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Multimedia Development of Integer Concept Material for Slow Learning Students Learner

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A B S T R A C T

This research is motivated by the difficulties of slow learner students in understanding the basic concepts of integers, such as recognizing the meaning of negative numbers, comparing numbers, and representing numbers on a number line, which has an impact on the low understanding of mathematical concepts on an ongoing basis. This research aims to develop valid, practical, and effective learning multimedia to help slow learner students understand the concept of integers in a more structured and in-depth manner. The method used was Research and Development (R&D) with the ADDIE model, which includes analysis, design, development, implementation, and evaluation. The research subjects consisted of nine slow-learning students at a public junior high school in Salatiga who had been identified through psychological testing. This research was conducted from February to March 2026. Data collection techniques include interviews, tests (pre-test and post-test), and validation and practicality questionnaires, while data analysis is carried out descriptively quantitatively and inferentially using statistical tests. The results of the study indicate that the multimedia "Slow but Sure Part 1" has a very high level of validity (media experts 92% and material experts 94%), is considered practical based on user responses, and is effective in improving learning outcomes as shown by significant differences between pre-test and post-test scores. In conclusion, the developed multimedia is suitable for use as an alternative adaptive learning media to support the understanding of integer concepts in slow learner students in the context of inclusive learning.

1. Introduction

SDGs (Sustainable Development Goals) or Sustainable Development Goals in point 4 is Quality Education which aims to ensure inclusive and equitable quality education and increase lifelong learning opportunities for all (Nations, 2026). Inclusiveness is a philosophy that states that classrooms and communities are

incomplete without children, with all their needs, and without hospitality for them. In line with this philosophy, education in Indonesia is conducted democratically, fairly, and non-discriminatory, as mandated by Law Number 20 of 2003 concerning the National Education System (Arriani et al., 2021). This emphasizes that the education system needs to accommodate all students, including slow learners in regular classes. Slow learners are students who experience delays in understanding material and following the learning process compared to their peers, requiring more time and appropriate learning assistance or strategies. Slow learners generally have slightly below-average intellectual abilities (around an IQ of 70–90), but are not categorized as having an intellectual disability and can still participate in regular classes with the right support (MS. Sangeeta Chauhan, 2011; Nugrahayati & Mustadi, 2019; Korikana, 2020; Baiq Yuni Wahyuningsih & Suranti, 2014). Inclusive education emphasizes the right of every learner, regardless of disability or background, to participate meaningfully in regular school settings (Rahmi Aulia & Hermanto, 2026). However, there is a discrepancy between inclusive education policy expectations and classroom-level practices, particularly in supporting students with learning difficulties (Rahmi Aulia & Hermanto, 2026).

In general, these children have quite poor grades in all subjects because they have difficulty understanding the lessons. They require repeated explanations for the same subject matter, master skills slowly, and even fail to master some skills (Aziz et al., 2016). This difficulty generally occurs in all subjects, including mathematics, because slow learner students tend to process and understand information more slowly (Susilo et al., 2022; Agestiningsih et al., 2025). One of the topics that slow learners struggle with is the concept of integers. Slow learners don't yet understand basic concepts, such as the meaning of negative numbers and their relationship to positive numbers, and have difficulty comparing, ordering, and performing operations with integers (Susilo et al., 2022). Other research also shows that students often have difficulty representing contextual situations using negative numbers, for example writing a depth of 200 meters without a negative sign in the situation "200 meters below sea level" (Fitriasari et al., 2025).

This is reinforced by the results of a pre-test given to slow learners, which showed that most students had difficulty recognizing and distinguishing positive and negative numbers in real-world situations and their sequence on a number line. Yet, understanding integers is an important fundamental concept in mathematics because it serves as a prerequisite for learning subsequent material, such as integer operations. Students' lack of understanding of this basic concept can lead to difficulties in solving various mathematical problems at a more advanced level. Effective mathematics learning should be able to help students build conceptual understanding gradually through meaningful learning experiences. This becomes even more important in learning involving slow learners, as these students require more time to grasp the material and must practice repeatedly to reach the minimum threshold (Wanabuliandari et al., 2020). However, many teachers are not yet able to identify and guide backward students such as slow learners to reach an optimal level (Aziz et al., 2016). Due to this urgency, one strategy that can be implemented is learning differentiation through multimedia tailored to the characteristics of slow learners. Therefore, the use of innovative and engaging learning media is essential

to enhance students' motivation and learning outcomes (Rohmatul Laili & Sutomo, 2026).

