, creativity, hard work, independence, democracy, curiosity, national spirit, patriotism, appreciation of achievement, communicativeness, love of reading, responsibility, and social and environmental awareness. Among these core values, the present study specifically focuses on the development of students' discipline.

Accordingly, the instructional materials presented to students are integrated with the value of discipline through the use of the designed instructional media. The consistent cultivation of this value in students' daily social interactions is expected to encourage them to make meaningful and positive contributions to their surrounding environment.

The observations conducted at SDN 203 Bongkamanu identified several challenges in the teaching and learning process. One of the primary issues was the limited use of instructional media, which has hindered the effective implementation of classroom instruction, particularly in integrating the value of discipline within character education. The learning process continues to rely primarily on teachers' manuals and student textbooks, resulting in the suboptimal implementation of character education in mathematics instruction. Therefore, the development of instructional media is expected to provide an effective solution for supporting the integration of discipline-based character education while simultaneously improving students' mathematics learning outcomes.

The discipline-based character education instructional media developed in this study are expected to fulfill the criteria of validity, effectiveness, and practicality in improving students' mathematics learning outcomes. The feasibility of the research instruments is determined based on the cumulative results of the evaluations conducted during the field implementation. To ensure the accuracy of the data regarding the effectiveness of the discipline-based instructional media, product validation and research instrument validation are essential. This research and development study was designed to produce mathematics instructional media that integrate the value of discipline and can be used independently by students to support classroom learning

activities.

METHODS

This study uses a Research and Development (R&D) approach with a 4-D development model based on Thiagarajan's theory, which consists of four stages: defining, designing, developing, and disseminating. This study aims to develop media based on discipline character education for students' mathematics learning outcomes. This study was conducted at SD Negeri 203 Bongamanu with 5th grade students as research subjects.

The research data were collected using several instruments, including a media validation sheet to assess the validity of the instructional media, a mathematics achievement test to evaluate its effectiveness, and a student response questionnaire to determine its practicality. Data collection was carried out through experimental procedures and documentation. The collected data were analyzed by examining the validity, practicality, and effectiveness of the developed product. The validation process was conducted by subject matter experts as well as media and instructional design experts, while the student response questionnaires and mathematics achievement tests were administered to fifth-grade students at SD Negeri 203 Bongkamanu.

The conceptual framework underlying the development of discipline-based character education instructional media to improve students' mathematics learning outcomes is presented as follows.

