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Flipbook-Based Digital Comics: Learning Outcomes and Attitudes of Elementary School Students

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ABSTRACT

Purpose of the study: This study aims to develop, assess the feasibility, and evaluate the effectiveness of the Flipbook-Based Digital Comics to Improve Learning Outcomes and Attitudes of Grade IV Students.

Methodology: The research employed a Research and Development (R&D) method using the Borg & Gall development model up to the eighth stage. The subjects of this study were 28 Grade IV students at Elementary School Tambangan 01 Semarang. Data analysis techniques included media feasibility assessments, teacher and student response analyses, normality testing, t-tests, and N-Gain evaluation.

Main Findings: Based on the results obtained, flipbook-based digital comic media can be used in learning activities. Flipbook-based digital comic learning media is effectively used in learning grade IV material on attitudes and behavior that reflect the practice of Pancasila in social life. The results of the validation assessment of media experts and material experts obtained a percentage of 83.33% and 100% which means it has a very feasible classification level. The student pretest score was 55% and the posttest score was 86.13%. The percentage of student learning outcomes classically increased by 31.13%.

Novelty/Originality of this study: The novelty of this research lies in the media Flipbook-Based Digital Comics to Improve Learning Outcomes and Attitudes. In addition, the learning model has been adjusted to students' abilities and uses HOTS (Higher Order Thinking Skills) based evaluation questions.

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1. INTRODUCTION

Education is a conscious and planned effort to develop human potential both physically and mentally, shaping individuals who are disciplined, resilient, respectful, pious, creative, and independent [1], [2]. It is a lifelong process that has a positive impact on the development of knowledge and skills. The national education system defines education as a structured effort to enhance students' abilities, including religious values, character, intelligence, morals, and skills [3], with the aim of developing human potential optimally [4]. According to Permendikbud, education is the key to building a society and state based on Pancasila, producing faithful, moral, and high-quality individuals who are democratic and responsible citizens [5].

In the modern era, technology plays a crucial role in improving the quality of learning [6]. Twenty-first century education increasingly recognizes the learning potential of digital-based media, including digital games and interactive platforms [7]. Consequently, teachers must master technology integration to enhance learning

outcomes [8]. Curriculum reforms, such as the *Merdeka Curriculum*, provide teachers with greater flexibility to design lesson plans [9], [10]. This also applies to Pancasila Education, which aims to instill Pancasila values in students to build a better Indonesia [11], [12].

However, in practice, Pancasila Education learning still faces several challenges. Observations, interviews, and documentation in Class IVB Elementary School Tambangan 01 Semarang with teacher Sutrisno revealed problems such as: (1) limited learning resources, (2) low student enthusiasm due to reliance on lecture methods, (3) lack of student-centered learning, (4) passive and shy students, (5) minimal technology utilization, (6) limited innovation in learning media (only using YouTube videos), and (7) absence of concrete media in learning. These issues lead to low student interest and suboptimal learning outcomes.

According to Marinda, students aged 9–11 years are in the concrete operational stage, meaning they can think logically and systematically [14]. Therefore, the use of appropriate and engaging media can greatly enhance learning quality [15]–[18]. Effective media not only improves learning outcomes but also fosters positive learning attitudes [19]. One potential solution is the use of flipbook-based digital comic media, which combines images, text, animations, and audio to stimulate imagination, increase interest, and improve both learning outcomes and attitudes [20]–[22].

Previous studies have shown promising results: digital comics can improve critical thinking [23], enhance learning outcomes in Pancasila Education [24], and are effective in developing students' understanding across subjects [25]–[28]. However, most existing studies focus only on cognitive outcomes (e.g., knowledge improvement) and less on affective domains such as learning attitudes. In addition, many studies apply digital comics in subjects like mathematics or general literacy, while research on flipbook-based digital comics specifically for Pancasila Education at the elementary level remains limited. Furthermore, there is a lack of development studies that combine both outcome and attitude improvements in one integrated media design. Based on this gap, the present study aims to develop flipbook-based digital comic media to improve both learning outcomes and learning attitudes in Pancasila Education for Grade IV students of Elementary School Tambangan 01 Semarang.

