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Reconceptualizing Mobile Interactive Multimedia as a Motivational Architecture in Civic Education: Evidence from Android-Mediated Learning Environments

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ABSTRACT

Background. The use of interactive multimedia in primary education has expanded rapidly and has been associated with students' learning motivation, engagement, and learning outcomes. However, less attention has been given to how specific multimedia features support motivational engagement in value-oriented civic education, particularly in Android-base learning for primary education.

Purpose. This study aimed to develop SiLaKu, an Android-based interactive media application for learning Pancasila values in daily life. It also examined the feasibility developed multimedia and its contribution to sixth-grade students' learning motivation.

Method. This study employed a Research and Development (R&D) design adapted from the Lee and Owens model, comprising assessment/analysis, design, development and implementation, and evaluation. The field trial involved 20 sixt-grade students at a primary school in Malang, East Java, Indonesia. Data were collected through classroom observation, interviewes, expert validation, documentation, and a pretest-posttest learning motivation questionnaire. The data were analyzed using percentage-based feasibility analysis, descriptive statistics, the Shapiro–Wilk normality test, the Wilcoxon Signed-Ranks Test, Wilcoxon effect size r, and normalized gain analysis.

Results. The developed multimedia received high feasibility ratings from subject matter and media experts, with validation scores of 97.00% and 91.25%, respectively. Students' mean motivation score increase from 2.455 before implementation to 3.525 after implementatiom. The Wilcoxon Signed-Rank test indicated a significant increase in students' learning motivation ($Z = -3.953$, $p < .001$), with a large effect size, r = 0.884. The normalized gain score was 0.69, indicating moderate improvement approaching the high category.

Conclusion. The findings suggest that Android-based interactive multimedia can support students' learning motivation in primary civic education when it incorporates learner-controlled navigation, multimodal materials, interactive quizzes, immediate feedback, and activity-based worksheets. This study contributes to the discourse on mobile civic learning by positioning Android-based multimedia as a structured multimedia support system rather than merely a digital presentation tool.

KEYWORDS

Android-Based Learning, Civic Education, Interactive Multimedia, Learning Motivation, Mobile Learning, Primary Education

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INTRODUCTION

The rapid integration of digital technology into educational practice has reshaped how learning is designed, delivered, and experienced across different levels education (Bonfield et al., 2020). In primary education, the widespread use of smartphones and mobile applications has also encouraged the development of mobile learning environments that allow students to access instructional materials beyond conventional classroom settings (Mhlongo et al., 2023). Mobile learning has been associated with gerater flexibility because students can engage with learning resources according to their own pace, needs, and learning preferences ((Bidarra & Sousa, 2020a). In this context, Android-based learning media have become increasingly rlevant, especially in schools where computer-based learning infrastructure remains limited but mobile devices are more familiar to students in their everyday lives.

Interactive multimedia, particularly Android-based learning media, has been widely promoted as an approach for creating flexible, student-centered, and engaging learning experiences (Dewi et al., 2026; Sudarma et al., 2025). Previous studies have shown that multimedia-supported learning environments may improve classroom participation, engagement, and learning outcomes (Kusmayadi et al., 2026; Park & Braud, 2017; Tampubolon & Tampubolon, 2026). However, technology integration does not automatically sustain students' motivation or active involvement in learning. In many classrooms, digital media still functions primarily as a presentation tool rather than as a learning environment that support student engagement (Buzzard et al., 2011). This inconsistency suggests that the relationship between multimedia interaction and students' learning motivation remains insufficiently explained.

This issue is particularly important in civic education. Unlike subjects that mainly emphasize procedural mastery, civic education requires reflective understanding, value internalization, social participation, and active involvement in the learning process (Busara, 2023; Hoggan-Kloubert & Mabrey, 2022). In the teaching of Pancasila values, student are expected not only to remember civic concepts but also to connect them with concrete examples in daily life. Therefore, students' learning motivation becomes an important condition for achieving civic learning objectives. Value-oriented learning requires attention, participation, and willingness to engage with moral and social meanings.

