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Development of Smart Apps Creator-Based Interactive Learning Media to Support 21st Century Skills in Pancasila Education for Elementary Schools

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Abstract: This research aims to develop interactive learning media based on Smart Apps Creator to support 21st-century skills in Pancasila education for elementary school students that are feasible, practical, and effective. This study employed a Research and Development (R&D) method using the ADDIE development model, which consists of five stages: analysis, design, development, implementation, and evaluation. The research subjects included fifth-grade teachers and students from selected elementary schools in Padang, West Sumatra. The selection of research subjects was conducted purposively, considering factors such as implementing the Merdeka Curriculum, availability of technological infrastructure, and the schools' willingness to collaborate. Data were collected through observations, interviews, questionnaires, and learning outcome tests. Both qualitative and quantitative data analyses were used, including n-gain score analysis. The development resulted in an interactive media product for Pancasila education using Smart Apps Creator, which was declared feasible, practical, and effective. The feasibility assessment by material, linguistic, and media experts obtained an average score of 91.67%, categorized as very feasible. The practicality aspect, evaluated through teacher 90%, indicating a very practical product, and student responses achieved an average score of 96,6%, indicating a very practical product. The average N-gain score in the experimental class was 85.11 (high category), while the control class scored 44.57 (moderate category). These findings indicate that the developed interactive media effectively supports the enhancement of 21st-century skills, particularly in Pancasila learning for elementary students.

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Introduction

The 21st-century education paradigm demands a transformative shift in instructional methods to equip students with relevant and competitive competencies, especially in developing critical thinking skills one of the core elements of 21st-century competencies (Hanipah, 2023). Integrating technology into learning not only enhances digital literacy but also fosters critical thinking through problem-solving and complex analysis (Astuti, 2021). By introducing technology in the classroom, students can sharpen their critical thinking abilities and respond more effectively to the challenges of the 21st century.

Critical thinking is closely associated with problem-solving, especially within dynamic educational systems. Teachers play an important role in facilitating technology-integrated learning to help students think critically (Indarta et al., 2022). However, Varol (2013) emphasizes that the effective use of technology is often hindered by teachers' beliefs regarding its effectiveness. A study by Chandra and Sinaga (2021) further identifies several

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barriers to technology use in elementary schools, including limited teacher knowledge, unstable electricity, and school policies that do not optimally support the integration of technology. Therefore, mastering technological tools becomes essential through targeted training and facility improvements to support tech-based learning environments.

The integration of technology in elementary education aims to ensure that students can demonstrate creativity, innovation, critical thinking, collaboration, and meaningful learning as integral components of educational development (Jayadi et al., 2020). Interactive learning media allow students not only to receive information passively but also to actively engage in learning processes (Cuit, 2022). This approach encourages students to think critically about the information they receive and to respond based on their understanding (Zubaidah, 2016). As students develop problem-solving skills, they become more capable of overcoming challenges and expressing creativity in dealing with complex situations.

At the elementary level, the integration of 4C skills (Critical Thinking, Communication, Collaboration, and Creativity) has become a fundamental requirement of 21st-century learning (Erdogan, 2019). This not only calls for a change in teaching methods but also demands that teachers help students consistently apply these competencies in daily life (Prihadi, 2017). Critical thinking, as a core element of the 4Cs, supports students in improving their knowledge, reasoning quality, and ability to form informed judgments while addressing various problems (Tuzlukova et al., 2017). Thus, fostering critical thinking enables students to approach problem-solving more systematically.

The cultivation of critical thinking is particularly essential in Pancasila Education, a subject in elementary schools that aims to develop students' competencies in making responsible decisions in line with conscience, and in understanding developments in science and technology (Ishaq, 2021). Specifically, Pancasila Education seeks to equip students with fundamental knowledge and skills for engaging in civic life as Indonesian citizens. Pancasila values form the foundational principles of national identity and citizenship (Azhar & Djunaidi, 2019). In this context, students are expected to develop civic responsibility and civic skills through active participation in democratic processes (Komalasari, 2011).