2. RESEARCH METHOD

This research uses quantitative methods. Sugiyono, explains that quantitative methods are a positivism philosophy approach and utilize instruments in the process [29]. Explains development research is a systematic method of developing learning programs and products that include 4 stages, namely research, design, production, and testing. The development model of this research is the Borg and Gall in Sugiyono. This study only carried oit 8 of the 10 stages of the research procedure, namely potential and problems, data collection, product design, design validation, design revision, product trial, product revision, and trial usage.

This study employed three data collection methods: observation, interviews, and questionnaires. Observations were conducted during Indonesian language lessons in the second-grade classroom to directly monitor the learning environment and student engagement. Additionally, questionnaires were distributed to gather quantitative data on the perceptions, experiences, and feedback from teachers regarding the developed learning media. Similar questionnaires were also administered to material and media experts to assess the feasibility of the Lawang Sewu mobile game learning media in terms of content quality and media design.

The media expert evaluation focused on three key aspects: alignment of the media with learning objectives, language accuracy, and usability. These aspects were operationalized into sixteen indicators serving as criteria for assessing media feasibility. Data collected from the media expert validation questionnaires were analyzed using a simple percentage formula as described by Arikunto [23]. Subsequently, the results were categorized into predefined feasibility levels.

Table 1. Media Expert Validation Assessment Criteria

Percentage	Criteria
81 – 100	Very Feasible
61 – 80	Worth
41 – 60	Decent Enough
21 – 40	Less feasible
0 – 20	Not Feasible

The validation process conducted by material experts encompassed three dimensions: content feasibility, presentation feasibility, and language feasibility. These dimensions were further broken down into thirteen specific indicators to guide the evaluation of the material content within the media feasibility assessment. Data collected from the material expert validation questionnaires were analyzed using a simple percentage calculation method. The resulting scores were then classified into categories, as presented in Table 2

Table 2. Criteria for Material Expert Validation Assessment

Percentage	Criteria
81 – 100	Very Feasible
61 – 80	Worth
41 – 60	Decent Enough
21 – 40	Less feasible
0 – 20	Not Feasible

The data analysis in this study was conducted through three primary phases: product data analysis, preliminary data analysis, and final data analysis. The initial phase focused on assessing the feasibility of the developed learning media and analyzing teacher feedback. Material feasibility was evaluated through expert validation of the local wisdom-based mobile game learning media, considering both media validation criteria and content quality. Scores provided by validators were interpreted using established feasibility classifications to determine the appropriateness of the media for educational use. Additionally, teacher responses obtained via questionnaires were analyzed to gauge the media's effectiveness and utility within the learning context.

The second phase, preliminary data analysis, aimed to establish a comparative baseline for measuring differences and improvements in student learning outcomes. This included conducting normality tests on pretest and posttest scores, using the Shapiro-Wilk method implemented through SPSS version 30. Data were considered normally distributed if the significance value exceeded 0.05; otherwise, data were regarded as non-normal. This step ensured the validity of data prior to further statistical testing.

The final phase encompassed inferential statistical analyses, including paired sample t-tests and N-gain calculations to assess learning improvements. The paired t-test evaluated whether the difference between pretest and posttest means was statistically significant, with a significance threshold of 0.05. Values below this threshold indicated a significant difference, whereas values above suggested no significant change. The N-gain analysis quantified the degree of improvement by comparing pretest and posttest scores relative to the ideal maximum score.

3. RESULTS AND DISCUSSION

This research uses the type of *Research and Development* (R&D). Explains that (R&D) functions to validate and develop products. Validating means that the product already exists and the researcher only tests its effectiveness and validity. Product development includes updating existing products to make them more practical, effective, and efficient. Borg and Gall in Sugiyono explains that the 10 development steps are simplified into 8 steps that are adjusted to the conditions in the research process being carried out. The model in this step includes potential and problems, data collection, product design, design validation, design revision, product trials, product revision, and trial usage. The results of the research product are the form og *flipbook-based* digital comic media material about attitudes and behaviors that reflect the practive of Pancasila in social life.