Previous studies on interactive multimedia in Pancasila and civic education have provided important evidence that digital media can support students' learning interest, conceptual understanding, classroom engagement (Istiqomah & Wibowo, 2024; Tirtoni & Ramadhan, 2024; Wahyudi & Kawuryan, 2025a). Nevertheless, many studies still emphasize product feasibility, usability, or academic achievement, while giving less attention to how multimedia interaction shapes students' motivational engagement in value-oriented learning. Reseacrh on mobile learnig and interactive multimedia also remains more dominant in STEM and language learning contexts, while civic education id relatively less explored as a context for examining motivationally supportive multimedia design (Djahara et al., 2026; Rahmad et al., 2025)

Another problem concerns the technocentric orientation of multimedia learning research. Interactive features such as learner-contorolled navigation, multimodal representation, embedded feedback, and self-paced learning are often treated as technical components rather than as pedagogical mechanisms that shape students' motivational experiences (Dubey et al., 2023; Rhode, 2009; Schindler et al., 2017a). Recent discussion in digital pedagogy also suggest that technological richness alone does not necessarily produce sustained motivation or meaningful learning participation (Getenet et al., 2024; Poon et al., 2024; Rapanta et al., 2021; Teng & Wang, 2021). Therefore, interactive multimemdia needs to be examined not only in terms of its technical feasibility but also in terms of how its design supports students' autonomy, competence, and active engagement.

This study draws on Self-Determation Theory (SDT), which emphasizes autonomy, competence, and relatedness as central dimensions of learning motivation (Martin et al., 2018; Ryan & Deci, 2020; Yang et al., 2025). From this perspective, motivation develops when students experience meaningful control over learning activities, perceive themselves as capable learners, and participate in meaningful learning interactions. Interactive multimedia may support motivation not simply because it uses digital technology, but because it can provide learner agency, multimodal interaction, immediate feedback, and self-directed participation (Liu & Correia, 2021; Mohammadi Zenouzagh et al., 2023).

The present study addresses these gaps by developing and examining SiLaKu, an Android-based interactive multimedia application for learning Pancasila values in daily life among sixth-garde students in an Islamic primary school. This study positions Android-based interactive multimedia not merely as a digital instructional aid, but as a structured motivational support system for primary civic education. This positioning is important because Android use in elementary and Islamic primary school contexts is often restricted, even though students are increasingly familiar with smartphones outside school. In this study, Android use was therefore implemented under teacher supervision and aligned with specific learning objectives.

Therefore, this research aims to develop Android-based interactive multimedia for citizenship education, test its feasibility through expert validation, and analyze student learning motivation before and after its implementation in the classroom. This research also seeks to explain how student-controlled navigation, multimodal materials, interactive quizzes, direct feedback, and activity-based worksheets can support students' motivational engagement in learning Pancasila values.

RESEARCH METHODOLOGY

This study employed a research and development design adapted form the Lee and Owens model. The design was selected because the purpose of the study was not only to examine students' learning motivation, but also to develop, evalidate, revise, and implement an Android-based interactive multimedia product for civic education. The development procedure consisted of four main stages: assessment and analysis, design, development and implementation, and evaluation. Through these stages, the study sought to ensure that the multimedia product was developed according needs, aligned with learning objectives, validated by experts, and tested in authentic classroom setting.

The study was conducted in a sixth-garde civic education class at MI NU Hidayatul Mubtadiin Malang, Indonesia. The filed trial involved 20 sixth-grade students who participated in the implementation stage. The relatively small number of participants reflected the limited field-trial nature of research and development design. Therefore, the quantitative analysis was intended to provide initial evidence of motivational improvement after product implementation rather than to establish broad causal generalization across different school contexts.

During the field trial, the implementation was conducted in the regular classroom setting under teacher supervision. Before using SiLaKu, students completed a pretest motivation questionnaire. The teacher the allowed students to use Android smartphones for the learning activity, and the application was distributed through the class WhatsApp group. Students downloaded and installed the application on their devices before using it to learn the topic of Pancasila values in daily life. During the learning process, students accessed the learning materials and videos, completed multiple-choice quizzes individually, and worked on student worksheet activities collaboratively in groups. After the learning activity was completed, students filled in the posttest motivation questionnaire.

Several instruments were used in this study, including observation sheets, interview guidelines, expert validation questionnaires, student motivation questionnaires, and documentation (Table 1).