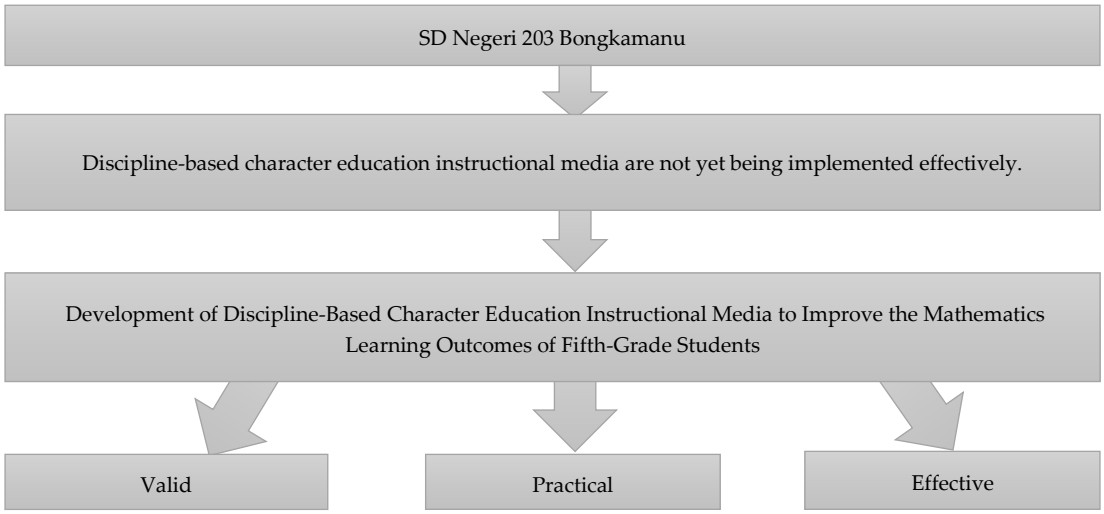

Figure 1. Conceptual Framework of the Study

FINDINGS AND DISCUSSION

This study employed a Research and Development (R&D) approach by adopting the Four-D (4-D) development model. Through this development process, an innovative interactive instructional media integrating discipline-based character education was produced to enhance students' mathematics learning outcomes. Each stage of the development process was systematically interconnected, leading to the final product that met the established quality standards and was considered suitable for implementation in elementary schools. A detailed

description of the outcomes achieved at each stage of the 4-D development model is presented below.

1. Define Stage

During the define stage, an analysis of the existing conditions in the field was conducted. This stage included several key activities, namely a preliminary analysis, learner analysis, material analysis, concept analysis, and assessment analysis.

a. Preliminary Analysis

The data required for this study were initially collected through direct classroom observations conducted at SD Negeri 203 Bongkamanu, East Luwu Regency. The observations revealed that fifth-grade students demonstrated a low level of discipline during the teaching and learning process.

b. Learner Analysis

The learner analysis was conducted to identify students' characteristics so that the instructional media could be designed in accordance with their conditions, abilities, and learning needs. The analysis revealed that the students exhibited a low level of discipline, particularly during mathematics lessons. This lack of discipline was considered to have a negative impact on their mathematics learning outcomes.

c. Material Analysis

Based on the classroom observations conducted in the fifth grade at SD Negeri 203 Bongkamanu, the topic of fraction addition and subtraction in mathematics was selected as the basis for developing the instructional media. Mathematics is one of the essential subjects that students need to master, as it equips them with the fundamental skills required to perform fraction addition and subtraction. The developed instructional media were designed to make the learning process more engaging while simultaneously integrating the value of discipline to promote positive learning behavior during mathematics instruction.

d. Concept Analysis

The concept analysis was conducted to identify the key concepts and organize the learning materials in a systematic and comprehensive manner. The results of this analysis were aligned with the fifth-grade teaching module under the *Merdeka Curriculum*, focusing on the topic of fraction addition and subtraction in mathematics. The selected topic was then divided into several sub-concepts, each of which was integrated with the values of discipline-based character education.

e. Assessment Analysis

Based on the results of the previous analyses, a set of learning tasks was developed for the fifth-grade students. These tasks were presented in the form of a mathematics achievement test administered after the learning process to evaluate the effectiveness of the instruction and to measure students' learning achievement.

2. Design Stage

At this stage, the researcher designed the initial draft of the discipline-based character education instructional media to improve students' mathematics learning outcomes. This stage

also involved the development of a teaching module and research instruments for data collection, which were subsequently validated by subject matter experts and practitioner validators. The procedures undertaken during the Design stage are described as follows.

a. Format Selection

Adobe Flash was utilized to develop the instructional media integrating discipline-based character education. The content focused on fraction addition and subtraction and was developed in accordance with the *Merdeka Curriculum*.

b. Initial Design

At this stage, the initial design of the instructional media was developed by preparing video content that incorporated discipline-related values, instructional materials, and quizzes on the topics of fraction addition and subtraction. The content was compiled from various sources and aligned with the fifth-grade mathematics teaching module under the *Merdeka Curriculum*. It was then integrated into an interactive instructional media based on discipline-based character education to improve fifth-grade students' mathematics learning outcomes. The initial design of the interactive instructional media integrating discipline-based character education is presented below.

1) Initial Interface Design

The initial interface design represents the main screen of the instructional media. It was designed to provide users with a set of navigation menus, including Learning Outcomes, Learning Materials, Quiz, and four discipline-based character education videos. In addition, the home screen includes an About menu containing the developer's profile and a sound control button for managing the background audio. The initial interface design is illustrated in the following figure.