3.1. The Result of the Development of *Flipbook-Based Digital* Comics to Improve Learning Outcomes and Attitudes of Grade IV Students

Based on the findings from conducted interviews and observations, there are several probblems related to the learning process. Starting from the limited learning media. Teachers are only guided by the teacher's book and teaching methods that are less interactive make students bored. This is indicated by low learning outcomes and learning attitudes. Learning media acts as a tool for teachers and students in learning [30]. Data collection technique is a way of collecting necessary information [31]. Data was collected by distributing teacher and student questionnaires regarding the needs required in learning. Based on the collected, it was found that student books and teacher books are less effective because they require repetition of material. Seeing the limited media conditions, teachers need innovative learning media and can keep up with the times. Students need reading materials that noy only contain text but are also accompanied by colorful pictures.

Based on this, researchers propose a comic media by utilizing technology, namely *flipbooks,* so that researchers make innovations in making *flipbook-based* digital comics. The material in the media is adjusted to learning outcomes, learning objectives, and students cognitive thinking skills. Design is associated with a plan related to the product innovation process [32]. *Flipbook-based* digital comic media is designed based on learning outcomes and learning objectives. Digital comics are developed with concepts that involve student development so that they are easy to understand. *Flipbook-based* digital comic consist of:

Figure 2. Front cover

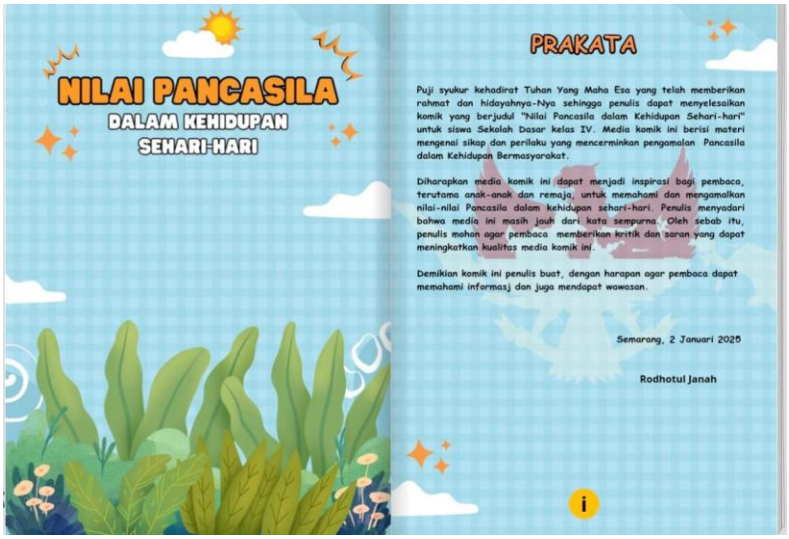

Figure 3. Inside cover and foreword

Figure 4. table of contents and instructions for using comic media

Figure 5. Comic reading instructions and learning outcomes

Figure 6. Learning objectives and learning objectives flow

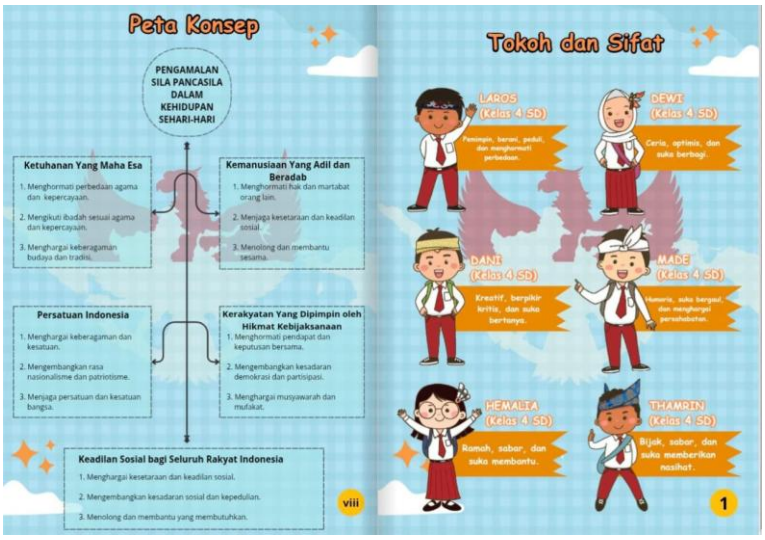

Figure 7. Concept map and characters & traits

Figure 8. Story panel

Figure 9. Exercise question

Figure 10. Bibliography and creator profile

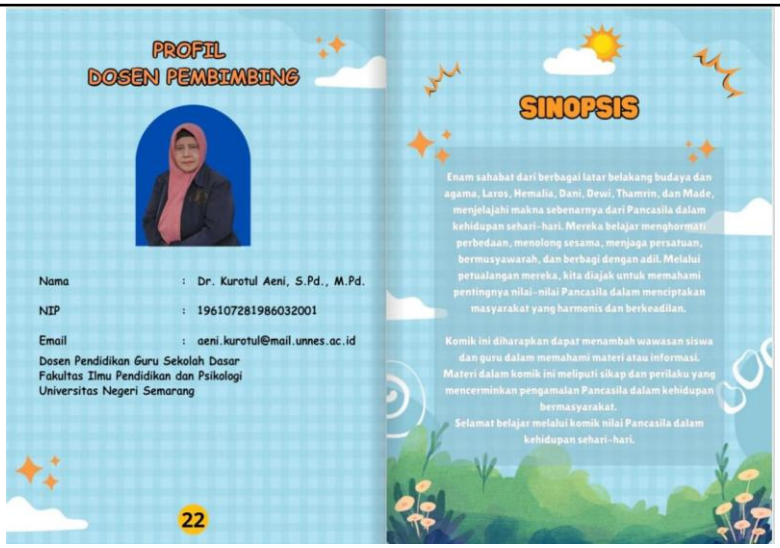

Figure 11. Lecturer profile and synopsis

3.2. Result of the *Flipbook-Based Digital* Comics to Improve Learning Outcomes and Attitudes of Grade IV Students