Table 1. Research Instrument

No.	Instrument	Goal
1	Observation sheets	to record the classroom learning process and the availability of instructional facilities
2	Interview guidelines	to collect information from the teacher and students regarding learning problems and media needs
3	Expert validation questionnaires	To examine validity
4	Student motivation questionnaires	to examine changes in students' learning motivation
5	Documentation	to support and record the development and implementation process

Students' learning motivation was measured using a 10-item questionnaire adapted from the motivation section of the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Dayel et al. (2018). The items were contextually modified for sixth-grade civic education learning on Pancasila values in daily life and organized into two indicators: intrinsic-oriented and extrinsic-oriented motivation. The intrinsic-oriented items reflected students' interest, enjoyment, perceived importance, confidence, and independent task completion, while the extrinsic-oriented items reflected motivation related to rewards, examination performance, achievement, social recognition, and expected scores. The questionnaire was administered before and after the implementation of SiLaKu using a four-point Likert scale, with higher scores indicating higher learning motivation. Table 2 show the structure of the questionnaire.

Table 2. Structure of the Adapted Learning Motivation Questionnaire

Indicator	Item Focus	Number of Items	Example of Adapted Item
Intrinsic-oriented motivation	Interest, enjoyment, perceived importance, confidence in understanding the material, and independent task completion	5	I am very interested in learning Pancasila values in daily life.
Extrinsic-oriented motivation	Teacher appreciation or rewards, examination performance, achievement, social recognition, and expectations of obtaining good scores	5	I am motivated to learn so that I can do well on the examination.

The data analysis was conducted according to the type of data collected. Expert validation data were analysed using percentage-based feasibility criteria to determine whether the developed multimedia was valid and feasible for classroom use. Students' motivation data were analysed using descriptive statistics to compare pretest and posttest motivation scores. Before hypothesis testing, the normality of the pretest and posttest scores was examined using the Shapiro–Wilk test because the number of participants was fewer than 50. Since the posttest scores did not meet the normality assumption, the Wilcoxon Signed-Ranks Test was used to examine whether students' motivation scores differed significantly before and after the implementation of SiLaKu. The effect size was calculated using Wilcoxon effect size r, while the normalized gain score was used to estimate the

magnitude of students' motivational improvement. This analytical procedure allowed the study to evaluate both product feasibility and initial motivational improvement within the context of a limited field trial.

RESULT AND DISCUSSION

Preliminary Needs Assessment

The development process began with a preliminary needs assessment to identify the instructional and motivational problems in sixt-grade civic education learning. This stage was conducted through classroom observation and interviews with the civic education teacher and students. The findings indicated that students showed low learning motivation during classroom instruction, as reflected in their limited attention, boredom, and tendency to talk with peers during lesson. The teacher also reported that 50% of students had not reached the minimum mastery criterion, suggesting that motivational problems were also related to learning achievement.

The needs assessment further showed that civic education learning was still dominated by lecture-based instruction. The teacher commonly explained the material in front of the class, while students listened and completed evaluation tasks after the explanation. In this learning pattern, students tended to respond only when directly asked by the teacher. Learning resources were also limited to textbooks and conventional visual media, such as the Garuda Pancasila image displayed in the classroom. Although the school had supporting facilities, including an LCD projector and sound system, these facilities had not yet been used to support civic education learning.

Student interviews confirmed the same instructional problem. Students stated that they sometimes felt bored when the teacher explained the material repeatedly. They also reported that interactive media had not been used in the classroom and that learning usually relied on oral explanation, the blackboard, and textbooks. At the same time, students expressed interest in learning with media because they believed it could make the material easier to understand, more enjoyable, and less monotonous.

The technology analysis indicated that the school had limited but relevant digital infrastructure. LCD projectors and speakers were available in classrooms, but they had not been optimally used by the teacher in civic education. The school also had only a limited number of computers or laptops connected to the internet. However, students were allowed to bring smartphones for certain school activities, such as examinations, because the available computers were insufficient. This condition provided a practical basis for developing Android-based interactive multimedia that matched the technological context of the school.

Based on these findings, the development of SiLaKu was directed toward addressing two main needs: increasing students' motivation and providing more interactive learning media for civic education. The application was therefore designed to support the topic of Pancasila values in daily life through a more engaging, accessible, and student-centered learning environment. The learning objectives were aligned with the basic competencies requiring students to analyse and present examples of Pancasila values in everyday life.

Design and Development of the SiLaKu Application

Based on the preliminary needs assessment, the SiLaKu application was designed as Android-based interactive multimedia for learning Pancasila values in daily life. The design process began by aligning the learning content with the basic competencies and learning objectives used in the sixth-grade civic education curriculum. The selected topic focused on identifying, analysing, discussing, and presenting examples of Pancasila values in everyday life (Figure 1).