This is supported by the research results of Susilo and Prihatnani (2022) which states that the use of images, videos, representative activities, and manipulative media that can be used repeatedly by students has been proven to help in understanding the concept of integers. Furthermore, the results of research by Risanah and Agustin (2023) states that interactive multimedia can be used to help slow learners improve their learning outcomes. Interactive multimedia can be used to help slow learners improve their learning outcomes (Muzakki et al., 2026). Multimedia such as videos, images, and interactive platforms are effective in accommodating various student learning styles, both visual, auditory, and kinesthetic (Rudy Widyatama & Huda, 2025). Therefore, Slow but Sure Part 1 multimedia was developed as an alternative learning multimedia to help students, especially slow learners, overcome difficulties in understanding the concept of positive and negative integers.

Development is a process to process and improve existing potential into something better. In the context of research, research and development (R&D) is a method used to produce or refine a product, which is then tested for effectiveness so that it becomes a feasible and accountable product (Oktaviani & Ayu, 2021;Ritonga et al., 2022). This multimedia development is designed to meet the characteristics of slow learners, with simple learning stages, engaging visuals, and repeatable exercises tailored to their learning needs. According to Mayer and Fiorella (2022) Multimedia is defined as the presentation of material in the form of words and images. Words can be written text or spoken words, while images can be illustrations, photographs, diagrams, graphs, animations, or videos. The development of this multimedia is based on the Theory of Multimedia Learning (CTML) developed by Mayer. This theory explains that learning will be more effective if the presentation of information is adapted to the way the human cognitive system works. Thus, this multimedia is expected to be able to provide a more structured, interactive learning experience and support slow learners in understanding the concept of integers more optimally.

In this context, this research aims to develop valid, practical, and effective multimedia learning to improve understanding of integer concepts in slow learners. This multimedia is designed by considering student characteristics, multimedia learning principles, and contextual and gradual learning needs. Therefore, this research is expected to contribute to the development of innovative learning media and support the implementation of quality inclusive education.

2. Methodology

Research Design

This research uses a research and development (R&D) design. The R&D method is a research method used to produce a specific product and test its effectiveness

(Soegiyono, 2011). This study uses the ADDIE (Analyze, Design, Development, Implementation, and Evaluation) model. In the analysis stage, curriculum analysis, learning problem analysis, and slow learner student characteristics were conducted through a literature review and interviews with teachers and shadow teachers at a public junior high school in Salatiga in the month of February to March 2026. The design stage is carried out based on the results of the analysis by determining the theme and title of the multimedia, as well as compiling the systematic flow of the Slow but Sure Part 1 multimedia. Next, in the development stage, an application that can be used via laptop or mobile phone is selected, namely GDevelop. The implementation stage begins with a pre-test to measure students' initial abilities, then Slow but Sure Part 1 multimedia is used in learning, and ends with a post-test to determine differences in learning outcomes. The final stage is evaluation, which is carried out to measure the effectiveness of using Slow but Sure Part 1 multimedia.

Participants

This research was conducted at a public junior high school in Salatiga. Nine slow-learning students enrolled in regular classes were the subjects of this study. Subjects were selected based on the results of psychological tests administered by the school and further screened through follow-up examinations at Salatiga Regional Hospital. These test results were available prior to the study and were used as the basis for selecting the subjects. Interviews were conducted with the mathematics teacher and the shadow teacher who assisted the slow-learning students.

Instrument

The data collection techniques used in this study included interviews, documentation, tests, and questionnaires. These interviews aimed to determine the research subjects who were classified as slow learners, determine the students' academic abilities, and ensure their suitability with the characteristics of slow learners based on theoretical studies. The tests used consisted of a pre-test and a post-test aimed at determining the effectiveness of the developed learning multimedia. The questionnaire was used to determine the validity and practicality of the multimedia. The validity questionnaire was given to expert lecturers and mathematics subject teachers. Meanwhile, the practicality questionnaire was filled out by subject teachers and slow learner students. The questionnaire was presented in the form of statements with answer choices using an agreement scale.

Data Analysis

The data analysis techniques used in this study include validity analysis, practicality analysis, and effectiveness analysis. Validity is obtained from the assessment results of media experts and material experts. The data obtained is then analyzed descriptively quantitatively, namely by calculating a percentage score. This assessment will be analyzed using the following formula:

$$Percentage\ Score\ (PS) = \frac{Total\ Score\ Obtained}{Maximum\ Possible\ Score} \times 100\%$$

The final result of the Percentage of validity and practicality will be the assessment category with the rules in Table 1 (Aswardi et al., 2019).