Design validation is an evaluation conducted to assess the product [33]. Design validation is carried out after the product design is complete. Design validation was assessed by media and material experts. The material assessment was conducted by Dr. TA. while the media assessment was conducted by Mr. MF. both experts gave scores by filling out the validation questionnaire provided by the researcher. The following are the result of the recapitulation of media and material feasibility.

Table 1. Recapitulation of Feasibility Assessment Result of *Flipbook-Based* Digital Comic

Expert	Total Score	Percentage	Criteria
Media Expert	53	83.33	Very Feasible
Materi Expert	56	100.0	Very Feasible

Based on the table, the score obtained from the media expert assessment is 53 percentage 83,33% very feasible category. There are 4 aspects assessed in the media expert assessment including convenience, technical, practical, and suitability for learning objectives. The recapitulation of the material validation assessment obtained a score of 56 with a percentage of 100% very feasible. There are 5 asspect that are assessed, namely, the accuracy of the material, suitability for the level of thinking of students, supporting learning objectives, supporting images, and media that support Pancasila education learning. This is line with research conducted [34] states that comic-based flipchart media is feasible to use with a media validation value of 91,33% and material experts 93,75%. Another study by [35] states that digital comic media assessed by media experts is 97% very valid and 98% material experts. Based on this table, *flipbook-based* digital comic media gets a very worthy assessment to be tested with revisions.

Design Revision

After the product design is validated, weaknesses in the product design will be identified through discussions with experts. These weaknesses will be corrected to improve the quality of the product design. Researchers revised the design based on the suggestions of media and material experts. The suggestion from the media expert is to add the profile of the creator and lecturer. While suggestions from material experts are to improve learning objectives and examples and examples of practicing Pancasila. The result of the product revision are as follows.