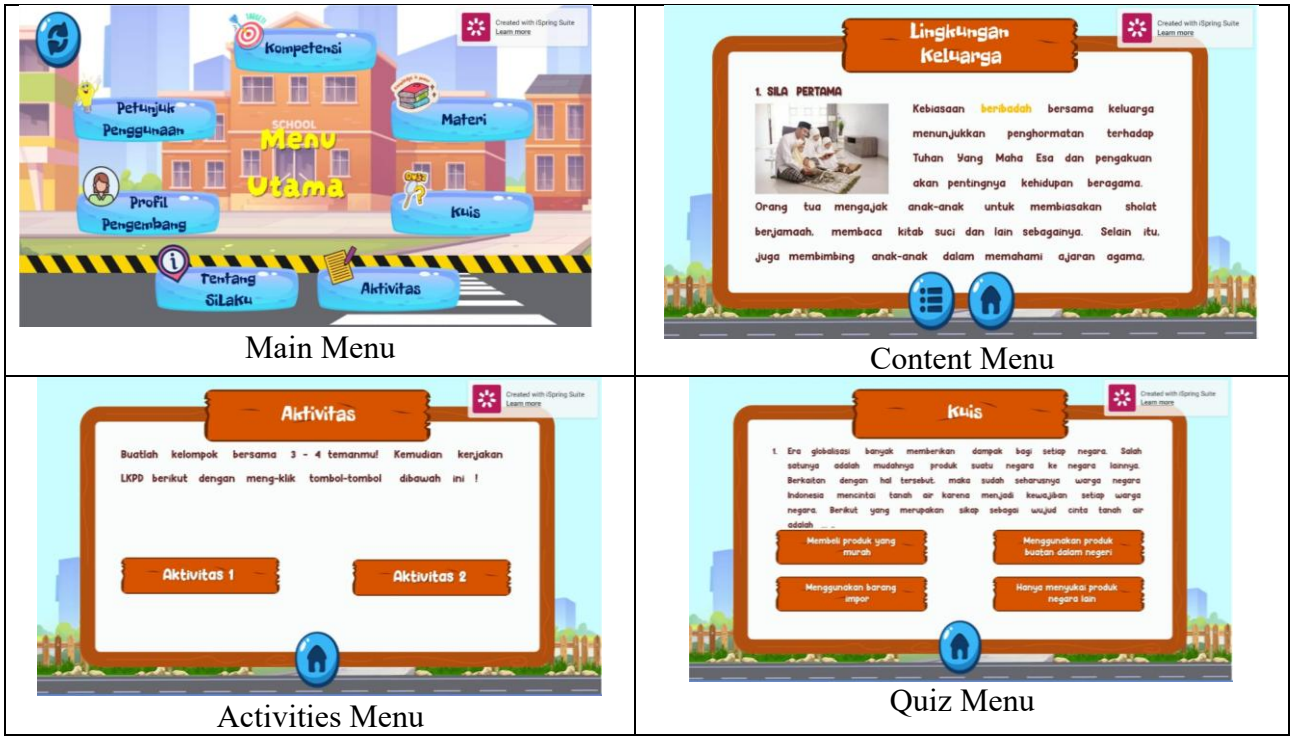


Figure 1. Navigation and Interactive Interface of the SiLaKu Android Application

The multimedia design was developed to respond to students' need for more engaging and interactive learning media. The application was planned by considering several multimedia elements, including interface design, text, video, animation, navigation symbols, and audio. The interface was designed with consistent page layouts, bright colours, readable font sizes, and simple navigation buttons to make the application accessible for sixth-grade students. The language used in the application was also adjusted to students' level of understanding, while video, animation, and background sound were included to make the learning process clearer and more enjoyable.

The structure of SiLaKu included several main components: the main page, menu page, user instructions, competencies and learning objectives, learning materials, quizzes, activity pages, developer profile, and information about the media. The researcher prepared a storyboard as an initial design reference to compile the layout and content of these pages. The storyboard helps ensure that the application is developed systematically and that each page has a clear instructional function.

The production process begins with the development of multimedia content using PowerPoint 2010. Various multimedia elements such as images, animations, audio, videos, symbols, and instructional text are integrated into the application as per the storyboard. Hyperlinks are added to the navigation buttons to allow movement across the page. The activity menu also includes Liveworksheet-based student worksheets that are linked via URL navigation, allowing students to engage with learning tasks beyond just reading material.