Table 1. Validity and Practicality Categories

Achievement Level (%)	Validity Category	Practicality Category
90-100	Very Valid	Very Practical
80-89	Valid	Practical
65-79	Quite Valid	Quite Practical
55-64	Less Valid	Less practical
0-54	Invalid	Impractical

The effectiveness analysis was determined based on the results of the pre-test and post-test scores of students after using Slow but Sure Part 1 multimedia. The data obtained were then analyzed using SPSS version 29. Before conducting the hypothesis test, a normality test was first conducted to determine the distribution of the data. If the data was normally distributed, then it was continued with a homogeneity test and a Paired Sample t-test. Conversely, if the data was not normally distributed, then a non-parametric statistical analysis was used, namely the Wilcoxon Signed Rank Test. SPSS test description:

1) $H_0: \mu_0 = \mu_1$ (There is no difference in student learning outcomes before and after using Slow but Sure Part 1 multimedia)
2) $H_0: \mu_0 \neq \mu_1$(There is a difference in student learning outcomes before and after using Slow but Sure Part 1 multimedia)

3. Results and Discussion

This development research used the ADDIE (Analyze, Design, Develop, Implement, and Evaluation) model. Based on the research stages, the following results were obtained.

Analysis Stage (Analyze)

The multimedia development process began with a curriculum analysis to map learning outcomes, material flow, and crucial conceptual prerequisites for students before entering the material on integer operations. Through a review of the Independent Curriculum Mathematics Teacher's Book, researchers focused on the sub-chapter on the definition of integers, which targets students' ability to model the relationship between positive and negative numbers on a number line and the use of appropriate notation. Based on this structure, researchers developed learning multimedia that maintains the integrity of the material's substance but is adaptively packaged to align with the needs of slow learners. The goal is for this group of students to still be able to achieve competency outcomes equivalent to regular students through a more structured learning process. This need for adaptive multimedia was reinforced by the results of the analysis of learning problems explored through interviews with subject teachers and shadow teachers. It was

revealed that slow learners face significant obstacles when learning in inclusive classes; differences in the speed of material comprehension are a major obstacle that often creates dilemmas for teachers. On the one hand, keeping up with the pace of regular students will leave slow learners behind, but on the other hand, slowing down the class pace can hinder the learning dynamics of regular students. This situation highlights a gap between the need for intensive mentoring and gradual scaffolding for slow learners and the current classical learning model. Therefore, the presence of self-paced multimedia learning that can provide structured support is an urgent solution to bridge this gap.

Design Stage

At this stage, the learning multimedia design process in the form of Slow but Sure Part 1 multimedia is carried out based on the results of the analysis that has been done in the previous stage. The design is focused on the preparation of the multimedia structure and the systematic presentation of questions that are adjusted to the learning representation stage, namely the stage of understanding integers. The multimedia design stage includes several main aspects, namely the design of the question content in the multimedia, where the selection of questions is arranged in stages to help students build a deep understanding of the concept. In addition, the sentences in the questions are designed to be simple and concise to minimize the use of sentences that are too long. The design of the multimedia display also pays attention to the selection of attractive visuals and supports readability so that it is in accordance with the characteristics and learning needs of Slow learner students.

a. Content of questions, activities and multimedia systematics
    1) The "Predict" question is presented on a number line, asking students to predict the five numbers to the left of 0. This question aims to determine students' initial understanding of the concept of numbers on a number line. Whether the answer is correct or incorrect, students can still proceed to Activity 1.
    2) Activity 1: Contains six integer problems related to everyday situations. These problems present pairs of opposite events to help students understand the concept of positive and negative numbers. Contexts include positions above and below sea level, right and left directions, profit and loss, weight gain and loss, saving and withdrawing money, and climbing and descending stairs.
    3) Activity 2: Contains eight problems that present the representation of integers using pictorial symbols. In this activity, students are asked to determine the appropriate image to represent a positive or negative number based on the given symbol examples. Through this activity, students learn to understand the relationship between visual symbols and the meaning of positive and negative numbers through visual representation, thereby enabling a more concrete and easier understanding of the concepts of positive and negative numbers.
    4) Activity 3: Contains problems using a number line. Students are asked to fill in the blanks with the correct numbers based on their order, position, and

scale on the number line. The problems are structured in stages to help students understand the concept systematically and thoroughly.

5) Prediction Check: This question is similar in format to the "Predict" question, using a number line. The goal is to review students' understanding after completing Activities 1–3 to see if there has been any improvement in identifying numbers to the left of 0.
6) Challenge questions: Contains a number line with more limited information (only numbers 1–3 are shown), so students are required to think more deeply to determine the position of other numbers, including negative numbers.
7) Conclusion: This activity presents a complete number line, then students are asked to determine which numbers are positive, which numbers are negative, and which are the position of the number 0, as a form of final reinforcement of understanding the concept of integers.

The multimedia systematics of Slow but Sure Part 1 can be seen in Figure 1.