Figure 2. Initial Interface Design

2) Learning Outcomes Menu Design

This menu presents the expected learning outcomes and learning objectives for fifth-grade students on the topic of fraction addition and subtraction. It outlines the competencies that students are expected to achieve upon completing the learning activities.

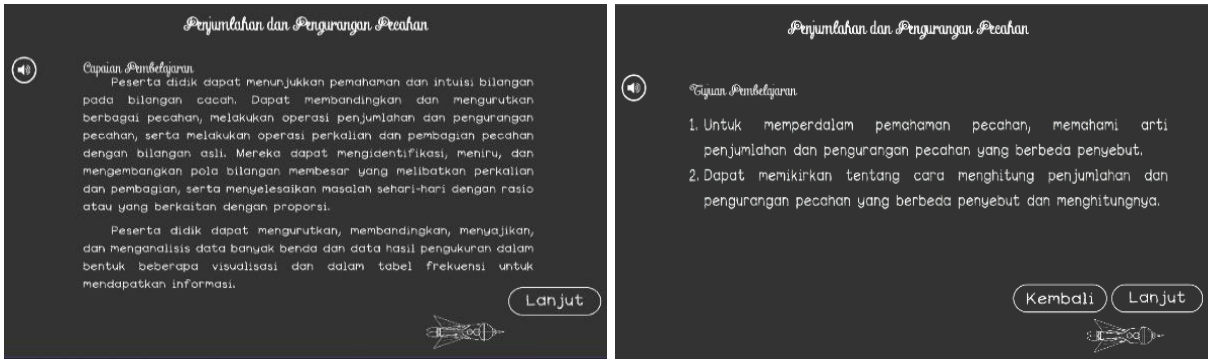

Figure 3. Learning Outcomes and Learning Objectives Interface

3) Video Content Design

The video content section consists of four menu options that present learning materials related to discipline-based character education. The design of the video content is shown below.

Figure 4. Character Education Menu

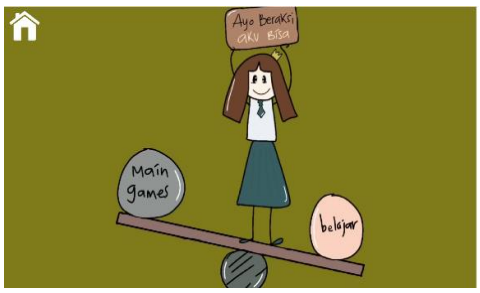

Figure 5. Self-Discipline Menu

Figure 6. Time Discipline Menu

Figure 7. Obedience to Rules Menu

4) Learning Material Design

The learning material design presents instructional content on fraction addition and subtraction. The materials include worked examples accompanied by audio explanations to facilitate students' understanding of the concepts.

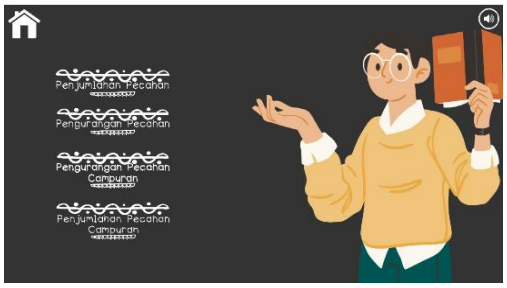

Figure 8. Learning Material Interface

Figure 9. Example Problems Interface

5) Quiz Design

The quiz design presents questions given to students to determine the extent to which the taught material has been absorbed and understood. The quiz is used as an evaluation tool to measure students' understanding of the learning content. The quiz menu design is shown below.

Figure 10. Quiz Selection Interface

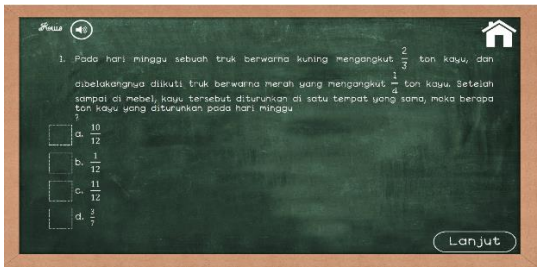

Figure 11. Quiz Interface

c. Design Preparation

At this stage, the researcher carefully prepared the design in order to gain a clear understanding of the product to be developed. This preparation ensured that the researcher had a well-defined concept of the instructional media design prior to its development.