The quiz section is developed in the form of multiple-choice questions. Interactive feedback is provided for correct and incorrect answers through animations controlled by trigger features. This feedback mechanism is important because it allows students to receive direct responses to their answers, making the learning process more interactive and supporting motivation.

Once the multimedia component is created, the product is converted to HTML5 format using iSpring. The HTML5 file is then converted into an Android Package Kit (.apk) using Website 2 APK Builder Pro so that the app can be installed and used on Android smartphones. This process results in an Android-based multimedia application that integrates citizenship education content, multimodal presentations, learner navigation, interactive quizzes, and activity-based worksheets.

In many educational contexts, Android-based learning media have become increasingly relevant due to the widespread accessibility of smartphones among students (Eliza et al., 2023a; Sriwhyuni et al., 2025a). Mobile learning environments provide opportunities for learners to access instructional content beyond classroom limitations and participate in learning activities according to their own pace and preferences (Bidarra & Sousa, 2020b). This flexibility has contributed to the growing use of Android-based multimedia in primary education.

Previous studies have shown that interactive multimedia may improve classroom participation, learning engagement, and instructional effectiveness (Dirgatama et al., 2021a; Rogti, 2024a; Trianingsih et al., 2026a; Utami et al., 2023a). Multimedia-supported learning environments are often associated with increased student attention and greater interest in classroom activities because they integrate visual, auditory, and interactive elements into the learning process (Barnett-Itzhaki et al., 2023; Sankey & Gardiner, 2010; Yulhendri et al., 2022). Interactive features such as quizzes, animations, learner-controlled navigation, and direct feedback are also believed to encourage more active learning participation.

However, most of the existing literature continues to focus on product feasibility, usability, and learning outcomes. Many multimedia studies remain developmentally oriented and descriptive, emphasizing technical quality and implementation outcomes rather than examining how multimedia interactions shape student motivational engagement (Anshari, 2024a; Mandernach, 2009a; Schindler et al., 2017b). Consequently, interactive multimedia is frequently positioned as a technological instructional aid rather than as a pedagogical environment capable of influencing learners' motivational experiences.

These limitations are becoming more evident in civic education. In contrast to STEM-oriented subjects that often emphasize procedural mastery, civics education focuses on reflective understanding, internalization of values, participation, and social engagement. These characteristics require a learning environment that encourages active engagement and ongoing engagement throughout the learning process (Altaany, 2024; Owen et al., 2019). However, research examining the motivational role of Android-based interactive multimedia in elementary civic education remains relatively limited.

Product Feasibility and Expert Validation

Prior to its implementation in the field, mobile interactive multimedia underwent a rigorous two-level validation process to determine its feasibility. Validation is carried out by Subject Matter Experts (SME) to assess pedagogical content and Media Experts to evaluate the technology architecture. Table 1 presents a summary of the results of expert validation. The assessment uses the Aiken index formula to ensure the accuracy of the experts' assessments, ensuring that the content and media components meet the required thresholds for learning usability (Muktiani et al., 2022).

Table 1. Expert Validation Results of the Interactive Multimedia

Validator	Assessed Aspects	Score Obtained	Maximum Score	Percentage	Category
Material Expert	Relevance, consistency, adequacy	58	60	97.00%	Very valid/very feasible

Media Expert	Product identity, product appearance, product specifications	73	80	91.25%	Very valid/very feasible

As presented in Table 1, The material expert validation was conducted to examine the quality of the Pancasila values content presented in the multimedia. The material expert assessed three aspects: relevance, consistency, and adequacy. The validation result showed that the product obtained a score of 58 out of 60, equivalent to 97.00%. This percentage placed the material component in the "very valid/very feasible" category. This finding indicates that the content was considered relevant to the learning objectives, consistent with the intended competencies, and adequate for supporting civic education learning.

Media expert validation was carried out to determine the quality of multimedia design and technical presentation. The aspects assessed included product identity, product appearance, and product specifications. The validation results showed that the product obtained a score of 73 out of 80 or equivalent to 91.25%. This percentage also placed the media component in the "very valid/very feasible" category. These results showed that the implementation was considered feasible in terms of interface design, visual presentation, product specifications, and implementation readiness in the classroom.

In addition to the quantitative validation score, expert comments are used to revise the product. Subject matter experts suggest adding learning activities, while media experts suggest adjusting the back and next buttons using the built-in application features. These suggestions are incorporated into the product revision before the field trial. Therefore, the validation stage not only serves as a feasibility check, but also as a formative process to improve the quality of SiLaKu's learning and technicalities.