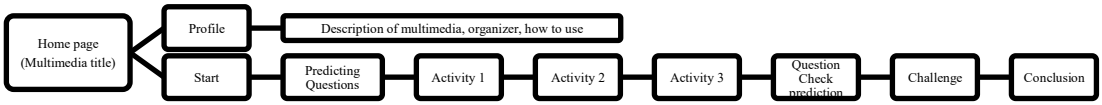


Figure 1.Multimedia Systematics

b. Multimedia Display
The design of the Slow but Sure Part 1 multimedia display aims to produce visually appealing learning multimedia and support the effectiveness of the student learning process. On the homepage, rabbit and turtle visuals are used as symbols of consistency and perseverance in learning, thus providing a motivational message from the beginning of multimedia use. Every important information or sentence is displayed with emphasis using bold or color highlights to help focus students' attention and facilitate understanding of the main concepts. The multimedia display is designed with a 16:9 ratio to be proportional on various devices, with a standard size of 1920 × 1080 pixels so that the visuals look clear and comfortable to use.

Development Stage

This stage is the product realization stage, namely the creation of learning multimedia to understand the concept of integers which includes determining the content of the questions, the coding process, and validation. The development process is carried out using Canva to design all visual elements such as backgrounds, navigation buttons (next, back, home), icons, characters, question boxes, number lines, score displays, instructions, and sound buttons (sound on/off), while GDevelop is used for the coding process, interactivity settings, drag and drop systems, navigation between scenes, audio settings so that they can be turned on and off, and processing correct and incorrect responses in each activity.



Figure 2. Home

The homepage (Figure 2) displays a homepage complete with navigation buttons, such as sound settings and a start button to begin learning. Next, users are directed to an introductory section containing a concept map, multimedia descriptions, and user instructions as a starting point before moving on to the main activities.



Figure 3. Example of activity 1

The core activities in this multimedia program consist of several learning activities structured in stages. In Activity 1 (Figure 3), students work on multiple-choice questions related to everyday events. Each answer provided receives immediate feedback in the form of correct or incorrect information, and the correct answer is displayed if an error occurs.



Figure 4. Example of activity 2 questions

Activity 2 is slightly different from the first activity which presents the representation of integers using picture symbols. In activity 2 (Figure 4) students are asked to determine the correct picture to represent a positive or negative number based on the example symbols given. The game logic remains the same, each answer given will immediately receive feedback in the form of correct or incorrect information, and the correct answer will be displayed if an error occurs.



Figure 5. Example of activity 3

Furthermore, this multimedia also offers a variety of problem formats to enhance interactivity, such as Activity 3 (Figure 5), which uses a drag-and-drop model on a number line. This activity aims to help students understand the relationship between positive and negative numbers on a number line.



Figure 6. Challenge questions

After completing all activities, students are directed to the evaluation stage through the same prediction check questions as inview before activity 1and challenges (Figure6) that encourages further thinking skills. Finally, the system provides feedback in the form of appreciation and reflection as a form of reinforcement for student learning outcomes. After compiling Slow but Sure Part 1, the research instrument was created, including a validation sheet, a feedback sheet, and a feedback sheet.questionnaire, as well as pre-test and post-test question sheets. This process involved five validators: five lecturers and one mathematics teacher who had previously taught slow learners in their classes. The results of the validator assessments can be seen in table 2.

Table 2.Results of the assessment by media expert validators

No	Assessor	Presetase	Category
1	Validator 1	90%	Very Valid
2	Validator 2	97%	Very Valid
3	Validator 3	83%	Valid
4	Validator 4	92%	Very Valid
5	Validator 5	99%	Very Valid
	Average	92%	Very Valid

Based on the table above, the average rating from the five media expert validators was 92%. This indicates that Slow but Sure Part 1 falls into the Very Valid category.

Furthermore, Table 3 shows the results of the Content Expert Validation Assessment.

Table 3. Assessment results of material expert validators

No	Assessor	Percentage	Category
1	Validator 1	91%	Very Valid
2	Validator 2	99%	Very Valid
3	Validator 3	88%	Valid
4	Validator 4	91%	Very Valid
5	Validator 5	100%	Very Valid
	Average	94%	Very Valid

Based on the table above, the average rating from the five expert validators was 94%. This indicates that Slow but Sure Part 1 falls into the Very Valid category.

Implementation Stage

After Slow but Sure Part 1 was declared valid, the next step was the implementation of Slow but Sure Part 1. This implementation aimed to determine the effectiveness of Slow but Sure Part 1 as multimedia in understanding the concept of integers for slow learner students. In the implementation stage, the research was conducted in one of the public junior high schools in Salatiga with a total of 9 students who were indicated as slow learners. The implementation activity was carried out for two days.