3. Develop Stage

The researcher conducted product validation of the instructional media based on evaluations from practitioner validators (lecturers) and expert validators in the field of education, consisting of two material experts and two media and design experts. This development stage included instrument validation by experts to determine the feasibility of the research instruments, as well as media validation using the prepared evaluation instruments.

a. Expert Validation

This stage involved the presentation and review of data by experts who served as validators in the product development process, including media experts and material experts.

1.) Media Validation

The media validation process was conducted to determine whether the developed instructional media met the established standards and criteria for achieving the learning

objectives. Media validation was carried out on April 6, 2026 by Media Validator I and on April 13, 2026 by Media Validator II. The assessment used a Likert scale with four response options, namely 1, 2, 3, and 4. The validation results from the media and design experts are presented in the table below.

Table 1. Results of Media and Design Expert Validation

No.	validator	Total Score	Mean Score	Criteria
1	Validator I	57	3,80	Highly feasible
2	Validator II	59	3,93	Highly feasible
Total			3,86	Highly feasible

Source: Primary data after processing (2026).

2.) Material Validation

The product validation was conducted by two lecturers in mathematics education. Consultation with material experts was carried out to collect data for verifying the developed learning materials prior to field testing. The validation by the two material experts was conducted on April 7, 2026 by Validator I and on April 15, 2026 by Validator II. The assessment used a Likert scale with four response options, namely 1, 2, 3, and 4. The results of the material expert validation are presented in the following table.

Table 2. Results of Material Validation

No.	Validator	Total Score	Mean Score	Criteria
1	Validator I	40	4,00	Highly feasible
2	Validator II	35	3,50	Highly feasible
Total			3,75	Highly feasible

Source: Primary data after processing (2026).

b. Practitioner Validation

This stage involved the presentation and review of data by experts who acted as validators of the research instruments used in the field testing of the developed instructional media. The validated instruments included the student response questionnaire and the mathematics achievement test.

1.) Student Response Questionnaire Validation

This validation was conducted to collect data for verifying the student response questionnaire instrument that would be used by the researcher during the field testing of the instructional media. The validation of the student response questionnaire was carried out on April 7, 2026. The assessment used a Likert scale with four response options, namely 1, 2, 3, and 4. The results of the validator's assessment are presented in the following table.

Table 3. Results of Student Response Questionnaire Validation

No.	Statement on the Instrument	Validator Score
1.	Clarity of the questionnaire title	4
2.	Clarity of the questionnaire instructions	4
3.	The student response questionnaire is easy to use	4
4.	The questionnaire statements are easy to understand	4
5.	The questionnaire statements are in line with the targeted aspects	4
6.	The language used is easy to understand	4
7.	Writing follows standard spelling conventions	4
Total score		28
Mean Score		4,00

Source: Primary data after processing (2026)

2.) Test Instrument Validation

Consultation was conducted to collect data for verifying the test instrument that would be used by the researcher during the field testing of the instructional media. The validation of the test instrument was carried out on April 7, 2026. The assessment used a Likert scale with four response options, namely 1, 2, 3, and 4. The results of the validator's evaluation are presented in the following table.