To achieve this, teachers are expected to have the ability to apply technology in their teaching practices through the integration of Technological Pedagogical Content Knowledge (TPACK). TPACK provides a useful framework for identifying the knowledge required to integrate technology into teaching and for developing that knowledge systematically (Schmidt et al., 2014). Teachers must also adopt creative and innovative approaches to delivering content, including selecting appropriate and engaging learning media (Widyawati & Sukadari, 2023). Additionally, learning media should support students in thinking critically, expressing ideas, being creative, and collaborating to solve problems (Živković, 2016). Effective use of instructional media enhances the overall quality and effectiveness of classroom learning.

Instructional media play a vital role in the learning process (Rahim et al., 2022). Optimal learning outcomes can be achieved when media are appropriately selected and aligned with current technological advancements. According to Mustika (2015), choosing the right media has a significant impact on learning success, as it helps teachers convey material from various sources and facilitates students in achieving learning goals.

However, these instructional media are not yet proven to be valid, practical, or effective in enhancing the quality of learning, particularly in Pancasila Education. Interviews conducted with homeroom teachers across these schools revealed that many lack experience in developing innovative learning media, primarily due to limited training opportunities. This limitation has led to decreased student motivation and increased boredom during Pancasila

Education classes. Despite these challenges, the schools provide sufficient infrastructure such as laptops, Chromebooks, projectors, speakers, Wi-Fi, and policy support allowing students to bring gadgets to facilitate the use of technology in the classroom.

In addition, during the needs analysis conducted among students in Kuranji Subdistrict, Padang City, it was found that a significant proportion (51%) believed that interactive technology-based learning would increase their interest in learning. Meanwhile, 9% considered traditional print media less engaging, and 40% preferred media that supported collaborative learning with peers. This finding underscores the urgent need for interactive, engaging, and relevant digital media tailored to the needs of the current generation of learners. Therefore, the development of technology-based interactive media using Smart Apps Creator is a promising solution. The schools involved in the preliminary study already possess adequate infrastructure, and students have shown a strong interest in more interactive learning tools.

To support the integration of technology in the classroom, the use of appropriate learning media is important. Particularly in the context of Pancasila Education for Grade V students, technology-based media can improve motivation, engagement, and comprehension. Hence, this study aims to develop interactive learning media using Smart Apps Creator to enhance the quality of learning in Pancasila Education at the elementary level. However, studies specifically examining the use of Smart Apps Creator in Pancasila education are still very limited, especially those that intentionally integrate 21st-century skill development. In fact, the values in Pancasila are highly relevant to 21st-century skills, such as collaboration in gotong royong, critical thinking in making fair decisions, and communication in fostering mutual respect and tolerance. The absence of interactive media specifically designed for Pancasila education is one factor contributing to the lack of effective character and civic education in the digital era.

Based on this gap, there is an urgent need to develop interactive learning media using Smart Apps Creator that not only delivers Pancasila content but also supports the development of 21st-century skills in an integrated manner. Previous studies have shown that while interactive digital media are widely used in various subjects, their specific application in civic or character education remains limited (Candra & Sinaga, 2022; Komalasari, 2011). Moreover, most digital media developed so far do not explicitly integrate 21st-century competencies such as collaboration, creativity, and critical thinking with Pancasila values (Makda, 2025). This innovation thus aims to create a more engaging, participatory, and contextual learning experience for elementary students. In addition, the media can serve as a flexible teaching aid for teachers and support the “Kurikulum Merdeka”, which encourages differentiated, student-centered learning.

The scientific novelty of this study lies in the development of Smart Apps Creator-based interactive learning media specifically designed for Pancasila education, with a strong focus on enhancing students’ 21st-century skills at the elementary school level. The integration of civic and character education content with technology-based interactive approaches is expected to be a significant contribution to both theory and practice in the field of elementary education in the digital era.

Research Method

This research employed a Research and Development (R&D) approach using the ADDIE development model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation (Ramly et al., 2022). This model was chosen due to its systematic and iterative characteristics, enabling the development of interactive learning

media that are valid, practical, and effective in enhancing student learning outcomes, particularly in the Pancasila subject for Grade V.

The research was conducted in six elementary schools in Padang City that had implemented the Merdeka Curriculum. The research subjects were fifth-grade students, elementary school teachers, as well as media and material experts who served as validators. In the qualitative phases of this study (particularly the analysis and evaluation stages), the researcher was directly involved in classroom activities as an observer and facilitator, and also conducted interviews and discussions with informants to gain deeper insights into the needs and impacts of the developed media.