On the first day (Figure 7) On February 11, 2026, the activity began with an introductory session between the researcher and students. This introductory stage was carried out with the aim of building closeness and creating a comfortable atmosphere, so that students could participate in learning activities more openly and without feeling awkward. This was important considering that the research subjects were students who were indicated as slow learners, so a more personalized approach was needed so that students felt confident in participating in the activities. After the introductory session, the activity continued with a pretest that aimed to determine students' initial abilities regarding the concept of integers before using the developed multimedia. The pretest questions were presented in the form of descriptions and fill-in-the-blank questions. After the pretest was completed, the researcher introduced the Slow but Sure Part 1 learning multimedia and provided a brief explanation on how to access and play the multimedia. During the activity, students appeared quite enthusiastic although they were still shy at first. As the game activity progressed, students began to show interest in the multimedia used. This was evident when students showed happy expressions when they successfully answered questions correctly. The feedback that appeared directly on the multimedia also made students more motivated to continue the game and complete each challenge given.



Figure 7. First day implementation

On the second day, implementation activities were carried out on March 6, 2026, at 8:00–9:30 AM. In this meeting, students again used the Slow but Sure Part 1 multimedia. Unlike the first day, in this activity, students were asked to replay the multimedia from the beginning. This was done by considering the characteristics of slow learner students who generally have relatively short memories, so repetition of learning activities is necessary to help strengthen students' understanding of the concepts being learned. In addition, one round of the multimedia game does not require too much time, so repetition is still possible within the available learning time. During the activity, students appeared more confident than in the previous meeting. This was evident from the students' courage in trying to answer questions and their involvement while playing the multimedia. Some students also appeared to be quicker in understanding the flow of the game because they had previously gained experience using the multimedia. This condition indicates that repeating the use of multimedia can help students become more familiar with the learning activities provided. After students finished playing the multimedia, the activity continued with the implementation of the post-test. The post-test was given in the form of essay and fill-in-the-blank questions, the same as in the pre-test, with the aim of determining changes in students' understanding after using the learning multimedia. Next, students were asked to fill out a response questionnaire regarding the use of Slow but Sure Part 1 multimedia. The questionnaire consisted of 14 statements with a rating scale of 1–4. Filling out this questionnaire aimed to determine students' responses to aspects of appearance, ease of use, and the usefulness of multimedia in helping them understand the concept of integers.



Figure 8. Second day implementation

After the multimedia implementation, a test was conducted on students' pre-test and post-test scores to analyze the effectiveness of Slow but Sure Part 1. A summary of the initial data from the pre-test and post-test scores is presented in Table 5.

Table 5. Initial data recap

Information	Number of students	Lowest value	The highest score	Average
Pre-test	9	0	30	16.5
Post-test	9	53	80	64.3

The analysis procedure begins with a normality test which can be seen in Table 6.

Table 6. Normality Test Results

Tests of Normality

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	Df	Sig.	Statistics	df	Sig.
PRETEST	.172	9	.200*	.939	9	.575
Posttest	.226	9	.200*	.936	9	.537

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Based on the results of the normality test in Table 6, it is known that the number of research subjects is less than 50, so the normality test used is the Shapiro–Wilk. The results of the normality test show that the significance value for the pre-test data is 0.575 and for the post-test data is 0.537. Both significance values are greater than 0.05, so it can be concluded that the pre-test and post-test data are normally distributed. Thus, the research data meets the assumption of normality and can be continued with parametric statistical analysis, namely the paired sample t-test.

Table 7. Descriptive Statistics of Pre-test and Post-test

Paired Samples Statistics

		Mean	N	Standard Deviation	Std. Error Mean
Pair 1	PRETEST	16.5556	9	10.64320	3.54773
	Posttest	64.3333	9	8.91628	2.97209

Based on the results of the Paired Samples Statistics analysis, it is known that the average pretest score was 16.56 with a standard deviation of 10.64. Meanwhile, the average post-test score was 64.33 with a standard deviation of 8.92. The data shows that there was a change in the average score from the pre-test to the post-test after students participated in learning using the developed multimedia. This increase in the average score indicates that students' understanding of the concept of integers increased after being given treatment in the form of the use of learning multimedia. Paired T-test show in table 8.

Based on the results of the Paired Samples Test analysis, the t-value was obtained at -15.113 with a degree of freedom (df) of 8 and a significance value (Sig. (2-tailed)) of 0.000. Since the significance value of 0.000 < 0.05, it can be concluded that there is a significant difference between the pre-test and post-test scores. The

difference is in the form of an increase in the average score which can be seen in Table 17. These results indicate that the developed learning multimedia has an effect on increasing the understanding of the concept of integers in slow learner students. The improvement in students' learning outcomes can be explained by the use of adaptive and interactive learning media. Integrating digital game-based media within a differentiated learning framework provides an adaptive and inclusive approach that effectively enhances student participation (Prayuda Pratama & Minsih, 2026).

Table 8. Paired T-test

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Standard Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PRETEST - POSTTEST	-47.77778	9.48390	3.16130	-55.06775	-40.48780	-15,113	8	.000

Meanwhile, to assess the practicality of Slow but Sure Part 1, a practicality test was conducted using a questionnaire on the second day of implementation. The results of the practicality test yielded a percentage of 90%, with the categories shown in Table 9.