Table 4. Results of Test Instrument Validation

No.	Statement on the Instrument	Validator Score
1.	Suitability of test items with the learning material	4
2.	Clarity of the test item instructions	4
3.	Test items do not contain ambiguous meanings	4
4.	Images in the test items are clear	4
5.	Alignment with learning objectives	4
6.	The language used in the test items is easy to understand	4
7.	Writing follows standard spelling conventions	4
Total score		28
Mean Score		4,00

Source: Primary data after processing (2026)

4. Disseminate Stage

The Disseminate stage aims to test the effectiveness and practicality of the developed instructional media. The dissemination was conducted in class V-B at SD Negeri 203 Bongkamanu, East Luwu Regency, involving 19 students in mathematics learning. During the field implementation, the researcher/developer explained the contents and learning materials included in the interactive instructional media. At the end of the trial, tests were conducted to evaluate the effectiveness and practicality of the media, as described below.

a. Effectiveness Test

To determine the level of effectiveness of the developed product, students' learning outcomes were assessed at the end of the media trial by administering a mathematics test based on the teaching module and the interactive instructional media that had been previously explained. The test scores were obtained from a five-item essay test. The following table presents the percentage of students' learning outcomes achieved by 19 fifth-grade B students.

Table 5. Percentage of Students' Learning Outcomes Scores

Students	Percentage (%)	Criteria
19	87,05	High

Source: Primary data after processing (2026)

The effectiveness of the instructional media was also analyzed based on the minimum mastery criterion score of 70, with a classical completeness percentage of ≥ 70%. A summary of the students' effectiveness test results is presented in the following table.

Table 6. Results of Media Effectiveness Test

Students	Number of Students Achieving ≥70	Percentage (%)	Criteria
19	18	94,73	Very effective

Source: Primary data after processing (2026)

b. Practicality Test

After students observed and used the instructional media, a practicality test was conducted at the end of the trial by administering a student response questionnaire. The questionnaire was completed by 19 fifth-grade B students to determine their level of response and understanding after participating in learning supported by the interactive instructional media. The students' responses are presented in the following table.

Table 7. Results of Media Practicality Test

Respondents	Percentage (%)	Criteria
19	93	Very practical

Source: Primary data after processing (2026)

Discussion

One way to address various problems related to students' discipline character in learning is through the use of appropriate instructional materials. Alti et al. (2022) state that instructional media are highly strategic instruments in determining the success of the teaching and learning process. With the support of appropriate learning materials or media, students can enhance their cognitive abilities, achieve better learning processes, and improve their discipline character during classroom activities.

This study was conducted to develop discipline-based character education instructional media aimed at improving the mathematics learning outcomes of fifth-grade students at SDN 203 Bongkamanu, ensuring that the product is valid, effective, and practical. Based on preliminary observations conducted directly at SDN 203 Bongkamanu, various obstacles in classroom academic activities were identified. To address these issues, this research employed the Four-D (4-D) development model, which integrates the stages of Define, Design, Develop, and Disseminate (Sugiyono, 2015). The implementation of these systematic stages ultimately resulted in the development of instructional media with a high level of validity and suitability for classroom use.

Widoyoko (2019) states that the steps for analyzing the quality of learning tools include validity analysis, effectiveness analysis, and practicality analysis. Validation is a method used to evaluate instructional media through rational analysis without conducting field testing. The validation process was carried out by two material experts and two media and design experts. In addition, validation was also conducted on the student response questionnaire and the test instruments used during the field trial of the product. The student response questionnaire was used to assess the practicality level of the developed media, while the test instrument was used to measure its effectiveness.

Based on the recommendations of the validation experts, the product was then tested on fifth-grade students at SD Negeri 203 Bongkamanu as the subjects of the media trial. The validation results from the media and design experts were assessed using 15 items in the evaluation instrument. Saputri (2014) states that instructional media are categorized as highly feasible/valid if they obtain a mean score of $3{,}25 < \bar{x} \leq 4{,}0$. Based on the validation results, the media was classified as highly feasible and valid for use in the learning process. The overall mean score from the media and design experts was 3.86, indicating that the media is highly feasible and valid for classroom implementation. Meanwhile, the material experts' validation, consisting of 10 items, yielded a mean score of 3.75, also indicating that the media is highly feasible and valid for use in the field.