Figure 12. Creator profile and lecturer profile after revision

Figure 13. Learning objectives Before revision

Figure 14. Learning objectives after revision

Figure 15. Example of practice Pancasila precepts before revision

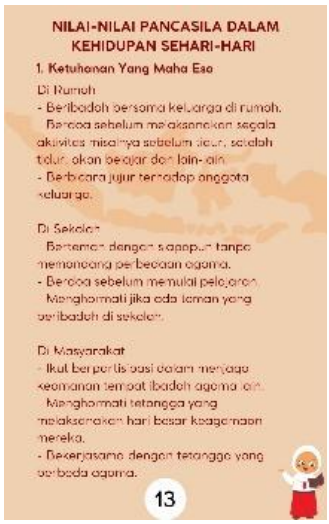

Figure 16. Example of practice Pancasila precepts after revision

3.3. Result of the Effectiveness Test of the *Flipbook-Based Digital* Comics to Improve Learning Outcomes and Attitudes of Grade IV Students

Product Trial

The *flipbook-based* digital comic media was tested on a small scale involving 6 students of class IVB Elementary School Tambangan 01 Semarang. Students were divided into 3 achievement categories, namely high low, and medium. The data collected included *pretest* and *posttest* results, teacher and student response questionnaires, and learning attitude questionnaires. The average result of the *pretest* was 53,33 and the *posttest* was 89,17. The increase in value by 35,84 shows that the use of *flipbook-based* digital comic media has succeeded in improving student learning outcomes. Students and teachers filled out a response questionnaire to find out the response to *flipbook-based* digital comic media as a learning tool. The results of the recapitulation of teacher's response questionnaire 100% stongly agreed including the category very feasible, while the 82,81% student response included the category very feasible. *Flipbook-based* digital comic media is suitable for use as learning tool for students of class IVB Elementary School Tambangan 01 Semarang. The questionnaire results show that students are interested in Pancasila education material and find the material easy to understand through *flipbook-based* digital comic media. Students feel comfortable, happy, and confident answering questions about Pancasila education.

Trial Usage

The trial use of comic media was carried out in large groups. Large-scale trial data includes learning outcomes from *pretest* and *posttest.* The average *pretest* was 55 while the average *posttest* was 86,13 with a difference of 31,13%. The use of *flipbook-based* digital comic media was declared successful in improving sudent learning outcomes. The number of students in the large-scale trial was 33 students obtained from 28 students and minus 6 students who had participated in the small-scale trial. The result of the teacher's response obtained a score of 100% very feasible criteria. *Flipbook-based* digital comic media proved to be very effective to use, especially the material of attitudes and behaviors that reflect the practice of Pancasila in social life.

The result of the learning attitude questionnaire show that students have a high interest in Pancasila education material and feel that *flipbook-based* digital comic media facilitates understanding of the material. Significant improvements were seen from small scale to large scale, anmely students became confident in asking questions and increased their ability to do questions well. After testing, researchers then analyzed the intial data to evaluate the effectiveness of *flipbook-based* digital comic media. Initial data analysis includes a normality test. The normality test is conducted to assess whether the data from the *pretest* and *posttest* result of class IV students at Elementary School Tambangan 01 Semarang are normally or abnormally distributed.

Table 2. Normality Test Results

Information	Shapiro-Wilk		
	Statistic	df	Sig.
Pancasila Education *Pretest*	157	28	395
Pancasila Education *Posttest*	160	28	152

The saphiro-wilk table shows a significance of 0,395 *pretest* and 0,152 *posttest*. The test result have a significance level of more than 0,05, it can be concluded that the *pretest* and *posttest* result normally distributed. The final data analysis contains the results of the *t-test* and n-gain test. The *t-test* was conducted to determine the effectiveness of using *flipbook-based* comic media. The *t-test* testd the following hypothesis. H_0 : *Flipbook-based* digital comic media is not effective in learning to improve learning outcomes and learning attitudes of Pancasila education grade IV students of Elementary School Tambangan 01 Semarang. Ha : *Flipbook-based* comic media effectively used in learning to improve learning outcomes and learning attitudes of Pancasila rducation grade IV students of Elementary School Tambangan 01 Semarang. If *t count* is greater that *t table,* then H_0 is rejected and Ha is accepted. The following are the results of the *t-test*.