The population of this study included all Grade V students in public elementary schools in Padang City, while the sample was selected using purposive sampling. SDN 48, 50, 53 Kuranji was selected as the implementation site due to its accessibility and the readiness of the school to collaborate, total of 68 students participated in the trial implementation.

Data collection was carried out using several instruments: (1) interview guidelines and observation sheets during the needs analysis phase; (2) validation sheets for media and content during the development stage; (3) student response questionnaires and teacher feedback forms during the implementation phase; and (4) learning outcome tests (pretest and posttest) to evaluate the effectiveness of the media. The learning media were developed using Smart Apps Creator, a digital tool used to create interactive multimedia applications compatible with mobile and desktop platforms. The media contained thematic learning materials on the topic “Aku dan Lingkungan Sekitarku” which is part of the Pancasila subject in the Grade V curriculum. The media featured narration, images, animations, and interactive quizzes designed to foster critical thinking and engagement.

Quantitative data, such as the results from validation sheets, practicality questionnaires, and pretest-posttest scores, were analyzed using descriptive statistics. The effectiveness of the product was measured using the normalized gain (N-Gain) formula (Ramadhanintyas et al., 2025). Meanwhile, qualitative data from interviews and observations were analyzed using content analysis to identify themes and patterns relevant to students' responses, media usability, and classroom dynamics (Wijaya, 2019). To ensure the validity of the research results, triangulation techniques were applied by comparing data from various sources, including expert validations, teacher feedback, and student reflections (Handoko et al., 2024). The iterative process of revision and re-validation ensured the credibility and reliability of the developed media before its final implementation in the classroom.

Results and Discussion

Analyze Stage

At the Analyze stage, a needs analysis was carried out to identify the problems faced by educators and students in the learning process of Pendidikan Pancasila for Grade V, particularly in the sub-theme "Aku dan Lingkungan Sekitarku". This stage involved interviews and observations conducted in several elementary schools to obtain comprehensive data related to the current teaching practices, media used, and challenges encountered during the implementation of the learning process.

From interviews with teachers, it was found that most educators still rely on printed teaching materials provided by the government. These include textbooks and worksheets (LKS), although aligned with the curriculum, are limited in number and lack interactive features. As a result, the learning process tends to be monotonous, teacher-centered, and less engaging for students. Teachers acknowledged that while they are aware of the importance of

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utilizing digital technology in learning, they often face constraints in terms of time, workload, and limited skills in designing multimedia-based teaching tools.

Observations conducted in the classroom supported these findings. It was seen that the learning process, especially in the sub-theme "Aku dan Lingkungan Sekitarku", did not fully facilitate active learning. Students were observed to be passive, with minimal involvement in class discussions and activities. The materials presented were not contextualized with students' real-life environments, making it difficult for them to internalize values such as environmental awareness, care, and responsibility.

The analysis also revealed that the implementation of the Merdeka Curriculum is still in its early adaptation stage. Teachers are required to develop differentiated and student-centered learning, but the lack of practical and engaging media becomes a challenge in achieving this. There is a clear need for innovative learning resources that are both accessible and capable of supporting the development of students' character and critical thinking skills. Based on these findings, it can be concluded that there is a strong need for the development of interactive multimedia-based learning media using tools such as Smart Apps Creator. This type of media is expected to provide a more engaging, interactive, and meaningful learning experience for students, while also helping teachers overcome the challenges of limited resources and time in preparing learning tools.

Design Stage

The design stage was carried out based on the findings of the analysis stage, which indicated the need for interactive and engaging digital learning media to support the learning of the sub-theme "Aku dan Lingkungan Sekitarku" in Grade V of elementary school. At this stage, the learning media was conceptually designed using the Smart Apps Creator application, which allows the integration of images, audio, animation, and interactive features suitable for elementary students.

The initial step in this phase involved determining the learning objectives and aligning them with the Merdeka Curriculum, particularly the Pancasila Education subject. The content was mapped based on the CP (Capaian Pembelajaran) and TP (Tujuan Pembelajaran), with the aim of fostering environmental awareness, responsibility, and care as part of the Pancasila values. The learning objectives were translated into storyboards that guided the development of multimedia content.