The effectiveness of the instructional media was assessed through a student evaluation in the form of a five-item essay test. The test was administered to determine students' learning outcomes after using the media, and the scoring was based on a Likert scale. The students' learning achievement score obtained from 19 students was 87.5%, categorized as "High." According to Annainawa (2018), instructional media are considered effective if they obtain a percentage of 61%–80%, and very effective if they achieve 81%–100%. Based on the test results,

the classical mastery level of ≥70% reached 94.73%, indicating that the media is highly effective for use in learning.

The practicality level of the instructional media was determined based on the results of a student response questionnaire administered after using the media, consisting of 13 statements. The questionnaire was assessed using a Likert scale with four response options, namely 1, 2, 3, and 4. Wati et al. (2022) state that instructional media are considered practical if they obtain a percentage of 61%–80%, and very practical if they achieve 81%–100%. Based on the responses of 19 fifth-grade B students, the media was categorized as very practical, as it obtained a percentage score of 93%.

The implementation of the media dissemination process was conducted in class V-B at SD Negeri 203 Bongkamanu. The researcher explained the developed instructional media, including its components and the steps for using the media in the learning process. The media was applied in mathematics lessons in accordance with the learning materials. The instructional media were introduced as an effort to increase students' interest and concentration in order to achieve learning objectives and enhance students' motivation in learning (Iskandar et al., 2023).

After the explanation of the developed media, the researcher presented motivational videos related to discipline-based character education, which were shown before and/or after the learning material was delivered. The presentation of these videos aimed to motivate students to develop discipline in learning activities. According to Supiana (2019), discipline education is intended to prevent students from engaging in undesirable behaviors that are contrary to norms and from negative impacts associated with technological advancement. At the end of the learning session, students were asked to complete a quiz related to the material.

Research on the development of Macromedia Flash-based instructional media to improve understanding of mathematical concepts has been widely conducted, including a study by Masykur et al. (2017), which successfully simplified the Borg & Gall Research and Development (R&D) procedure into seven effective stages. Although the study proved to be valid and practical for visualizing abstract material, its evaluation focus was still limited to aspects of content, media, and language feasibility within a conventional classroom context. The novelty of the present study lies in the integration of interactive instructional media based on discipline-oriented character education with mathematics learning in the classroom. This study employs the 4-D development model, which not only examines the technical validity of the media but also measures its impact on students' mathematics learning outcomes and discipline character after using the media, as evidenced through the validity, effectiveness, and practicality of the developed product. Thus, this study contributes to the optimization of interactive media utilization within a flexible digital learning ecosystem.

The development of this instructional media can influence both students' discipline levels and their cognitive abilities in the learning process. According to Batubara (2017), instructional media can be used as a supporting tool in the teaching and learning process. This also serves as a reference for teachers in independently designing instructional media that are aligned with the learning materials to be taught to students. The development of learning using interactive media

is also an alternative strategy to improve students' learning outcomes and discipline. This study has demonstrated that the developed media is valid, effective, and practical for use in classroom learning.

Classroom academic activities showed more adaptive support after the implementation of this instructional media. The learning materials became easier for students to understand, and the teaching process was more practical for the teacher. This conclusion was drawn from the media feasibility testing conducted by the researcher. This finding is supported by Masykur (2017), who states that the role of digital tools and educational technology can assist students with varying levels of intellectual ability in gaining broader learning opportunities.

CONCLUSION

The development of the instructional media involving 19 fifth-grade students at SD Negeri 203 Bongkamanu produced results obtained through the analysis of validity, effectiveness, and practicality. The validity analysis showed that the developed media was highly feasible/valid for use, as indicated by the media and design expert validation with a mean score of 3.86, and the material expert validation with a mean score of 3.75, both categorized as highly feasible/valid. The developed media was also found to be highly effective, as demonstrated by the test results with a percentage score of 94.73%. In addition, the media was categorized as highly practical, as indicated by the student response questionnaire results with a percentage score of 93%. The integration of discipline-based character education interactive media with mathematics learning in the classroom also demonstrated more adaptive learning activities and had an impact on students' discipline and cognitive abilities.

However, considering the limitations of this study, further research is needed to examine the feasibility of the media and to develop more interactive instructional media that are easier to use and implement in classroom settings.

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