This high validation value is in line with recent research showing that multimedia tools developed under the close supervision of experts are consistently considered very feasible for fostering conceptual understanding and character development in civics education (Wahyudi & Kawuryan, 2025a; Wahyuni et al., 2022).

Implementation of SiLaKu in the Field Trial

After being revised and declared valid and feasible, SiLaKu was implemented in a field trial involving 20 sixth-grade students at MI NU Hidayatul Mubtadiin Malang. The implementation took place in the regular classroom setting under teacher supervision. The teacher allowed students to bring smartphones for the learning activity, and the application was distributed through the class WhatsApp group. Students downloaded and installed the .apk file on their Android devices before using the application. Before the intervention, students completed a motivation questionnaire. They then used SiLaKu to study Pancasila values in daily life through text materials and videos, completed multiple-choice quizzes individually, and worked on student worksheets in groups. At the end of the lesson, students completed the motivation questionnaire again to measure changes in their learning motivation.

Descriptive Statistics of Students' Motivation

To examine changes in students' learning motivation after the implementation of the interactive multimedia, descriptive statistics were calculated from the pretest and posttest questionnaire data of the 20 sixth-grade participants. The results are presented in Table 2.

Table 2. Descriptive Statistics of Students' Learning Motivation

Assessment Phase	N	Mean	Std. Deviation	Minimum	Maximum	95% CI Lower	95% CI Upper
Pretest	20	2.455	0.228	2.10	2.90	2.348	2.562
Posttest	20	3.525	0.295	2.80	3.80	3.387	3.663

As shown in Table 2, students' mean motivation score increased from 2.455 before the intervention to 3.525 after the implementation of the Android-based interactive multimedia. The higher posttest mean indicates an upward shift in students' motivational responses after using SiLaKu. The increase in the minimum score from pretest to posttest also suggests that the overall distribution of motivation scores moved in a positive direction.

Normality Test

Prior to hypothesis testing, the normality of the pretest and posttest motivation scores was examined using the Shapiro–Wilk test. The results are presented in Table 3.

Table 3. Normality Test of Students' Motivation Scores

Assessment Phase	Shapiro–Wilk Statistic	df	Sig.
Pretest	0.964	20	0.619
Posttest	0.835	20	0.003

As shown in Table 3, the pretest score meets the assumption of normality, while the posttest score does not. Because one of the paired data violates the assumption of normality, the nonparametric test is considered more appropriate. Therefore, the Wilcoxon Signed-Ranks Test is used to test the difference in student motivation scores before and after the implementation of Android-based interactive multimedia.

Wilcoxon Signed-Ranks Test and Effect Size

Following the normality test, the Wilcoxon Signed-Ranks Test was conducted to examine whether students' motivation scores differed significantly before and after the implementation of the Android-based interactive multimedia. The results are presented in Table 4.

Table 4. Wilcoxon Signed-Ranks Test and Effect Size

Comparison	Negative Ranks	Positive Ranks	Ties	Z	Sig.	Effect Size (*r*)	Interpretation
Posttest–Pretest	0	20	0	−3.953	< .001	0.884	Very large

As shown in Table 4, all students obtained higher posttest scores than pretest scores, with no negative ranks and no tied scores. The Wilcoxon Signed-Ranks Test indicated a statistically significant increase in students' learning motivation after using the Android-based interactive multimedia. The effect size value of $r = 0.884$ suggests that the implementation of SiLaKu was associated with a large practical effect on students' motivation within this limited field trial.

Normalized Gain Score Analysis

To estimate the magnitude of students' motivational improvement, a normalized gain analysis was calculated based on the pretest and posttest motivation scores. The results are presented in Table 5.

Table 5. Normalized Gain Score of Students' Learning Motivation

Assessment Phase	Mean Score	Maximum Score	N-Gain	Category
Pretest	2.455	4.00		
Posttest	3.525	4.00	0.69	Moderate

As shown in Table 5, the N-Gain score was 0.69, indicating a moderate level of improvement in students' learning motivation. Although the value is close to the high category, it is more cautiously interpreted as moderate because the score does not exceed 0.70. This finding suggests that the increase in motivation was not only statistically significant, as indicated by the Wilcoxon Signed-Ranks Test, but also educationally meaningful within the context of a limited field trial.