Table 9.Practicality Test Results

Aspect	Percentage
Convenience	91%
Legibility	92%
Attractiveness	92%
Clarity of material	92%
Speed	82%
Repetition	82%
Interaction	95%
Motivation	92%
Independence	95%
Percentage Score	90.3%
Avarage Score	**Very Practical**

Based on the practicality test in Table 9, the Percentage obtained is the table above, it is known that the average Percentage is 90.3% with a very practical category. The interaction and independence aspects obtained a high average score with an acquisition of 3.8. This shows that Slow but Sure Part 1 is an interactive multimedia and can support student learning independence. So it can be concluded that Slow but Sure Part 1 is very practical to use to understand the material of integer concepts, especially for slow learner students.

Evaluation Stage

The evaluation stage is the final stage in the ADDIE model, which aims to assess the quality and feasibility of Slow but Sure Part 1. The evaluation is conducted to

determine the level of success of the product after being implemented in learning and as a basis for product improvement. The evaluation process is carried out by integrating various data, including validation results from material experts and media experts, practicality questionnaire results based on student responses, and effectiveness analysis through a comparison of pretest and posttest scores. Based on these overall results, Slow but Sure Part 1 is declared to meet the criteria of being valid, practical, and effective in supporting learning for slow learner students.

Nevertheless, several suggestions from validators and students were considered for product refinement in the next development stage. Improvements include minimizing the use of machine voices and replacing them with human voices to better align with the principles of Cognitive Theory of Multimedia Learning. These refinements are expected to enhance the quality of multimedia, making it more engaging, communicative, and effective for use in the learning process.

The findings of this study indicate that the validity, practicality, and effectiveness of Slow but Sure Part 1 multimedia are closely related to the systematic implementation of each stage in the ADDIE development model. The analysis stage played a crucial role in identifying the specific learning difficulties experienced by slow learner students, particularly in understanding negative numbers, interpreting integer relationships, and locating numbers on a number line. These findings became the foundation for the design decisions implemented in the multimedia, including the use of contextual situations, gradual learning sequences, concise instructions, repetitive activities, and visual representations. Therefore, the quality of the final product cannot be separated from the needs analysis process that guided the development of the multimedia.

The high validity scores obtained from both media experts (92%) and material experts (94%) reflect the success of the design and development stages in translating theoretical principles into an appropriate instructional product. During the design stage, the multimedia was intentionally structured into sequential activities that progressively guided students from concrete situations toward more abstract representations of integers. In the development stage, visual elements, navigation systems, immediate feedback, and interactive activities were integrated to support learning. These design decisions are consistent with the Cognitive Theory of Multimedia Learning (CTML) proposed by Mayer and Fiorella (2022), which suggests that learners understand concepts more effectively when verbal and visual information are presented in an organized and cognitively manageable manner. The high validity results therefore indicate not only technical feasibility but also alignment between the multimedia design and the cognitive characteristics of slow learner students.

The practicality results (90.3%) also demonstrate the contribution of the design and development stages to product usability. The multimedia was designed with simple navigation, clear instructions, immediate feedback, and opportunities for repeated practice, allowing students to interact with the material independently. These features are particularly important for slow learner students, who often require additional support and more time to process information. The high scores in the

interaction and independence aspects suggest that the multimedia functioned as a form of instructional scaffolding, enabling students to engage with learning activities with reduced dependence on teacher assistance. This finding supports previous studies indicating that interactive multimedia can increase learner engagement and facilitate independent learning.

The effectiveness results revealed a significant increase in students' understanding of integer concepts, as indicated by the rise in the mean score from 16.56 (pre-test) to 64.33 (post-test) and the significant paired sample t-test result ($p = 0.000$). This improvement is closely related to the implementation stage of the ADDIE model, where students directly interacted with the developed multimedia through repeated learning activities. The structured implementation, which involved two learning sessions, allowed students to reinforce their understanding through repetition, which is particularly important for slow learner students who require more time to process mathematical concepts.

From the perspective of the Cognitive Theory of Multimedia Learning (CTML), the learning improvement can be explained by the integration of verbal explanations, visual representations such as number lines, and interactive activities that reduce cognitive load. This combination helps students construct meaningful mental models of integer concepts rather than memorizing abstract symbols. However, the improvement cannot be attributed solely to the multimedia design, as the repeated exposure during the implementation stage also contributed significantly to students' learning gains.

However, the interpretation of these findings should consider several limitations. First, the study involved only nine slow learner students, which limits generalization to broader populations. Second, the short duration of the intervention may not fully capture long-term retention of learning outcomes. Third, potential external factors such as teacher guidance, student motivation, and familiarity with the test format may have influenced the results. Therefore, the findings should be interpreted as indicative rather than conclusive evidence of effectiveness.