The design of the media included:

a) Character design: Two main characters, Brian and Raya, were created to accompany students throughout the learning activities, using a storytelling approach to increase engagement and familiarity.
b) Navigation structure: The media was designed with simple and intuitive navigation to allow independent use by students. It included a main menu, material sections, interactive quizzes, and a reflection page.
c) Visual and audio elements: Bright, child-friendly illustrations were selected to represent real-life environments such as home, school, and neighborhood. Voice narration was also designed to support early readers and promote accessibility.
d) Assessment design: Formative assessments in the form of multiple-choice quizzes and drag-and-drop activities were embedded to measure students' understanding and encourage active participation.

Furthermore, the media design considered the TPACK (Technological Pedagogical Content Knowledge) framework, ensuring that the integration of technology did not only serve as a tool, but also as a meaningful support for pedagogical strategies and content delivery. The

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final output of the design stage was a detailed storyboard and flowchart that served as a blueprint for the media development. The storyboard included the content for each screen, interaction types, character dialogues, and transitions. This design document was then used in the next stage Development for creating the actual interactive learning media using Smart Apps Creator. At this point, media validators will validate the product to offer evaluation and feedback as a foundation for future development. This step ensures that the design meets both pedagogical and technical standards before proceeding to the development stage.

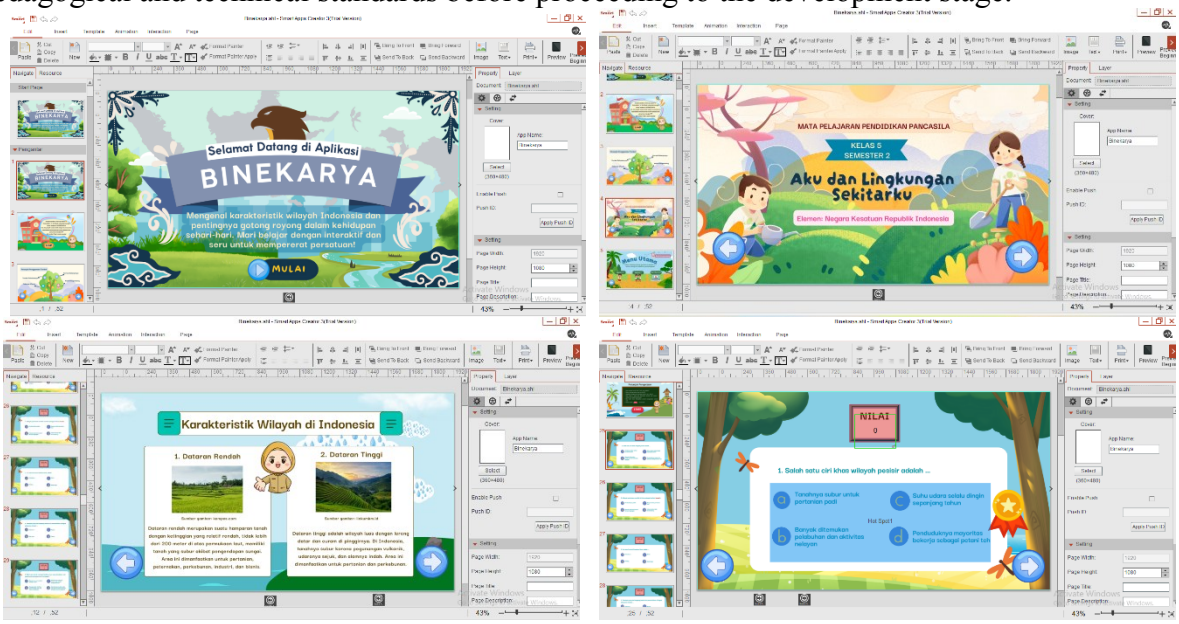

Figure 1. Product design of Smart Apps Creator

Development Stage

After the development phase, the interactive learning media was subjected to validation and trials involving both students and teachers. The trial process was carried out in three stages: one-on-one trials, small group trials, and field trials. Validation aimed to assess the feasibility of the product, while the trials were conducted to evaluate its practicality. The evaluation outcomes from the material and media experts indicated that the product was highly feasible, with the following scores.