Discussion of Motivational Improvement through the SDT Perspective

The improvement in students' learning motivation can be interpreted through the perspective of Self-Determination Theory, which emphasizes autonomy, competence, and relatedness as central psychological needs in learning motivation (Martin et al., 2018; Ryan & Deci, 2020; Yang et al., 2025). From this perspective, motivation is more likely to develop when students experience meaningful control over learning activities, perceive themselves as capable participants, and engage actively with the learning environment. Therefore, the motivational improvement found in this study should not be attributed merely to the use of Android technology, but to the way SiLaKu was designed as an interactive and structured learning environment.

First, SiLaKu may have supported students' autonomy by allowing them to access learning materials through their own Android devices and navigate the application under teacher guidance. Previous studies suggest that learner-controlled navigation, self-paced learning, and independent interaction with digital materials can support students' agency in technology-mediated learning environments (Chiu, 2024; Liu & Correia, 2021; Rhode, 2009; Yang et al., 2025). In this study, students downloaded and installed the application, then used it to study Pancasila values through text-based materials and videos. The use of hyperlinks and navigation buttons also enabled students to move across learning pages, making the learning process less dependent on one-way teacher explanation.

Second, the application may have supported students' sense of competence through multimodal explanations, interactive quizzes, and immediate feedback. Multimedia learning environments can strengthen students' learning experience when they combine multiple representations, guided activities, feedback, and opportunities for successful task completion (Cairncross & Mannion, 2001; Taipjutorus et al., 2012; Zheng et al., 2009). In SiLaKu, the materials were presented through text, video, animation, audio, and visual elements. The quiz section also provided feedback for correct and incorrect answers through animation and trigger features. These features may help students recognize their progress, correct misunderstandings, and experience successful completion of learning tasks.

Third, SiLaKu may have encouraged classroom engagement through individual and collaborative learning activities. The field trial required students to complete multiple-choice quizzes individually and work on student worksheets collaboratively in groups. This combination is relevant to civic education because learning Pancasila values requires not only individual understanding, but also discussion, reflection, and the ability to relate values to everyday situations. In this regard, interactive multimedia can be understood not merely as a tool for delivering instructional content, but as a learning environment that shapes how students participate, interact, and sustain engagement during learning activities (Anshari, 2024b; Feldon et al., 2021; Schindler et al., 2017a).

Overall, these findings indicate that Android-based interactive multimedia can foster motivation when its features are pedagogically designed around learner navigation, multimodal representation, interactive feedback, and structured learning activities. This interpretation aligns with the Self-Determination Theory (SDT) perspective that digital learning environments can support motivation by providing opportunities for autonomy, competence, and meaningful engagement (He & Li, 2023; Ryan & Deci, 2020; Urhahne & Wijnia, 2023). However, given that this study employed a limited field trial without a control group, these findings should be regarded as preliminary evidence of motivational enhancement rather than definitive proof of causal effectiveness.

Android-Based Multimedia in Primary Civic Education

The findings of this study also contribute to the discussion of Android-based interactive multimedia in basic citizenship education. The increasing integration of digital technologies has changed the way learning is designed, delivered, and experienced in educational contexts (Bonfield et al., 2020). In this development, mobile learning is becoming increasingly relevant as it allows students to access learning materials more flexibly through familiar digital devices (Bidarra & Sousa, 2020a; Mhlongo et al., 2023). Therefore, Android-based learning media has been widely promoted as a practical alternative to creating a flexible, accessible, and student-centered learning environment, especially when schools face limitations in computer-based infrastructure (Eliza et al., 2023b; Sriwhyuni et al., 2025b; Utami et al., 2023b).

However, in the context of civic education, the use of Android-based multimedia requires more than just the availability of technology. Civic education, including Pancasila education, is not limited to the delivery of factual knowledge alone. This learning requires reflective understanding, internalization of values, social participation, and active involvement in the learning process (Busara, 2023; Hoggan-Kloubert & Mabrey, 2022). Previous research has shown that interactive media can support Pancasila education and civic learning at the elementary school level (Istiqomah & Wibowo, 2024; Tirtoni & Ramadhan, 2024; Wahyudi & Kawuryan, 2025b). Nonetheless, many studies still tend to emphasize aspects of product feasibility, usability, or learning outcomes, but pay less attention to how multimedia interactions shape students' motivational engagement in value-oriented learning (Anshari, 2024b; Mandernach, 2009b; Schindler et al., 2017a).