Each stage of the ADDIE model contributed to the final outcome of the multimedia. The analysis stage ensured that the learning needs of slow learner students were properly identified, particularly their difficulties in understanding integer concepts. The design and development stages translated these needs into structured multimedia features, including step-by-step activities and visual representations. The implementation stage provided real learning experiences through repeated interaction, while the evaluation stage confirmed the validity, practicality, and effectiveness of the product.

Furthermore, the implementation stage may have contributed substantially to the observed learning gains. Students interacted with the multimedia on two occasions and repeated several learning activities. For slow learner students, repetition is an important instructional strategy because it supports memory retention and strengthens conceptual understanding. Therefore, the improvement in post-test scores may not only reflect the effectiveness of multimedia features but also the

influence of repeated exposure to the learning content. This interpretation suggests that the effectiveness of Slow but Sure Part 1 emerges from the combination of adaptive multimedia design and repeated learning opportunities.

Despite these positive findings, several alternative explanations should be considered. First, because the pre-test and post-test measured similar conceptual indicators, students may have benefited from familiarity with the assessment format. Second, the intervention was conducted over a relatively short period, making it difficult to determine whether the improvement would be maintained over time. Third, external factors such as teacher assistance, student motivation, and increased confidence resulting from repeated exposure to the multimedia may also have influenced the results. Therefore, the effectiveness findings should be interpreted cautiously rather than being attributed entirely to the multimedia itself.

Another important limitation concerns the sample size and research setting. The study involved only nine slow learner students from a single school, which limits the generalizability of the findings to broader populations. The learning characteristics of slow learner students may vary across schools and educational contexts, and therefore similar results cannot automatically be expected in different settings. Future studies should involve larger and more diverse samples, longer implementation periods, and comparison groups to provide stronger evidence regarding the effectiveness of multimedia-based interventions for slow learner students.

Overall, the findings demonstrate that the successful development of Slow but Sure Part 1 was strongly influenced by the integration of all ADDIE stages. The analysis stage identified learner needs, the design and development stages translated those needs into adaptive multimedia features, the implementation stage provided opportunities for structured and repeated learning, and the evaluation stage confirmed the validity, practicality, and effectiveness of the product. These findings suggest that multimedia effectiveness is determined not merely by technological attractiveness but by the extent to which instructional design accommodates the cognitive characteristics, learning pace, and learning needs of slow learner students.

4. Conclusion

This study aims to develop multimedia learning materials on integer concepts for slow learner students and to test the level of validity, practicality, and effectiveness. Based on the results of the study, it can be concluded that the multimedia "Slow but Sure Part 1" developed has met the criteria of validity, practicality, and effectiveness. From the validity aspect, the multimedia is declared suitable for use because it is in accordance with the learning needs and characteristics of slow learner students. From the practical aspect, the multimedia is easy to use, interesting, and able to encourage student learning independence. Meanwhile, from the effectiveness aspect, the use of multimedia has been proven to significantly improve students' understanding of integer concepts. Thus, the developed

multimedia can be an innovative learning solution in helping slow learner students understand mathematical concepts more optimally.

Based on these research findings, it is recommended that teachers utilize multimedia learning as an alternative learning strategy that is more adaptive to the needs of slow learners. Furthermore, similar multimedia development should be conducted on other mathematics materials to broaden its benefits in improving learning quality. Further research is also recommended to involve a broader range of subjects and develop more interactive multimedia features to optimize the results and allow for broader generalization.

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References

Agestiningsih, D., Sujarwanto, & Murtadlo. (2025). Pengembangan media bilangan interaktif berbasis android untuk meningkatkan kemampuan operasi hitung dasar pada siswa slow learner. *Pendas: Jurnal Ilmiah Pendidikan Dasar, 10*(1).

Arriani, F., Rizki, A., Widiyanti, R., Wibowo, S., Tulalessy, C., Herawati, & Herawati, F. (2021). Panduan pelaksanaan pendidikan inklusif (Vol. 21, No. 3). Pusat Kurikulum dan Perbukuan Badan Penelitian dan Pengembangan dan Perbukuan Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Jakarta.

Aswardi, Mukhaiyar, R., Elfizon, & Nelitawati. (2019). Pengembangan trainer programmable logic controller sebagai media pembelajaran di SMK Negeri Kota Payakumbuh. *Jurnal Teknik Elektro dan Vokasional, 5*. https://doi.org/10.24036/jtev.v5i1.104846

Aziz, A. N., Sugiman, S., & Prabowo, A. (2016). Analisis proses pembelajaran matematika pada anak berkebutuhan khusus (ABK) slow learner di kelas inklusif. *Kreano, Jurnal Matematika Kreatif-Inovatif, 6*(2), 111. https://doi.org/10.15294/kreano.v6i2.4168

Baiq Yuni Wahyuningsih, & Suranti, N. M. Y. (2014). Strategi pembelajaran efektif bagi siswa slow learner: sebuah kajian literatur. *Indonesian Journal of Elementary and Childhood Education, 2*(1), 101–118.