Table 1. The validation evaluation by media, linguistics, and material experts

No	Type validation	Aspects	Score	Percentage	Predicate
1	Material	1. Suitability and Effectiveness of Learning Materials	5	95%	Very Valid
		2. Clarity of Material Delivery in Learning Media	4		
		3. Relevance and Contextualization of Material	5		
		4. Evaluation of Learning Materials	5		
2	Linguistics	1. Clarity and Accuracy of Language in Learning Media	5	93,33%	Very Valid
		2. Conformity to Grammar	4		

3	Media	3. Clarity of Typeface 1. Effectiveness and Interactivity of Learning Media 2. Readability and Clarity 3. Functionality and Quality of Learning Media	5 5 4 4	86,67%	Very Valid

The findings of the assessment conducted by media, linguistics, and material validators, based on predetermined scoring criteria, showed that the interactive learning media developed using Smart Apps Creator for the topic "Aku dan Lingkungan Sekitarku" an average score of 91,67%, was categorized as "very feasible", and thus, could proceed to the next stage product trials.

At this stage, the product was tested through three phases: one-to-one trial, small group trial, and field trial. These stages aimed to assess the practicality of the media when used by students and teachers in real classroom settings. The results of each trial phase are presented in the following table.

No	Stage	Responden	Total	Mean	Predicate
1	Trial Class	Student	24	95,75	Very practical
		Teacher	1	86,67	Practical
2	Experimental Class	Student	22	97,44	Very practical
		Teacher	1	93,33	Practical

Referring to the predetermined scoring guidelines, the findings of the practicality assessment by instructors and students revealed that the developed using Smart Apps Creator for the Pancasila subject on the theme "Aku dan Lingkungan Sekitarku" product was categorized as "very practical," allowing it to proceed to the next stage, namely the implementation test.

Implementation Stage

The implementation aimed to examine the effectiveness of the interactive learning media developed using Smart Apps Creator in enhancing collaboration skills in the Pancasila Educaioon subject under the theme ″Aku dan Lingkungan Sekitarku.″ This stage was conducted using a pretest-posttest control group design, where the experimental group utilized the developed media and the control group used conventional learning methods. The results of the pretest and posttest are presented in the tables below:

No	Class	Mean			Predicate
		Pretest	Posttest	N-Gain Score	
1	Eksperiment	73,18	95,23	0,85	Effective
2	Control	72,75	83,75	0,45	Less Effective

Based on the table above, the results of the N-gain score test showed that the average N-gain score for the experimental class (which used interactive learning media based on Smart Apps Creator) was 85.11, which falls into the high or effective category. Meanwhile, the average N-gain score for the control class (which used textbooks and conventional learning media) was 44.57, which falls into the moderate or fairly effective category.

Therefore, it can be concluded that the development of interactive learning media using Smart Apps Creator in the Pancasila Education subject under the theme "Aku dan Lingkungan Sekitarku" for fifth-grade elementary school students is effective for use in the

learning process. This media has proven to support the improvement of students collaboration skills and provide a more contextual and engaging learning experience.

Evaluation Stage

In the evaluation stage, a comprehensive review was carried out on the overall stages of product development to ensure the quality and effectiveness of the interactive learning media created using Smart Apps Creator. This stage involved reflecting on feedback from validators, trial participants (teachers and students), and the results of implementation.

Based on the validation results, the product received a "very feasible" rating from media and material experts. Furthermore, practicality assessments from both teachers and students indicated that the media was "very practical" to use in classroom settings. The implementation test results also demonstrated a significant improvement in students' collaboration skills, especially in the experimental class using the developed media. This stage ensured that the final product met the required standards of validity, practicality, and effectiveness, supporting its suitability for broader classroom application. Any identified weaknesses or suggestions gathered during the implementation phase were also used as input for minor revisions and final improvements of the product before dissemination.

Discussion

The development of interactive learning media using Smart Apps Creator for Pendidikan Pancasila in elementary school was carried out to respond to the needs of teachers and students in implementing the Merdeka Curriculum, especially in integrating digital technology into character education. Based on the analysis stage, it was found that most teachers still relied on printed teaching materials and conventional media due to time constraints and limited digital resources. This finding supports research by Makda (2025), which highlights the urgent need for digital teaching materials that are accessible, practical, and aligned with current curriculum demands.

The product developed was validated by media and content experts and showed results in the "very feasible" category. This indicates that the content, visual presentation, interactivity, and technical functionality of the media met the standards for implementation in classroom settings. Furthermore, the practicality test involving teachers and students from three different schools also showed results in the "very practical" category. These results reflect that the media was easy to use, engaging, and helpful in supporting the learning of Pancasila values such as collaboration, care, responsibility, and mutual respect values that are central to the subject.