Table 3. T-Test Result

Test	N	t-count	t-table	Description	Sig. (2-tailed)	Description
Pretest	28	20.162	2.056	*Ha diterima*	< 0.001	Significan
Posttest	28			*Ha diterima*		

Based on the *t-test* table, the significance value (2-tailed) 0,0001<0,05, it shows that there is a significant difference and the influence of the different treatments given to each variable. From the table above, it is known t_{count} = 20,162 and t_{table} = 2,056 at a significant level of 5%. the *paired samples test* proves that H_0 is rejected because t count > t table. The calculation results obtained t_{count} = 20,162 > t_{table} = 2,056 thus, H_0 is rejected and Ha is accepted so that *flipbook-based* digital comic media is provem effective and feasible to use in

learning to improve learning outcomes and learning attitudes of Pancasila education grade IV students Elementary School Tambangan 01 Semarang.

The scores obtained from the *pretest* and *posttest* results are dta that will be tested with the N-Gain formula, to determine the average incrase in student learning outcomes. The N-Gain test is obtained by comparing the defference in *pretest* and *posttest* score with the difference in maximum and *pretest* scores. The following are the results of the N-gain test.

Table 4. N-Gain Result

Average *Pretest*	Average *Posttest*	Score Maximum	N-Gain	Criteria
55	86.13	100	0,7135	High

The result of data processing through the N-gain test showed a value of 0,7135 high criteria. It is stated that the use of digital comic media for grade IV students of Elementary School Tambangan 01 Semarang is effective with the acquisition of N-Gain percent 71,3539. The difference between *pretest* and *posttest* scores is 31,13.

The development of flipbook-based digital comic media for Pancasila Education in Grade IV Elementary School has demonstrated a clear potential to address the challenges identified in the preliminary observations and interviews. Prior to the intervention, learning in Pancasila Education was constrained by limited resources, teacher-centered methods, minimal technological integration, and low student engagement. These factors contributed to suboptimal learning outcomes and passive learning attitudes, aligning with previous research that shows conventional lecture-based approaches often fail to stimulate critical thinking, motivation, and active participation in young learners [36]-[39].

The validation results from both media and material experts confirmed that the developed flipbook-based digital comic was in the “very feasible” category (83.33% and 100%, respectively). This high feasibility rating indicates that the media met key requirements for content accuracy, appropriateness for students’ cognitive development, alignment with learning objectives, and technical usability. These findings are consistent with earlier studies that have reported high feasibility scores for similar comic-based media in enhancing student understanding and engagement [40], [42]. The inclusion of colorful visuals, relatable characters, and structured storylines is particularly important for students in the concrete operational stage, as per Piaget’s theory, because it aids in concretizing abstract values such as the Pancasila principles.

The product revisions, based on expert feedback, further strengthened the media’s quality by clarifying learning objectives, enriching examples of Pancasila practice, and adding creator and lecturer profiles. Such refinements not only increased content clarity but also enhanced the authenticity and credibility of the learning material, which can positively influence student trust and motivation. The effectiveness trials, both small-scale and large-scale, revealed substantial improvements in learning outcomes. The increase from an average pretest score of 55 to a posttest score of 86.13, supported by a high N-Gain score of 0.7135, indicates that the media had a strong positive impact on student achievement. The results of the paired t-test ($t\text{-count} = 20.162$, $p < 0.05$) confirmed that these gains were statistically significant. These findings corroborate previous studies demonstrating that interactive and visually rich media can significantly boost cognitive learning outcomes by providing multiple channels for information processing [43]-[46].