Chigbu, B. I., & Makapela, S. L. (2025). AI in education, sustainability, and the future of work: An integrative review of industry 5.0, education 5.0, and work 5.0. *Journal of Open Innovation: Technology, Market, and Complexity, 11*(4). https://doi.org/10.1016/j.joitmc.2025.100645

Fitriasari, P., Suryadi, D., Nurlaelah, E., et al. (2025). Reconstructing students' understanding of integer addition and subtraction: A didactical design grounded in the theory of didactical situations. *Journal of Cultural Analysis and Social Change, 10*(3), 235–253. https://doi.org/10.64753/jcasc.v11i1.3582

Korikana, A. (2020). Slow learners – A universal problem and providing educational opportunities to them to be a successful learner. *People: International Journal of Social Sciences, 6*(1), 29–42. https://doi.org/10.20319/pijss.2020.61.2942

Mayer, R. E., & Fiorella, L. (2022). *The Cambridge handbook of multimedia learning* (Vol. 32, No. 3). https://doi.org/10.1017/9781108894333

Ms. Sangeeta Chauhan. (2011). Slow learners: Their psychology and educational programmes. *International Journal of Multidisciplinary Research, 1*(8), 279–289.

Muzakki, K., Sutomo, M., & Wahyuni, I. (2026). The implementation of flashcard media in early-grade learning: A case study on strengthening students' understanding of fundamental mathematical concepts at MI Al Magfiroh. *Journal of Educational Sciences, 10*(2), 3332–3345. https://doi.org/10.31258/jes.10.2.p.3332-3345

Nations, U. (2026). Sustainable Development Goals. https://sdgs.un.org/goals/goal4

Nugrahayati, W., & Mustadi, A. (2019). Slow learner learning facts in their inclusion class. *ICERI Proceedings, 330*(70), 149–152. https://doi.org/10.2991/iceri-18.2019.30

Oktaviani, L., & Ayu, M. (2021). Pengembangan sistem informasi sekolah berbasis web dua bahasa SMA Muhammadiyah Gading Rejo. *Jurnal Pengabdian Pada Masyarakat, 6*(2). https://doi.org/10.30653/002.202162.731

Pratama, I. P., & Minsih. (2026). The effectiveness of Educandy media through differentiated learning on the learning participation of slow learner elementary school students. *Journal of Educational Sciences, 10*(2), 3346–3365. https://doi.org/10.31258/jes.10.2.p.3346-3365

Rahmi Aulia, C., & Hermanto. (2026). Co-teaching level of regular teachers and special supervisory teachers in elementary schools providing inclusive education in Padang City. *Journal of Educational Sciences, 10*(3), 383–391. https://doi.org/10.31258/jes.10.3.p.383-391

Risanah, D. A. O., & Agustin, I. (2023). Pengembangan multimedia interaktif pembelajaran matematika untuk siswa slow learner kelas V sekolah dasar. *Prosiding Seminar Nasional Penelitian dan Pengabdian Masyarakat, 8*(1), 485–493.

Ritonga, A. P., Andini, N. P., & Iklmah, L. (2022). Pengembangan bahan ajaran media. *Jurnal Multidisiplin Dehasen (MUDE), 1*(3), 343–348. https://doi.org/10.37676/mude.v1i3.2612

Rohmatul Laili, W., & Sutomo, M. (2026). Application of PADI media (diagram board) in improving learning motivation and mathematics learning outcomes of class V students. *Journal of Educational Sciences, 10*(6), 27–38. https://doi.org/10.31258/jes.10.6.p.27-38

Rudy Widyatama, P., & Huda, N. (2025). Students' views on multimedia in differentiated learning of Pancasila education. *Journal of Educational Sciences, 9*(2), 782–801. https://doi.org/10.31258/jes.9.2.p.782-801

Soegiyono. (2011). *Metode penelitian kuantitatif, kualitatif dan R&D*.

Susilo, C. Y., Prihatnani, E., et al. (2022). Scaffolding for slow learner children on integer operations. *Kreano: Jurnal Matematika Kreatif-Inovatif, 13*(1), 113–125.

Wanabuliandari, S., Ristiyani, R., & Kurniasih, N. (2020). Desain pengembangan modul matematika berbasis santun berbahasa untuk siswa slow learner di sekolah dasar. *Aksioma: Jurnal Program Studi Pendidikan Matematika, 9*(3), 601.

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