The implementation stage, which included one-to-one trials, small group trials, and field trials, revealed a significant improvement in students' collaboration skills in the experimental group compared to the control group. Pretest and posttest scores showed that students who used the interactive media had higher N-gain scores, with an average of 85.11 (categorized as high), while students in the control group had an average of 45.57 (categorized as moderate). This result aligns with studies by Gan (2015) and Kesuma (2025), which state that digital learning media can significantly enhance student engagement and character development when combined with active learning models such as colaboration learning.

The interactive learning media not only helped students understand abstract concepts in Pendidikan Pancasila but also fostered meaningful interaction, cooperation, and reflective thinking. The media's use of animations, interactive quizzes, and storytelling through by Teacher contributed to a learning environment that was both fun and value-driven. This is in

line with the view of Erdoğan (2019), who assert that 21st-century learning must incorporate creativity, communication, and collaboration to be effective.

The findings of this study highlight the effectiveness of digital-based interactive media in enhancing not only cognitive understanding but also socio-emotional and affective competencies in elementary students, provided the media is contextually designed and aligned with learning objectives. This underscores the importance of integrating technology into education, promoting a holistic approach that supports both intellectual and emotional development. In the context of Pendidikan Pancasila, which aims to instill foundational national values from an early age, digital media serves as a powerful tool to convey these values in an engaging and interactive way. This approach not only enriches students' academic skills but also fosters moral and social awareness, creating a more dynamic and meaningful learning experience.

Practically, the study suggests that educators can leverage digital interactive media to engage students in a more comprehensive learning process. When designed with clear educational goals and relevant content, such media can foster the development of cognitive knowledge and socio-emotional skills, such as empathy, collaboration, and self-awareness. Furthermore, the findings emphasize the potential of digital tools to support the implementation of Pendidikan Pancasila, facilitating the teaching and internalization of core national values. Therefore, educators are encouraged to incorporate digital media into their pedagogical strategies, enhancing student engagement and ensuring that learning experiences are meaningful and aligned with the broader goals of nation-building through education.

Conclusion

Based on the results of the research and development conducted, the interactive learning media developed using Smart Apps Creator is highly feasible, practical, and effective for use in teaching Pancasila Education for Grade V elementary school students. The feasibility assessment by material, linguistics and media experts obtained an average score of 91,67%, categorized as very feasible. The practicality aspect, evaluated through teacher responses, achieved an average score of 90%, and student responses, achieved an average score of 96,6%, indicating a very practical product. The average N-gain score in the experimental class was 85.11 (high category), while the control class scored 44.57 (moderate category). Furthermore, implementation tests conducted in three different elementary schools demonstrated a significant improvement in students' collaboration skills, as evidenced by the high N-gain scores in the experimental groups compared to the control groups.

These findings suggest that digital interactive media, when designed using technological tools like Smart Apps Creator and guided by appropriate pedagogical principles, can substantially enhance students' engagement, critical thinking, and collaboration in Pancasila Education. Therefore, this media can be recommended as an innovative alternative to support the realization of the Merdeka Belajar curriculum in elementary schools.

Recommendation

The developed Pancasila interactive learning media presents a valuable complement to existing Pancasila teaching materials. Its user-friendly and accessible design provides an innovative example of digital learning tools that are not only engaging but also interactive. This media allows students to use it independently from home, making it a practical and relevant option for online and hybrid learning environments. For teachers, it is recommended to integrate this interactive media into their lesson plans as an additional resource to enhance

student engagement and deepen their understanding of Pancasila values. Teachers should also consider providing guidance on how to effectively use the media to encourage self-directed learning, which can be particularly beneficial in remote or blended learning settings.

For future researchers, this study provides a foundation for further development and enhancement of the media. Future research should focus on refining the tool to address any identified limitations, such as improving interactivity or incorporating more diverse content. Researchers are encouraged to explore ways to adapt the media for different educational contexts or grade levels and assess its long-term impact on students' understanding and internalization of Pancasila values. Additionally, future studies could evaluate the media's effectiveness in promoting not only cognitive outcomes but also its role in fostering students' socio-emotional development, ensuring its broader applicability in various educational settings.

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