Equally important, the learning attitude questionnaire results revealed a notable improvement in affective domains. Students expressed greater interest in Pancasila Education, felt more confident in answering questions, and were more willing to participate actively in class discussions. This is significant because much of the existing literature on digital comics has focused primarily on cognitive outcomes, with less attention to affective benefits. The current findings therefore contribute to filling this gap by providing empirical evidence that flipbook-based digital comics can simultaneously enhance knowledge acquisition and foster positive learning attitudes.

The integration of technology through a flipbook format also aligns with the objectives of the Merdeka Curriculum, which emphasizes flexibility, student-centered approaches, and the use of digital resources to enrich the learning process [47]-[51]. By embedding Pancasila values into an engaging digital format, the study provides a practical example of how curriculum goals can be achieved through innovative media design. However, while the results are promising, it is worth noting that the study was conducted in a single school context with a relatively small sample size. Therefore, further research involving diverse school settings and larger populations is necessary to validate the generalizability of these findings. Additionally, longitudinal studies could be conducted to examine whether the observed improvements in learning outcomes and attitudes are sustained over time.

Overall, the study demonstrates that flipbook-based digital comic media is not only feasible and effective but also capable of addressing both cognitive and affective aspects of learning in Pancasila Education. This dual benefit suggests that such media could serve as a valuable resource for teachers seeking to modernize

instructional practices, foster student engagement, and strengthen the integration of national values in the classroom.

This study presents several novelties. First, unlike most previous research on digital comics that primarily focuses on cognitive improvement, this study simultaneously addresses both learning outcomes and learning attitudes in Pancasila Education. Second, while digital comic applications are often found in mathematics, science, or literacy subjects, this research uniquely applies flipbook-based digital comics to a values-based subject at the elementary school level, filling a gap in the literature. Third, the media was specifically designed to align with the Merdeka Curriculum and embed Pancasila values into an engaging digital format suitable for students in the concrete operational stage of cognitive development. The implications of this study are multifaceted. Pedagogically, flipbook-based digital comics can transform teacher-centered lectures into interactive and student-centered learning experiences, improving both understanding and enthusiasm. Curricularly, the integration of national values into a modern digital format supports the Pancasila Student Profile, promoting character development and civic responsibility alongside academic achievement. Technologically, the findings show that even schools with limited previous technology integration can adopt low-cost and easily distributable digital media to enhance learning. From a policy perspective, the results can encourage the implementation of technology-supported values education in broader educational reform initiatives.

However, this research has several limitations. The study was conducted in a single elementary school with a relatively small number of participants, limiting the generalizability of the findings. The short time frame only measured immediate post-intervention outcomes, without assessing long-term retention or sustained changes in attitudes. In addition, the implementation assumes access to devices capable of running flipbook media, which may not be feasible in all regions. Furthermore, the content was tailored to specific Pancasila Education material, meaning adaptation would be necessary for other subjects. Based on these findings, several recommendations can be made. Future studies should be conducted in multiple schools across different regions and socio-economic contexts to improve external validity. Longitudinal research is needed to evaluate the sustainability of learning improvements over time. The approach should also be tested in other subjects to explore broader applicability. Teachers should be provided with training to create and adapt flipbook-based comics for their teaching needs, and offline-compatible versions should be developed to ensure equitable access for schools with limited internet connectivity.

4. CONCLUSION

Based the development of flipbook-based digital comic media for Grade IV Pancasila Education at Elementary School Tambangan 01 Semarang has proven to be both feasible and effective, with media expert validation scores of 83.33% and material expert validation scores of 100%. The use of engaging visuals, relatable characters, and structured narratives made abstract Pancasila values more concrete and accessible, significantly improving learning outcomes (N-Gain = 0.7135, high category) and learning attitudes. The substantial statistical gains (t-count = 20.162, $p < 0.05$) confirm its effectiveness in enhancing students' understanding, participation, and confidence. This research offers a novel and practical contribution to values-based education, demonstrating that digital, interactive storytelling can be a powerful tool for fostering both knowledge and positive attitudes in line with the goals of the Merdeka Curriculum. While larger-scale and long-term research is recommended, flipbook-based digital comics hold strong potential as an innovative, technology-driven approach to revitalizing character education in Indonesian primary schools.

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