The SiLaKu application answers these problems by positioning Android-based multimedia not just as a digital presentation tool, but as a structured learning environment for civic education. The application combines text, video, animation, audio, visual elements, student-controlled navigation, interactive quizzes, feedback, and activity-based worksheets. These design features are consistent with research showing that interactive multimedia can increase student attention, engagement, participation, and learning effectiveness when organized pedagogically rather than used only as a complement to technology (Dirgatama et al., 2021b; Rogti, 2024b; Trianingsih et al., 2026b; Utami et al., 2023b).

This contribution is very relevant for the teaching of Pancasila values at the elementary school level. Abstract civic values need to be associated with concrete examples from students' daily lives so that they not only memorize concepts, but also be able to analyze, discuss, and present situations full of values. In SiLaKu, Pancasila values are presented through multimodal materials that are complemented by quizzes and student worksheet activities. This design is in line with various studies that emphasize that technology-based interactive media can support Pancasila learning by making citizenship concepts easier to understand, contextual, and attractive to elementary school students (Istiqomah & Wibowo, 2024; Tirtoni & Ramadhan, 2024; Wahyudi & Kawuryan, 2025b)

At the same time, the study addresses practical issues in the use of technology in elementary schools. Although mobile devices are often limited in elementary classrooms, students are increasingly familiar with Android technology in everyday life. The field context of this study shows that schools have limited access to computers, while the use of smartphones is allowed for specific learning purposes under the supervision of teachers. Therefore, Android-based multimedia can be a viable option if its use is carefully crafted, supervised, and aligned with learning objectives. This supports the argument that mobile learning should not be treated just as device use, but as a pedagogically designed environment that connects accessibility, interaction, and motivation (Bidarra & Sousa, 2020a; Liu & Correia, 2021; Mohammadi Zenouzagh et al., 2023).

Therefore, SiLaKu's main contribution lies in the integration of mobile accessibility, civic content, and interactions that support motivation. In contrast to the use of conventional technologies that function primarily as a medium of display or delivery, SiLaKu is designed to support students' active participation through navigation, multimodal representation, feedback, and individual-collaborative learning tasks. In this sense, Android-based interactive multimedia can be understood as a pedagogical environment that supports motivational engagement in basic civic education, especially when civic values are taught through concrete, interactive, and student-centered learning experiences.

CONCLUSION

This study developed and examined the feasibility of SiLaKu, an Android-based interactive multimedia application designed to support students' learning motivation in civic education. The findings showed that the application was considered highly feasibility by both material and media experts. The field trial also indicated an increase in students' learning motivation after the implementation of SiLaKu.

From a learning design perspective, the findings suggest that Android-based interactive multimedia can support motivational engagement when it is designed as more than a digital presentation tool. In SiLaKu, learner-controlled navigation, multimodal materials, interactive quizzes, immediate feedback, and activity-based worksheets provided students with opportunities to interact with civic education content. According to Self-Determination Theory, these features may support autonomy, competence, and classroom engagement by allowing them to access materials independently, receive feedback, and participate in individual as well as collaborative learning activities.

The contribution of this study lies in positioning Android-based interactive multimedia as a structured motivational support system for primary civic education. Rather than treating mobile learning merely as device use, this study highlights the importance of pedagogical design in transforming Android-based media into a learning environment that supports participation, accessibility, and motivation in value-oriented learning. This particularly relevant for primary schools with limited digital infrastructure, where supervised smartphone use may offer a practical alternative to computer-based learning.

However, the findings should be interpreted cautiously. The study involved only 20 students in one Islamic primary school and did not include a control group. In addition, students' motivation was measured primarily through self-report questionnaires, which capture motivational perceptions rather than long-term civic behavior. Future research should involve larger and more diverse samples, comparison groups, and longitudinal designs to examine whether Android-based interactive multimedia can produce sustained motivational engagement and support the internalization of civic values beyond the immediate classroom trial.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the author used ChatGPT, Google Gemini, and Jenni AI. ChatGPT is used to sharpen and check the coherence of sentences and paragraphs. Google Gemini is used to translate data from the original thesis into formal academic English, structure the manuscript according to journal-specific guidelines, and refine the scientific tone of the methodology, discussion, and conclusion sections. Jenni AI is used as a tool to identify and find relevant academic literature. After using these tools, authors review, validate, and edit the content to ensure accuracy and coherence, and they take full responsibility for the content of the publication.

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AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; Investigation.

Author 3: Supervision; Validation

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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